AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

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

Holtec Decommissioning International, LLC

is authorized to discharge from a facility located at

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

to receiving water named

Cape Cod Bay

a Class SA water, 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 signature.

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

This permit supersedes the permit that was issued on April 29, 1991, modified on August 30, 1994, and expired on April 29, 1996.

This permit consists of this cover page, Part I, Attachment A (Marine Acute Toxicity Test Protocol, July 2012), Attachment B (Impingement Monitoring Plan), Attachment C (Summary of Monitoring Parameters for Electrical Vault Sampling), and Part II (NPDES Part II Standard Conditions, April 2018).

Signed this 30th day of January , 2020.

/S/SIGNATURE ON FILE
Ken Moraff, Director
Water Division
Environmental Protection Agency
Boston, MA

/S/SIGNATURE ON FILE
Lealdon Langley, Director[1]
Division of Watershed Management
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

[1] Massachusetts Department of Environmental Protection (MassDEP), by taking this action, does not acquiesce in or accept past or future decisions and actions of the Nuclear Regulatory Commission, including those of its staff, approving the direct and indirect transfer of the Pilgrim Renewed Facility Operation License DPR-35 and the general license for the Pilgrim Independent Spent Fuel Storage Installation (ISFSI) from Entergy Nuclear Operation Inc. and Entergy Nuclear Generation Company (to be renamed Holtec Pilgrim, LLC) to Holtec International and Holtec Decommissioning International, LLC. MassDEP takes this action in an abundance of caution to ensure protection of Massachusetts' waters.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. The Permittee is authorized to discharge circulating water through **Outfall Serial Number 001** to the discharge canal which flows to Cape Cod Bay. This discharge, and commingled wastestreams in the discharge canal, shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate[3]	MGD	Report	224	Continuous [4]	Recorder
Hours of Operation[3]	Hours	---	Report	1/Month	Count
pH[5]	S.U.	---	Report	1/Month	Grab
Oil and Grease[6]	mg/L	Report	Report	1/Month	Grab
Total Residual Oxidants[7]	mg/L	0.1	0.1	1/Week	Grab
Tolyltriazole[8]	mg/L	Report	1.48	1/Month	Grab
Sodium Nitrite[8]	mg/L	Report	2.0	1/Month	Grab

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Temperature, Effluent	°F	Report	Report	Continuous [4]	Recorder
Temperature Rise (delta T)[9]	°F	---	Report	Continuous [4]	Recorder
WHOLE EFFLUENT TOXICITY[10,11,12, 13]					
LC_{50}	%	---	Report	2/Year	24-Hour Composite[10]
Total Residual Chlorine	mg/L	---	Report	2/Year	Grab
Salinity	g/Kg	---	Report	2/Year	24-Hour Composite[10]
pH	S.U.	---	Report	2/Year	Grab
Total Solids	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Suspended Solids	mg/L	---	Report	2/Year	24-Hour Composite[10]
Ammonia	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Organic Carbon	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Recoverable Cadmium	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Recoverable Lead	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Recoverable Copper	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Recoverable Zinc	mg/L	---	Report	2/Year	24-Hour Composite[10]
Total Recoverable Nickel	mg/L	---	Report	2/Year	24-Hour Composite[10]

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 001, taken at a location in the outfall channel discharge to Cape Cod Bay. This sampling point shall also include flows from Outfalls 004, 005, 010, 011, 012, and 014 when discharging. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report (DMR) submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 Code of Federal Regulations (CFR) §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., "C" for "No Discharge") on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary.The results of sampling for any parameter above its required frequency must also be reported.

3. The Permittee may discharge at this flow for up to 48 hours in any calendar month. The Permittee shall report the total number of hours that either circulating water pump operates during the period beginning on the first day of the calendar month and ending on the last day of the calendar month.

4. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart and shall be made available upon request by EPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minutes apart each day is acceptable in lieu of continuous monitoring data. The Permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate may be estimated from pump capacity curves and operational hours. The daily maximum values for effluent temperature and delta T shall be the highest values recorded during the month.

5. The minimum and maximum pH sample measurement values for the monitoring period shall be reported in standard units (S.U.).

6. The Permittee shall use EPA Method 1664A for oil and grease analysis, which has a minimum level of 5 mg/L (where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern. Sampling shall be conducted in the discharge canal at a point which includes flow from Outfalls 010, 011, and 014 when the circulating water pumps are not operating.

7. Chlorination of the intake water from either circulating water pump is prohibited. Sampling shall be conducted in the discharge canal at a point which includes flow from Outfall 010, when this flow is being chlorinated and no circulating water pump is operating. The minimum level (ML) for TRC is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved

version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine, which can be reported as the TRO value on the DMR. No other biocide shall be used without explicit approval from the Regional Administrator (RA) of Region I of the EPA and the Commissioner of the MassDEP or their designees.

8. The Permittee shall monitor the discharge for sodium nitrite and tolyltriazole originating from Outfall 011 and Outfall 014 on a monthly basis. These discharges may be made directly to the discharge canal. Monitoring must be conducted during dry weather prior to the effluent mixing with seawater when discharging from Outfall 011 and/or Outfall 014. If discharging simultaneously from Outfalls 011 and 014 during a reporting period, monitoring at the compliance point must be representative of the combined discharge.

9. The temperature rise, or delta T, is defined as the difference between the discharge temperature and the intake temperature measured within the same 15-minute interval.

10. The Permittee shall conduct acute whole effluent toxicity (WET) tests twice per year for years 1, 3 and 5 of the permit. The Permittee shall test the Mysid Shrimp, *Americamysis bahia*, and the Inland Silverside, *Menidia beryllina*. The test must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit. Samples shall be collected during dry weather prior to the effluent mixing with seawater when discharging from Outfall 011 and when there is no discharge from Outfall 014 or when a circulating water pump is operating. A 24-hour composite shall consist of twenty-four (24) grab samples collected at hourly intervals during a twenty-four hour period (*i.e.*, 0700 Monday to 0700 Tuesday), combined proportional to flow. If the discharge duration is less than 24 hours, the composite sample shall consist of a shorter time interval than hourly to assure that 24 grab samples are taken. Toxicity testing must be reported in the DMR no later than the second month following the month of testing. For example, for toxicity testing conducted in May, sampling results must be reported by the DMR submitted no later than the 15^{th} of July.

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

12. For each WET test, the Permittee shall report the concentrations of the parameters listed that are detected in a 100% effluent sample on the appropriate DMR. All of these chemical parameters shall be determined to at least the minimum levels of quantification (ML) shown on Pages 8 to 10 of **Attachment A**, as amended. The Permittee should note that all chemical parameter results must still be reported in the appropriate WET test report.

13. If toxicity test(s) using the receiving water as diluent show the receiving water to be toxic or unreliable, the Permittee shall follow procedures outlined in **Attachment A (Toxicity Test Procedure and Protocol) Section IV., DILUTION WATER** in order to obtain an individual approval for use of an alternate dilution water.

2. The Permittee is authorized to discharge non-thermal backwash water through **Outfall Serial Number 002**, which flows back through the intake structure and out to the intake embayment (Cape Cod Bay). Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow [3]	MGD	---	28	Total Daily	Estimate
Discharge Frequency[4]	count	---	1	1/Week	Count
Discharge Duration	hours	---	Report	1/Backwash	Duration
pH[5]	S.U.	6.5 - 8.5		1/Backwash	Grab

a. Chlorination of the cooling water system shall not be conducted during any backwash procedure.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 002, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to the intake embayment. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. Samples for pH shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event during each calendar week, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. The maximum daily flow of all backwashes shall be recorded and reported on the DMR.

4. The frequency of backwashes shall be limited to one per week except to respond to infrequent, abnormal events where backwashing is necessary to avoid severe property damage. Severe property damage means substantial physical damage to property or to cooling water intake-related equipment that causes it to become inoperable. If the frequency of backwashing exceeds once per week, the Permittee shall report the duration of each event and describe the conditions that resulted in a backwashing frequency exceeding once per week. The report shall be attached to the DMR for the reporting period in which more frequent backwashing occurred.

5. The pH of the effluent shall be in the range of 6.5 to 8.5 standard units (S.U.) and not more than 0.2 S.U. outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample measurement values for the month shall be reported in S.U.

3. The Permittee is authorized to discharge non-contact cooling water from the Salt Service Water (SSW) system, classified as low volume waste, through **Outfall Serial Number 010** to the discharge canal, which flows to Cape Cod Bay. Such discharge shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow	MGD	15.6	19.4	Continuous [3]	Estimate
Intake Velocity[4]	fps	Report	0.5	1/Month	Calculation
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
Temperature, Effluent	°F	80	90	Continuous [3]	Recorder
Temperature Rise (delta T) [5]	°F	---	10	Continuous [3]	Recorder
pH [6]	S.U.	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO) [7]	mg/L	0.5	1.0	2/Day	Grab

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 010, taken at a representative location of the discharge exiting from the heat exchangers and prior to mixing with any other flows. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., "C" for "No Discharge") on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart and shall be made readily available upon request by EPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minute apart each day is acceptable in lieu of continuous monitoring data. The Permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate shall be estimated from pump capacity curves and operational hours.

4. The intake velocity shall be monitored at the traveling screens at a minimum frequency of daily when only operating the salt service water pumps or may be calculated using water flow, depth, and the percent open screen area at the maximum salt service water pump flow rate for the reporting period. The maximum daily intake velocity is the maximum instantaneous velocity that is measured or calculated. Also see Part I.C.1.

5. The temperature rise, or delta T, is defined as the difference between the discharge temperature and the intake temperature.

6. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units (S.U.) and not more than 0.2 S.U. outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample measurement values for the month shall be reported in S.U.

7. These limits are based on the marine water quality criteria for TRC. The minimum level (ML) for TRC is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine,

which can be reported as the TRO value on the DMR. Compliance with the TRC limits shall be measured at the ML of detection for the test method used. In order to establish less stringent TRC limits, the Permittee shall demonstrate to EPA and the MassDEP that the discharge of higher levels of TRC are required for macroinvertebrate control and shall include any dilution estimates based on an acceptable dilution model of Cape Cod Bay in the vicinity of the discharge. Only chlorine may be used as a biocide. Sampling shall be conducted only during periods of chlorination at the Facility, when chlorine is expected to be present in the discharge. No other biocide shall be used without explicit approval from the Regional Administrator (RA) of Region I of the EPA and the Commissioner of the MassDEP or their designees. The Permittee shall use a sufficiently sensitive test procedures (method) for TRC consistent with Part I.A.13 below.

4. The Permittee is authorized to discharge intake screenwash water through **Outfall Serial Numbers 012** to Cape Cod Bay via the fish sluiceway which discharges directly to the discharge canal. Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate [3]	MGD	4.1	4.1	Daily	Estimate
pH [4]	S.U.	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO)	mg/L	Report	Report	1/Month	Grab

a. All water used for screenwash operations, with the exception of Station Fire water used during emergency conditions, shall be dechlorinated before being sprayed on the traveling screens and shall not have been used for any cooling purposes at the facility.

b. All live fish, shellfish, and other aquatic organisms that collected or are trapped on the screens or the intake bays shall be returned to the receiving water with minimal stress and at a sufficient distance from the intake so as to prevent reimpingement. All other material, except natural debris (e.g. leaves, seaweed, and algae), shall be removed from the intake screens and recycled or disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Any such material shall not be returned to the receiving water.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 012, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to the discharge canal. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code (e.g., "C" for "No Discharge") on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. The screenwash water shall consist of up to 3.2 MGD of Cape Cod Bay marine water and up to 0.90 MGD of potable freshwater normally used as Station Fire water. This water shall be used only under emergency conditions [as authorized by the U.S. Nuclear Regulatory Commission (NRC)] when traveling screen operation is impeded by the accumulation of algae or other biological material.

4. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units (S.U.) and not more than 0.2 S.U. outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample measurement values for the month shall be reported in S.U.

5. The Permittee is authorized to discharge stormwater through **Outfall Serial Numbers 004 and 005*** to the discharge canal to Cape Cod Bay. **Stormwater pumped out from electrical vaults may also be discharged to these stormwater outfalls**. **(See separate monitoring requirements for electrical vault discharges in Part I.A.7 below**) Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type[3]
Flow Rate	MGD	---	Report	1/Month	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	---	Non-detect[4]	1/Month	Grab
pH[5]	S.U.	6.0 – 8.5		1/Month	Grab

* Outfall 005 also discharges a portion of the flows from Internal Outfall 011 (Part I.C.3 of this permit). Discharges from the heating boiler blowdown via a floor drain to Outfall 005 are prohibited, except in an emergency situation. This discharge has occurred two times from 1998 to 2013. If this discharge occurs, it shall be sampled and be subject to the monitoring conditions and effluent limitations for the stormwater discharges shown above.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through each outfall and taken at a representative location at the point of discharge from the outfall to the discharge to the discharge canal. If an outfall is inaccessible or submerged, the Permittee shall proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with its analytical results. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. All samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. Stormwater samples shall be taken during the first flush of wet weather, defined as during the first hour of a storm event greater than 0.1 inches in magnitude and which occurs at least twenty four (24) hours from the previously measurable (greater than 0.1inch rainfall) storm event. If sampling within the first hour of a storm event is not feasible, the Permittee shall sample as soon as is practicable after the start of a storm which meets this definition and provide a brief explanation on the DMR or cover letter for that month as to why a first flush sample was not taken. For example, the Permittee may cite an unsafe condition (e.g. icing, high wind) as the reason why first flush sampling was not conducted. Flow for these stormwater outfalls shall be estimated for those storm events associated with the monthly sampling events.

4. For Outfalls 004 and 005, there shall be no detectable discharge of oil and grease (O&G). The Permittee shall use EPA Method 1664A for O&G analysis. Compliance with the non-detect limit for Outfalls 004 and 005 shall be measured at the minimum level (ML) of detection for the EPA approved test methods. The ML for O&G is 5 mg/l using EPA Method 1664A, where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern. If EPA approves a method under 40 CFR Part 136 for O&G that has a ML lower than 5 mg/l, the Permittee shall be required to use the improved method. If EPA approves a method under 40 CFR Part 136 for O&G that has a ML lower than 5 mg/l, the Permittee shall be required to use the improved method.

5. The pH of this discharge shall be in the range of 6.0 to 8.5 standard units (S.U.) and no more than 0.2 S.U. outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample values for the month shall be reported in S.U.

6. The Permittee is authorized to discharge stormwater through **Outfall Serial Numbers 006, 007, and 013** to the intake embayment, which flows to Cape Cod Bay. Discharges to Outfall 006 may include municipal water from the fire water storage tanks. **Stormwater pumped out from electrical vaults may also be discharged to these stormwater outfalls**. **(See separate monitoring requirements for electrical vault discharges in Part I.A.7 below**) Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type[3]
Flow Rate	MGD	---	Report	1/Month	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	---	Non-detect[4]	1/Month	Grab
pH[5]	S.U.	6.0 – 8.5		1/Month	Grab

Footnotes:

1. All samples shall be representative of the effluent that is discharged through each outfall and taken at a representative location at the point of discharge from the outfall to the discharge to the intake embayment. If an outfall is inaccessible or submerged, the Permittee shall proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with its analytical results. A routine sampling program shall be developed in which samples are taken at the same day, time, and location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP. Sampling for Outfall 013 is not required.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. Stormwater samples shall be taken during the first flush of wet weather, defined as during the first hour of a storm event greater than 0.1 inches in magnitude and which occurs at least twenty four (24) hours from the previously measurable (greater than 0.1inch rainfall) storm event. If sampling within the first hour of a storm event is not feasible, the Permittee shall sample as soon as is practicable after the start of a storm which meets this definition and provide a brief explanation on the DMR or cover letter for that month as to why a first flush sample was not taken. For example, the Permittee may cite an unsafe condition (e.g. icing, high wind) as the reason why first flush sampling was not conducted. Flow for these stormwater outfalls shall be estimated for those storm events associated with the monthly sampling events.

4. For Outfalls 006 and 007, there shall be no detectable discharge of oil and grease (O&G). The Permittee shall use EPA Method 1664A for O&G analysis. Compliance with the non-detect limit for Outfalls 006 and 007 shall be measured at the minimum level (ML) of detection for the EPA approved test methods. The ML for O&G is 5 mg/l using EPA Method 1664A, where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern. If EPA approves a method under 40 CFR Part 136 for O&G that has a ML lower than 5 mg/l, the Permittee shall be required to use the improved method.

5. The pH of this discharge shall be in the range of 6.0 to 8.5 standard units and no more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample values for the month shall be reported in S.U.

7. The Permittee is authorized to discharge stormwater from electrical vaults (manholes) through internal **Outfall Serial Numbers 004A (manhole MH-4[1]), 004B (manhole MH-2[1]), 005A (CP-4[1]), and 005B (MH-27A[1])** to the discharge canal to Cape Cod Bay **and through internal Outfall Serial Numbers 007A (MH-L[1])** to the intake embayment, which flows out to Cape Cod Bay. Such discharges shall consist of stormwater runoff only and shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [2]	
		Average Monthly	Maximum Daily	Measurement Frequency [3]	Sample Type [4]
Total Suspended Solids (TSS)	mg/L	---	Report	1/Quarter	Grab
Total Phenols	ug/l	---	Report	1/Quarter	Grab
Total Polychlorinated Biphenyls (PCBs) [4]	ug/l	---	Report	1/Quarter	Grab
Total Phthalates	ug/l	---	Report	1/Quarter	Grab
Total Antimony	ug/l	---	Report	1/Quarter	Grab
Total Cadmium	ug/l	---	Report	1/Quarter	Grab
Cyanide, Free	ug/l	---	Report	1/Quarter	Grab
Chromium VI	ug/l	---	Report	1/Quarter	Grab
Total Copper [5]	ug/l	---	Report	1/Quarter	Grab
Total Iron	ug/l	---	Report	1/Quarter	Grab
Total Lead [5]	ug/l	---	Report	1/Quarter	Grab
Total Nickel	ug/l	---	Report	1/Quarter	Grab

Total Zinc	ug/l	---	Report	1/Quarter	Grab
pH [6]	S.U.	Report		1/Quarter	Grab

Footnotes:

1. Manhole designations are provided by the Permittee in the June 30, 2015 CWA Section 308(a) information request letter submittal to EPA. **The Permittee is also authorized to discharge stormwater from twenty (20) other electrical vaults through one of the existing stormwater outfalls, designated as Outfalls 004 through 007. The routine monitoring requirements apply to the five named electrical vaults listed above. Discharges from all 25 electrical vaults are subject to Parts I.A.10 through Part I.A.18 and Part I.D of this Permit. The designations of the additional 20 electrical vaults are as follows: MH-5, MH-2A, MH-3, MH-1, MH-J, MH-Q, MH-K, CP-1, MH-27B, MH-20, MH-19, MH-26A, MH-26B, MH-28A, CP-6, MH-6A, CP-5, CP-2B, CP-2, and CP-3.**

2. Sampling shall be representative of the water that has collected in each electrical vault and prior to being pumped out and discharged to a permitted outfall. Sampling may be conducted in wet or dry weather and does not need to be at a time when the vault contents are being discharged to a stormwater outfall. Sampling locations in these five (5) vaults are considered internal outfalls to eventual discharge points, which are Outfalls 004, 005, and 007. The Permittee shall note the total precipitation and snowmelt over the forty-eight (48) hours prior to sampling. If there is any visible sheen present, the Permittee shall pump out the vault water and dispose of it off-site. A routine sampling program shall be developed in which samples are taken at the same day, time, and location each quarter. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

3. Sampling frequency of 1/quarter is defined as the sampling of one (1) discharge event during each calendar quarter, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. The Permittee shall conduct sampling of electrical vault water during the first month of the calendar quarter. If the vault is dry, the sampling shall be attempted during the following two (2) months of the quarter until a sample is obtained. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

4. The minimum level (ML) for analysis for total PCBs shall be no greater than 0.022 µg/L. 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. Provide the results of PCB

analyses as the sum of all Aroclors. Sampling results less than the detection limit shall be reported as "≤ [detection limit]" on the DMR.

5. The minimum levels (ML) for copper and lead are defined as 3 ug/l and 0.5 ug/l, respectively. These values are the MLs for copper and lead using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This method or another EPA-approved method with an equivalent or lower ML shall be used. Sampling results less than the detection limit shall be reported as "≤ [detection limit]" on the DMR.

6. The pH of this discharge shall be no more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample values for the month shall be reported in S.U.

8. During the period beginning on the effective date and lasting through the expiration date, the Permittee is authorized to discharge station heating system water, cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, drainage from the floor drains in the boiler room (station heating water), SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the demineralizer system * through **Internal Outfall Serial Number 011** which is directed through the drain line associated with Outfall 005 and discharged to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the Permittee as specified below: (* purified city water which does not meet the requirements of condenser makeup water)

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow	MGD	0.015	0.06	Continuous, when in use [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
pH[4]	S.U.	6.1 – 8.4		1/Month	Grab
Effluent Boron[5]	mg/L	Report	5.6	1/Month	Calculated
Boron[5], Ambient	mg/L	Report	Report	1/Month	Grab

See pages 22 and 23 for explanation of footnotes.

9. During the period beginning on the effective date and lasting through the expiration date, the Permittee is authorized to discharge cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the emergency standby liquid control system* through **Outfall Serial Number 014** to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow	MGD	0.015	0.06	Continuous, when in use [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Quarter, when discharging	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Quarter, when discharging	Grab
pH[4]	S.U.	6.1 – 8.4		1/Quarter, when discharging	Grab
Effluent Boron[5]	mg/L	Report	5.6	1/Quarter, when discharging	Calculated
Boron[5], Ambient	mg/L	Report	Report	1/Quarter, when discharging	Grab

* boronated water from the demineralizer which does not meet technical specifications

Footnotes:

1. All samples shall be representative of the effluent that is discharged through internal Outfalls 011, taken at a representative location of the discharge, prior to mixing with any other flows including flow through Outfall 005. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. All samples shall be analyzed using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. If no discharge occurs during the monitoring period, the Permittee shall indicate this on the Discharge Monitoring Report (DMR). For Outfall 014, quarterly sampling shall be conducted when discharge occurs. Such sampling shall be conducted during periods when the majority of the listed flows to this outfall are being discharged. For those months when there are no discharges, the Permittee must report a NODI Code (e.g., "C" for "No Discharge") on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at https://echo.epa.gov/tools/data-downloads/icis-npdes-dmr-summary. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart and shall be made readily available upon request by USEPA or MassDEP. If continuous monitoring at the outfall is unavailable, a minimum of four (4) manual grab samples taken at a minimum fifteen (15) minute intervals each day is acceptable in lieu of continuous monitoring data.

4. The pH of this discharge shall be in the range of 6.1 to 8.4 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class. The minimum and maximum pH sample values for the month shall be reported in S.U.

5. Each release of boron will be reported in that month's DMR and the Permittee shall provide the concentration of boron in the tank before release, and the calculated boron concentration in the discharge canal before mixing with Cape Cod Bay water. Sodium pentaborate may be discharged in 20,000-gallon batches at a maximum concentration of 16,500 mg/l calculated as boron. The boron concentration shall not exceed 1.0 mg/l above background, by calculation, in the discharge from the discharge canal. Each sodium pentaborate release shall be conducted at a rate and with adequate dilution to assure that this concentration is not exceeded in the discharge canal at any time. To calculate the estimated concentration of boron in the discharge canal, the Permittee shall divide the concentration of boron in this internal batch discharge by the dilution factor derived by dividing the flow rate of the cooling water flow being used from the combination of CW and SW pumps that are operating at the time of the batch discharge by the flow rate of this batch discharge. This estimate shall meet the limit of 1.0 mg/l above background of boron. These discharges may be made directly to the discharge canal. In order to confirm that the background concentration of boron is approximately 4.6 mg/l, the Permittee shall sample the ambient water at the intake for boron once per month for Outfall 011 and once per quarter for Outfall 014 during the same day that the batch discharge of boron occurs.

Part I.A. (continued)

10. The effluents shall not cause objectionable discoloration of the receiving waters.

11. The effluents shall not cause a violation of the water quality standards of the receiving waters.

12. The effluents shall be free from visible oil sheens or floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to the receiving water, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

13. 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 limits). A method is considered "sufficiently sensitive" when either (*1*) The method minimum level (ML) is at or below the level of the effluent limit established in this permit for the measured pollutant or pollutant parameter; or (*2*) The method has the lowest ML of the analytical methods approved under 40 C.F.R. § 136 or required under 40 C.F.R. Chapter I, Subchapter N or O for the measured pollutant or the pollutant parameter. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence.

14. Toxics Control

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

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

15. Numerical Effluent Limitations for Toxicants

    EPA or MassDEP may use the results of the chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including, but not limited to, those pollutants listed in Appendix D of 40 C.F.R. Part 122.

16. EPA may modify this permit in accordance with EPA regulations in 40 C.F.R. §§ 122.62 and 122.63 to incorporate more stringent effluent limitations, increase the frequency of analyses, or impose additional sampling and analytical requirements.

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

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

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

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

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

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

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

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

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

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

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

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

18. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

19. Any thermal plume in the receiving water resulting from the discharges from the Facility shall not block or severely restrict fish passage, nor interfere with the spawning of indigenous populations of fish in the receiving water, nor change the balanced indigenous population of the receiving water, and shall have minimal contact with the surrounding shoreline.

20. Unusual Impingement Event (UIE)

During the period beginning on the effective date of the permit, the Permittee shall visually inspect the traveling screens once every 24 hours. The Permittee shall report all "unusual impingement events" at the Facility. An "unusual impingement event" (UIE) at PNPS is defined as the impingement of 250 or more total fish of all species impinged in a single 12-hour period or impingement of more than 1,000 fish during a single event. Upon the occurrence of a UIE, the Permittee shall continuously rotate the traveling screens until the impingement rate decreases to less than 5 fish per hour.

UIEs must be reported to EPA and MassDEP by telephone no later than twelve (12) hours after the Permittee is aware of or has reason to believe an UIE has occurred (See Part I.G.6). A written confirmation report is to be provided within five (5) business days. The MassDEP and EPA addresses to be used are found in Parts I.G.4 and 5 of this permit. The written reports shall include the following information:

a. All fish shall be enumerated and recorded by species. Report the species, size ranges (maximum and minimum length), and approximate number of organisms involved in the UIE. In addition, a representative sample of 25% of fish specimens from each species, up to a maximum of 50 total fish specimens, shall be measured to the nearest centimeter total length.

b. The date and time of occurrence.

c. The determination or opinion of the Permittee as to the reason the incident occurred.

21. All live fish, shellfish, and other aquatic organisms collected or trapped on the screens or in the intake bays shall be returned to the receiving water with minimal stress and at a sufficient distance from the intake so as to minimize re-impingement. All other material, except natural debris (e.g. leaves, seaweed and twigs), shall be removed from the intake screens and recycled or disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Such material shall not be returned to the receiving water.

22. Sand Removal from CWIS

The Permittee may remove accumulated sand from the concrete surfaces of the CWIS as necessary to assure that the operation of the traveling screens is not compromised. Such sand shall be disposed of in accordance with local and state regulations or ordinances. Each sand removal occurrence shall be reported as an attachment to that month’s DMR.

23. Radioactive materials

The discharge of radioactive materials shall be in accordance with and regulated by the Nuclear Regulatory Commission (NRC) requirements (10 C.F.R. Part 20 and NRC Technical Specifications set forth in facility operating license, DPR-35).

24. Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.

B. UNAUTHORIZED DISCHARGES

1. The Permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfalls listed in Parts I.A. through I.C. of this permit. Discharges of wastewater from any other point sources not authorized by this permit shall be reported in accordance with the twenty-four-hour reporting provision found in Section D.1.e.(1) of Part II (Standard Conditions) of this permit. The Permittee must report any planned physical alterations or additions to the permitted facility in accordance with the reporting provision found in Section D.1.a of Part II (Standard Conditions) and give advance written notice (including notice to MassDEP) of any planned changes which may result in noncompliance with permit requirements in accordance with the reporting provision found in Section D.1.b of Part II (Standard Conditions).

2. The discharge of pollutants in spent fuel pool water (including, but not limited to, boron) is not authorized by this permit.

3. The discharge of pollutants in stormwater associated with construction activity, including activities, physical alterations, or additions associated with the dismantlement and demolition of plant systems, structures, and buildings is not authorized by this permit.

4. Discharges of pollutants associated with contaminated site dewatering, pipeline and tank dewatering, collection structure dewatering, or dredge-related dewatering, and including but not limited to physical alterations or additions resulting in the discharge of pollutants associated with the dismantlement and decontamination of plant systems and structures and/or the demolition of buildings are not authorized by this permit.

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

Section 316(b) of the CWA, 33 U.S.C. § 1326(b), dictates that this permit must require that the cooling water intake structure's (CWIS) design, location, construction, and capacity reflect the best technology available for minimizing adverse environmental impact (BTA), including the CWIS's entrainment and impingement of various life stages of aquatic organisms (e.g., eggs, larvae, juveniles, and adults).

PNPS has ceased electricity generating operations and entered its shutdown phase as of June 1, 2019. The BTA requirements in this permit reflect operation of the CWIS as of June 1, 2019. The Permittee may continue to operate the CWIS subject to the following conditions:

1. Operate the traveling screens with a maximum through-screen intake velocity no greater than 0.5 feet per second. Exceedances of the maximum through-screen velocity when a circulating water pump is operating shall not exceed 48 hours in a single calendar month.

2. Monitor the through-screen velocity at the screen at a minimum frequency of daily. Alternatively, the Permittee shall calculate the daily maximum through-screen velocity using water flow, depth, and screen open area. For this purpose, the maximum intake velocity shall be calculated during minimum ambient source water surface elevations and periods of maximum head loss across the screens. The average monthly and maximum daily through-screen intake velocity shall be reported each month on the DMR. See Part I.A.3. of this permit.

3. Cooling water withdrawals at the salt service water pumps shall be limited to a maximum daily flow of 19.4 MGD.

4. Operation of a single circulating water pump at a maximum daily flow of 224 MGD shall not exceed 48 hours over a single calendar month. Operation of either circulating water pump may exceed 48 hours in a single calendar month only to support the withdrawal of fire suppression water.

5. Continuously rotate the traveling screens when operating a circulating water pump.

6. The Permittee shall conduct impingement monitoring once per month when operating a circulating water pump. The Permittee shall conduct monitoring as described in Attachment B and submit an annual biological monitoring report no later than May 15th of the following year as an attachment to the April Discharge Monitoring Report. The Permittee may request a reduction in frequency or elimination of impingement monitoring after a minimum of two years of monthly monitoring. The Permittee is required to monitor at the frequency specified in the permit until written notice is received by certified mail from EPA that the frequency has changed.

7. Any change in the location, design, or capacity of any CWIS, except as expressed in the above requirements, must be approved in advance and in writing by the EPA and MassDEP.

D. SPECIAL CONDITIONS

1. Best Management Practices

The Permittee shall design, install, and implement control measures, including best management practices (BMPs), to minimize pollutant discharges from stormwater associated with industrial activity at the Facility to the receiving water. At a minimum, the Permittee must implement control measures, both structural and non-structural, consistent with those described in Part 2.1 and any Sector specific control measures in Part 8 of EPA's MSGP. (The current MSGP was effective June 4, 2015 – see https://www.epa.gov/npdes/final-2015-msgp-documents). Specifically, control measures, including BMPs must be selected and implemented in compliance with the non-numeric technology-based effluent limitations found in Parts 2.1.2 and 8.O.4 of the 2015 MSGP:

a. Minimize exposure of processing and material storage areas to stormwater discharges;
b. Good housekeeping measures designed to maintain areas that are potential sources of pollutants;
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;
e. Erosion and sediment controls designed to stabilize exposed areas and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants;
f. Runoff management practices to divert, infiltrate, reuse, contain, or otherwise reduce stormwater runoff;
g. Proper handling procedures for salt or materials containing chlorides that are used for snow and ice control;
h. Employee training to ensure personnel understand the requirements of this permit
i. Minimize dust generation and vehicle tracking of industrial materials; and
j. Sector specific non-numeric technology-based effluent limitations included in Sector O (Steam Electric Generating Facilities) of the 2015 MSGP.

2. Stormwater Pollution Prevention Plan (SWPPP)

The Permittee shall develop a Stormwater Pollution Prevention Plan (SWPPP) to document the selection, design and installation of control measures, including BMPs designed to meet the non-numeric technology-based effluent limitations required in Part I.C.1 and consistent with Parts 2.1.2, and 8.O.4 of the 2015 MSGP, to minimize the discharge of pollutants from the Permittee's operations to the receiving water. The SWPPP shall be a written document and consistent with the terms of this Permit.

a. The SWPPP shall be developed and certified by the Permittee within one hundred and eighty days (180) days after the effective date of this permit. The Permittee shall certify that its SWPPP has been completed and signed in accordance with the requirements identified in 40 C.F.R. §122.22. A copy of this certification shall be sent to EPA and MassDEP within thirty (30) days after the certification date.

b. The SWPPP shall be consistent with the general provisions for SWPPPs included in Part 5 of EPA's 2015 MSGP. The SWPPP shall be prepared in accordance with good engineering practices, identify potential sources of pollution that may reasonably be expected to affect the quality of the stormwater discharges, and document the implementation of non-numeric technology based effluent limitations described in Part I.D.1 that will be used to reduce the pollutants and assure compliance with this Permit. The Permittee shall incorporate into the SWPPP all the elements listed in Parts 5.2.1 through 5.2.5 and the sector-specific elements listed at Part 8.O.5 of the 2015 MSGP. Specifically, the SWPPP shall document the selection, design, and installation of control measures and contain the elements listed below:

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

ii. A site description which includes the activities at the facility; a general location map showing the facility, receiving waters, and outfall locations; and a site map showing the extent of significant structures and impervious surfaces, directions of stormwater flows, and locations of all existing structural control measures, stormwater conveyances, pollutant sources, stormwater monitoring points, stormwater inlets and outlets, **electrical vaults which collect stormwater**, and industrial activities exposed to precipitation such as those associated with materials storage, disposal, and material handling.

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

iv. A description of structural and non-structural stormwater controls.

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

vi. Sector specific SWPPP provisions included in Sector O (Steam Electric Generating Facilities) of the MSGP.

c. All areas with industrial materials or activities exposed to stormwater, all structural controls used to comply with effluent limits in this permit, and all discharge points shall be inspected, at least once per quarter, **including all electrical vaults that accumulate stormwater that is then discharged via one of the four authorized stormwater outfalls**, by qualified personnel with one or more members of the stormwater pollution prevention team. If discharge locations are inaccessible, nearby downstream locations must be inspected. Inspections shall be consistent with the conditions in Part 3.1 of the 2015 MSGP. Inspections shall begin during the 1st full calendar month after the effective date of this permit. The Permittee must examine the following during an inspection:

i. Industrial materials, residue, or trash that may have or could come into contact with stormwater;

ii. Leaks or spills from industrial equipment, drums, tanks, or other containers;

iii. Offsite tracking of industrial or waste materials, or sediment where vehicles enter or exit the site;

iv. Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas;

v. Control measures needing replacement, maintenance, or repair.

d. Once per quarter, a sample of stormwater discharged from Outfalls 004, 005, 006 and 007 shall be collected and visually assessed. Samples shall be collected within the first sixty (60) minutes of discharge from a storm event, 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. The Permittee shall document the following information for each inspection and maintain the records along 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 60 minutes;

iv. Weather information and a description of any discharges occurring at the time of the inspection;

v. Results of observations of stormwater discharges, including any observed discharges of pollutants and the probable sources of those pollutants;

vi. Any control measures needing maintenance, repairs or replacement; and,

vii. Any additional control measures needed to comply with the permit requirements.

e. The Permittee shall amend and update the SWPPP within thirty (30) days of any changes at the facility that result in a significant effect on the potential for the discharge of pollutants to the waters of the United States. Changes which may affect the SWPPP include, but are not limited to, the following activities: a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to the waters of the United States; a release of a reportable quantity of pollutants as described in 40 C.F.R. § 302; or a determination by the Permittee or EPA that the SWPPP appears to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with industrial activity. **The Permittee shall specifically address changes to the site associated with planned decommissioning activities and design and implement additional BMPs as**

necessary to account for changes in stormwater drainage patterns, new or additional potential pollutants, and demolition and construction activities which are not subject to the EPA's Construction General Permit. Any amended, modified, or new version of the SWPPP shall be re-certified and signed by the Permittee in accordance with the requirements identified in 40 C.F.R. §122.22.

f. The Permittee shall also 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. If the facility is not in compliance with any BMPs and/or activities described in the SWPPP, the annual certification shall state the non-compliance and the remedies which are being undertaken. Such annual certifications also shall be signed in accordance with the requirements identified in 40 C.F.R. §122.22 and Part II.D.2 of this Permit. The Permittee shall maintain at the facility a copy of its current SWPPP and all SWPPP certifications (the initial certification, re-certifications, and annual certifications) signed during the effective period of this permit and shall make these available for inspection by EPA and MassDEP. All documentation of SWPPP activities shall be kept at the Facility for at least five years and provided to EPA or MassDEP upon request. In addition, the Permittee shall document in the SWPPP any violation of numeric or non-numeric stormwater effluent limits with a date and description of any corrective actions taken.

E. REOPENER CLAUSE

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

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

   b. Controls any pollutants not limited in the permit.

F. ELECTRICAL VAULT SAMPLING

The Permittee shall conduct a one-time sampling for all of the electrical vaults which were not sampled pursuant to EPA's March 24, 2015 CWA Section 308(a) letter. The Permittee shall reference Exhibit B of its "Response to USEPA's March 24, 2015 Request for Information" submittal, which listed the twenty-five (25) electrical vaults on the property as identified by the Permittee. Since stormwater was sampled for seven (7) of these electrical vaults, this requirement shall apply for the remaining eighteen (18) electrical vaults. These samples shall be analyzed for the same parameters which were required by the 2015 308(a) letter which are listed in Permit Attachment C. The sampling results shall be submitted within 180 days of the effective date of the permit.

G. 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 MassDEP 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:

   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 accessible through EPA's Central Data Exchange at https://cdx.epa.gov/.

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.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 Water Division (WD) and MassDEP

   a. The following requests, reports, and information described in this permit shall be submitted to the NPDES Applications Coordinator in the EPA WD.

   (1) Transfer of Permit notice;
   (2) Request for changes in sampling location;
   (3) Annual Biological Monitoring Reports
   (4) BMP reports and certifications, if required;
   (5) Request for Reduction in WET Testing Requirement;
   (6) Report on unacceptable dilution water/request for alternative dilution water for WET testing;
   (7) Change in location, design or capacity of cooling water intake structure; and
   (8) Request to discharge new chemicals or additives.

b. These reports, information, and requests shall be submitted to EPA WD electronically at R1NPDESReporting@epa.gov or by hard copy mailed to the following address:

U.S. Environmental Protection Agency
Water Division
NPDES Applications Coordinator
5 Post Office Square - Suite 100 (06-03)
Boston, MA 02109-3912

Submit hard copies of reports listed above to MassDEP at the following address:

Massachusetts Department of Environmental Protection
Bureau of Water Resources
1 Winter St.
Boston, Massachusetts 02108

4. Submittal of Reports in Hard Copy Form

a. The following notifications and reports shall be signed and dated originals, submitted in hard copy, with a cover letter describing the submission:

(1) Prior to December 21, 2020, written notifications required under Part II. Starting on December 21, 2020, such notifications must be done electronically using EPA's NPDES Electronic Reporting Tool ("NeT"), or another approved EPA system, which will be accessible through EPA's Central Data Exchange at https://cdx.epa.gov/.

b. This information shall be submitted to EPA ECAD at the following address:

U.S. Environmental Protection Agency
Enforcement and Compliance Assurance Division
Water Compliance Section
5 Post Office Square, Suite 100 (04-SMR)
Boston, MA 02109-3912

5. State Reporting

Duplicate signed copies of all WET test reports shall be submitted to the Massachusetts Department of Environmental Protection, Division of Watershed Management, at the following address:

Massachusetts Department of Environmental Protection
Bureau of Water Resources
Division of Watershed Management
8 New Bond Street
Worcester, Massachusetts 01606

6. Verbal Reports and Verbal Notifications

a. 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 the State. This includes verbal reports and notifications which require reporting within 24 hours (e.g., Part II.B.4.c. (2), Part II.B.5.c. (3), and Part II.D.1.e.).

b. Verbal reports and verbal notifications shall be made to EPA's Enforcement and Compliance Assurance Division at:

617-918-1510

H. STATE PERMIT CONDITIONS

1. This authorization to discharge includes two separate and independent permit authorizations. The two permit authorizations are (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, and 314 CMR 3.00. The state authorization includes all of Part I, Attachment A, Attachment B, and Attachment C. In addition, the standard conditions contained in 314 CMR 3.19 are hereby incorporated by reference into this state surface water discharge permit. These standard conditions include, but are not limited to, 314 CMR 3.19(20)(e):

> The permittee shall report any non-compliance which may endanger public health or the environment. Any information shall be provided orally to the appropriate DEP office within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the non-compliance, including exact dates and times, and if the non-compliance 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 non-compliance. The following shall be included as information which must be reported within 24 hours:
>
> 1. Any unanticipated bypass which exceeds any effluent limitation in the permit.
> 2. Violation of the maximum daily discharge limitation for any of the pollutants listed by the Department in the permit to be reported within 24 hours.

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

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

4. For each year of the permit term, the permittee shall notify MassDEP when the Annual Radioactive Effluent Release Report and the Annual Radiological Environmental Operating Report submitted to the Nuclear Regulatory Commission are available, and the website at which the reports are available. If the one or both of the reports are not made available on a website, then the permittee shall also transmit to MassDEP electronic copies of the Reports with the notification. Notification shall be sent to: David Johnston, MassDEP Southeast Regional Office, david.johnston@mass.gov and Cathy Vakalopoulos, MassDEP Surface Water Discharge Permitting Program, catherine.vakalopoulos@mass.gov, or other contact as identified.

5. The permittee shall provide a copy to MassDEP of the reports it must provide to the Nuclear Regulatory Commission regarding events described in sections 3.2.2 (p.3/4-13), 3.2.3 (p.3/4-14), and 3.5.1 (p.3/4-24) of PNPS' Offsite Dose Calculation Manual, Revision 9 (2003) (NRC Adams Accession No. ML041400430). Reports shall be sent to David Johnston, MassDEP Southeast Regional Office, david.johnston@mass.gov and Cathy Vakalopoulos, MassDEP Surface Water Discharge Permitting Program, catherine.vakalopoulos@mass.gov, or other contact as identified, at the same time that they are submitted to the NRC.

6. Prior to making any physical alterations or additions to the facility that may result in discharges not specifically covered by this permit, including any discharges associated with activities encompassed by Part I.B (conditions 1 through 4), the Permittee shall provide written notice to MassDEP that includes, but is not limited to, a description of those activities and any potential associated discharges, potential volume of those discharges, and the pollutant profile of those discharges. MassDEP reserves the right to request additional information. Unless and until the permit is modified, any new or increased discharge in excess of permit limits or not specifically authorized by the state permit is prohibited.

ATTACHMENT A

MARINE ACUTE
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

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

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

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

II. METHODS

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

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

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

III. SAMPLE COLLECTION

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

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

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

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

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

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

IV. DILUTION WATER

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

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

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

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

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

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

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

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

and

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

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

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

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

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

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

---

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

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

Footnotes:

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

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

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

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

---

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

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

Footnotes:

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

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

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

V.1. Test Acceptability Criteria

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

V.2. Use of Reference Toxicity Testing

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

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

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

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

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

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

VI. CHEMICAL ANALYSIS

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

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

Superscript:

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

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

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

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration

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

Methods of Estimation:

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

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

No Observed Acute Effect Level (NOAEL)

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

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

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

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

In addition to the summary sheets the report must include:

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

PERMIT ATTACHMENT B
IMPINGEMENT MONITORING PROGRAM

The impingement monitoring program described in this attachment shall begin on the first day of the calendar month following the effective date of the permit.

Impingement monitoring shall be conducted once per month during a period in which a circulating water pump is operating. To the extent practicable, impingement monitoring shall consist of one eight-hour collection per month. In consecutive months, to the extent practicable, impingement monitoring shall represent morning, afternoon, and night (*e.g.*, morning in January, afternoon in February, and night in March). In the event that the sampling period is less than eight hours or three time periods are not monitored in each of three consecutive months, the Permittee shall provide an explanation in the Annual Biological Monitoring Report.

Impingement sampling shall be conducted using 1/4-inch or smaller stainless steel baskets placed in the screenwash return sluiceway. All fish will be immediately examined for initial condition (live, dead, or injured). All fish shall be identified to the lowest distinguishable taxonomic category, counted, and measured (to the nearest mm total length). In the event of a large impingement event of a school of equivalently sized forage fish, a subsample of 50 fish can be taken for length measurements.

For fish determined to be alive or injured at the time of collection, a representative sample of 25% of the total collection for each species (up to a maximum of 50 specimens per species) shall be placed in a holding tank supplied with continuously running ambient seawater. Latent survival shall be determined after 48 hours after which any live fish shall be safely returned to the subtidal waters of Cape Cod Bay.

Attachment C

Summary of Monitoring Parameters for Electrical Vault Sampling

	Parameter	**Minimum Level (ML) of detection** [1]
	1. Total Suspended Solids (TSS)	5 mg/L
	2. Total Petroleum Hydrocarbons (TPH)	5.0 mg/L
	3. Cyanide (CN)	10 ug/L
	4. Benzene (B)	2 ug/L
	5. Toluene (T)	2 ug/L
	6. Ethylbenzene (E)	2 ug/L
	7. (m,p,o) Xylenes (X)	2 ug/L
	8. Total Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) [2]	2 ug/L
	9. Naphthalene	2 ug/L
	10. Total Phenols	50 ug/L
	11. Total Phthalates (Phthalate esters)	5 ug/L
	12. Bis (2-Ethylhexyl) Phthalate	5 ug/L
	13. Total Polychlorinated Biphenyls (PCBs)	0.5 ug/L

	Metal parameter	**Total Recoverable Metal [3] - ML**
	14. Antimony	10 ug/l
	15. Arsenic	20 ug/l
	16. Cadmium	10 ug/l
	17. Chromium III (trivalent)	15 ug/l
	18. Chromium VI (hexavalent)	10 ug/l
	19. Copper	3 ug/l
	20. Lead	0.5 ug/l
	21. Mercury	0.2 ug/l
	22. Nickel	20 ug/l

	Metal parameter	Total Recoverable Metal [3] - ML
	23. Selenium	20 ug/l
	24. Silver	10 ug/l
	25. Zinc	15 ug/l
	26. Iron	20 ug/l

Footnotes:

[1] Minimum Level (ML) is the lowest level at which the analytical system gives a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence. The ML is calculated by multiplying the laboratory-determined method detection limit by 3.18 (see 40 CFR Part 136, Appendix B).

[2] BTEX = sum of Benzene, Toluene, Ethylbenzene, and total Xylenes.

[3] With the exception of Chromium III and Chromium VI

NPDES PART II STANDARD CONDITIONS
(April 26, 2018)[1]

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[1] Updated July 17, 2018 to fix typographical errors.

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 or Act) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

a. The Permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage 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, or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

b. Penalties for Violations of Permit Conditions: The Director will adjust the civil and administrative penalties listed below in accordance with the Civil Monetary Penalty Inflation Adjustment Rule (83 Fed. Reg. 1190-1194 (January 10, 2018) and the 2015 amendments to the Federal Civil Penalties Inflation Adjustment Act of 1990, 28 U.S.C. § 2461 note. See Pub. L.114-74, Section 701 (Nov. 2, 2015)). These requirements help ensure that EPA penalties keep pace with inflation. Under the above-cited 2015 amendments to inflationary adjustment law, EPA must review its statutory civil penalties each year and adjust them as necessary.

(1) Criminal Penalties

(a) *Negligent Violations.* The CWA provides that any person who negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to criminal penalties of not less than $2,500 nor more than $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation or by imprisonment of not more than 2 years, or both.

(b) *Knowing Violations.* The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act 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. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

(c) *Knowing Endangerment.* The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 303, 306, 307, 308, 318, or 405 of the Act and who knows at that time that he or she is placing another person in imminent danger of death or serious bodily injury shall upon conviction be subject to a fine of not more than $250,000 or by imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in Section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

(d) *False Statement.* 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. The Act further 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 non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

(2) *Civil Penalties*. The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed the maximum amounts authorized by Section 309(d) of the Act, the 2015 amendments to the Federal Civil Penalties Inflation Adjustment Act of 1990, 28 U.S.C. § 2461 note, and 40 C.F.R. Part 19. *See* Pub. L.114-74, Section 701 (Nov. 2, 2015); 83 Fed. Reg. 1190 (January 10, 2018).

(3) *Administrative Penalties*. The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to an administrative penalty as follows:

(a) *Class I Penalty.* Not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act, the 2015 amendments to the Federal Civil Penalties Inflation Adjustment Act of 1990, 28 U.S.C. § 2461 note, and 40 C.F.R. Part 19. *See* Pub. L.114-74, Section 701 (Nov. 2, 2015); 83 Fed. Reg. 1190 (January 10, 2018).

(b) *Class II Penalty.* Not to exceed the maximum amounts authorized by Section 309(g)(2)(B) of the Act the 2015 amendments to the Federal Civil Penalties Inflation Adjustment Act of 1990, 28 U.S.C. § 2461 note, and 40 C.F.R. Part 19. *See* Pub. L.114-74, Section 701 (Nov. 2, 2015); 83 Fed. Reg. 1190 (January 10, 2018).

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 a notification of planned changes or anticipated noncompliance does not stay any permit condition.

3. Duty to Provide Information

The Permittee shall furnish to the Director, within a reasonable time, any information which the Director 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 Director, upon request, copies of records required to be kept by this permit.

4. 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).

5. Property Rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

6. Confidentiality of Information

   a. In accordance with 40 C.F.R. 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 C.F.R. 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.

   c. Information required by NPDES application forms provided by the Director under 40 C.F.R. § 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.

7. Duty to Reapply

If the Permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, 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 Director. (The Director shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

8. State Authorities

Nothing in Parts 122, 123, or 124 precludes more stringent State regulation of any activity covered by the regulations in 40 C.F.R. Parts 122, 123, and 124, whether or not under an approved State program.

9. Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

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. 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 which are installed by a Permittee 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 reasonably be 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 provisions of paragraphs (c) and (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. As of December 21, 2020 all notices submitted in compliance with this Section must be submitted electronically by the Permittee to the Director or initial recipient, as defined in 40 C.F.R. § 127.2(b), in compliance with this Section and 40 C.F.R. Part 3 (including, in all cases, Subpart D to Part 3), § 122.22, and 40 C.F.R. Part 127. Part 127 is not intended to undo existing requirements for electronic reporting. Prior to this date, and independent of Part 127, Permittees may be required to report electronically if specified by a particular permit or if required to do so by state law.

(2) *Unanticipated bypass*. The Permittee shall submit notice of an unanticipated bypass as required in paragraph D.1.e. of this part (24-hour notice). As of December 21, 2020 all notices submitted in compliance with this Section must be submitted electronically by the Permittee to the Director or initial recipient, as defined in 40 C.F.R. § 127.2(b), in compliance with this Section and 40 C.F.R. Part 3 (including, in all cases, Subpart D to Part 3), § 122.22, and 40 C.F.R. Part 127. Part 127 is not intended to undo existing requirements for electronic reporting. Prior to this date, and independent of Part 127, Permittees may be required to report electronically if specified by a particular permit or required to do so by law.

d. *Prohibition of bypass.*

(1) Bypass is prohibited, and the Director may take enforcement action against a Permittee for bypass, unless:

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

(b) 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

(c) The Permittee submitted notices as required under paragraph 4.c of this Section.

(2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director 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; and
(3) The Permittee submitted notice of the upset as required in paragraph D.1.e.2.b. (24-hour notice).
(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.

C. MONITORING REQUIREMENTS

1. <u>Monitoring and Records</u>

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

b. Except for records of 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 5 years (or longer as required by 40 C.F.R. § 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. This period may be extended by request of the Director 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 must be conducted according to test procedures approved under 40 C.F.R. § 136 unless another method is required under 40 C.F.R. Subchapters N or O.

e. The Clean Water Act 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 Director, 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 Clean Water Act, any substances or parameters at any location.

D. REPORTING REQUIREMENTS

1. Reporting Requirements

a. *Planned Changes*. The Permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only 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 C.F.R. § 122.29(b); or

(2) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements at 40 C.F.R. § 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 that are 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 Director 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 Director. The Director 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 Clean Water Act. *See* 40 C.F.R. § 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. As of December 21, 2016 all reports and forms submitted in compliance with this Section must be submitted electronically by the Permittee to the Director or initial recipient, as defined in 40 C.F.R. § 127.2(b), in compliance with this Section and 40 C.F.R. Part 3 (including, in all cases, Subpart D to Part 3), § 122.22, and 40 C.F.R. Part 127. Part 127 is not intended to undo existing requirements for electronic reporting. Prior to this date, and independent of Part 127, Permittees may be required to report electronically if specified by a particular permit or if required to do so by State law.

(2) If the Permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 C.F.R. § 136, or another method required for an industry-specific waste stream under 40 C.F.R. Subchapters N or O, the results of such 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 report shall also be provided within 5 days of the time the Permittee becomes aware of the circumstances. The written report 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. For noncompliance events related to combined sewer overflows, sanitary sewer overflows, or bypass events, these reports must include the data described above (with the exception of time of discovery) as well as the type of event (combined sewer overflows, sanitary sewer overflows, or bypass events), type of sewer overflow structure (e.g., manhole, combined sewer overflow outfall), discharge volumes untreated by the treatment works treating domestic sewage, types of human health and environmental impacts of the sewer overflow event, and whether the noncompliance was related to wet weather. As of December 21, 2020 all

reports related to combined sewer overflows, sanitary sewer overflows, or bypass events submitted in compliance with this section must be submitted electronically by the Permittee to the Director or initial recipient, as defined in 40 C.F.R. § 127.2(b), in compliance with this Section and 40 C.F.R. Part 3 (including, in all cases Subpart D to Part 3), § 122.22, and 40 C.F.R. Part 127. Part 127 is not intended to undo existing requirements for electronic reporting. Prior to this date, and independent of Part 127, Permittees may be required to electronically submit reports related to combined sewer overflows, sanitary sewer overflows, or bypass events under this section by a particular permit or if required to do so by state law. The Director may also require Permittees to electronically submit reports not related to combined sewer overflows, sanitary sewer overflows, or bypass events under this section.

(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 C.F.R. § 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 Director in the permit to be reported within 24 hours. *See* 40 C.F.R. § 122.44(g).

(3) The Director may waive the written report on a case-by-case basis for reports under paragraph D.1.e. of this Section if the oral report has been received within 24 hours.

f. *Compliance Schedules.* Reports of compliance or noncompliance with, or 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. For noncompliance events related to combined sewer overflows, sanitary sewer overflows, or bypass events, these reports shall contain the information described in paragraph D.1.e. and the applicable required data in Appendix A to 40 C.F.R. Part 127. As of December 21, 2020 all reports related to combined sewer overflows, sanitary sewer overflows, or bypass events submitted in compliance with this section must be submitted electronically by the Permittee to the Director or initial recipient, as defined in 40 C.F.R. § 127.2(b), in compliance with this Section and 40 C.F.R. Part 3 (including, in all cases, Subpart D to Part 3), §122.22, and 40 C.F.R. Part 127. Part 127 is not intended to undo existing requirements for electronic reporting. Prior to this date, and independent of Part 127, Permittees may be required to electronically submit reports related to combined sewer overflows, sanitary sewer overflows, or bypass events under this section by a particular permit or if required to do so by state law. The Director may also require Permittees to electronically submit reports not related to combined sewer overflows, sanitary sewer overflows, or bypass events under 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 Director, it shall promptly submit such facts or information.

i. *Identification of the initial recipient for NPDES electronic reporting data*. The owner, operator, or the duly authorized representative of an NPDES-regulated entity is required to electronically submit the required NPDES information (as specified in Appendix A to 40 C.F.R. Part 127) to the appropriate initial recipient, as determined by EPA, and as defined in 40 C.F.R. § 127.2(b). EPA will identify and publish the list of initial recipients on its Web site and in the FEDERAL REGISTER, by state and by NPDES data group (see 40 C.F.R. § 127.2(c) of this Chapter). EPA will update and maintain this listing.

2. Signatory Requirement

a. All applications, reports, or information submitted to the Director shall be signed and certified. *See* 40 C.F.R. §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 non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

3. Availability of Reports.

Except for data determined to be confidential under paragraph A.6. 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 Director. 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.

E. DEFINITIONS AND ABBREVIATIONS

1. General Definitions

For more definitions related to sludge use and disposal requirements, see EPA Region 1's NPDES Permit Sludge Compliance Guidance document (4 November 1999, modified to add regulatory definitions, April 2018).

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 under the CWA, including "effluent limitations," water quality standards, standards of performance, toxic effluent standards or prohibitions, "best management practices," pretreatment standards, and "standards for sewage sludge use or disposal" under Sections 301, 302, 303, 304, 306, 307, 308, 403 and 405 of 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.

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

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

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

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

Bypass see B.4.a.1 above.

C-NOEC or *"Chronic (Long-term Exposure Test) – No Observed Effect Concentration" means* 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.

Class I sludge management facility is any publicly owned treatment works (POTW), as defined in 40 C.F.R. § 501.2, required to have an approved pretreatment program under 40 C.F.R. § 403.8 (a) (including any POTW located in a State that has elected to assume local program responsibilities pursuant to 40 C.F.R. § 403.10 (e)) and any treatment works treating domestic sewage, as defined in 40 C.F.R. § 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 its sewage sludge use or disposal practice to affect public health and the environment adversely.

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) Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483and Public Law 97-117, 33 U.S.C. 1251 *et seq*.

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

Daily Discharge means the "discharge of a pollutant" measured during a calendar day or any 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.

Direct Discharge means the "discharge of a pollutant."

Director means the Regional Administrator or an authorized representative. In the case of a permit also issued under Massachusetts' authority, it also refers to the Director of the Division of Watershed Management, Department of Environmental Protection, Commonwealth of Massachusetts.

Discharge

(a) When used without qualification, *discharge* means the "discharge of a pollutant."

(b) As used in the definitions for "interference" and "pass through," *discharge* means the introduction of pollutants into a POTW from any non-domestic source regulated under Section 307(b), (c) or (d) of the Act.

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

Discharge of a pollutant means:

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

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

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or 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 Director on quantities, discharge rates, and concentrations of "pollutants" which are "discharged" from "point sources" into "waters of the United States," the waters of the "contiguous zone," or the ocean.

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

Environmental Protection Agency ("EPA") means the United States Environmental Protection

Agency.

Grab Sample means an individual sample collected in a period of less than 15 minutes.

Hazardous substance means any substance designated under 40 C.F.R. Part 116 pursuant to Section 311 of CWA.

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

Indirect discharger means a nondomestic discharger introducing "pollutants" to a "publicly owned treatment works."

Interference means a discharge (see definition above) 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, 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 that is not a land application unit, surface impoundment, injection well, or waste pile.

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

LC_{50} means 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.

Maximum daily discharge limitation means the highest allowable "daily discharge."

Municipal solid waste landfill (MSWLF) unit means a discrete area of land or an excavation that receives household waste, and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined under 40 C.F.R. § 257.2. A MSWLF unit also may receive other types of RCRA Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, very small quantity generator waste and industrial solid waste. Such a landfill may be publicly or privately owned. A MSWLF unit may be a new MSWLF unit, an existing MSWLF unit or a lateral expansion. A construction and demolition landfill that receives residential lead-based paint waste and does not receive any other household waste is not a MSWLF unit.

Municipality

(a) When used without qualification *municipality* means a city, town, borough, county, parish, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under Section 208 of CWA.

(b) As related to sludge use and disposal, *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.

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 exploratory drilling rig or a coastal oil and gas developmental drilling rig) such as a seafood processing rig, seafood processing vessel, or aggregate plant, that begins discharging at a "site" for which it does not have a permit; and any offshore or coastal mobile oil and gas exploratory drilling rig or coastal mobile oil and gas developmental drilling rig that commences the discharge of pollutants after August 13, 1979, at a "site" under EPA's permitting jurisdiction for which it is not covered by an individual or general permit and which is located in an area determined by the Director 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 Director shall consider the factors specified in 40 C.F.R. §§ 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 (see definition above) 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).

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

Permit means an authorization, license, or equivalent control document issued by EPA or an “approved State” to implement the requirements of Parts 122, 123, and 124. “Permit” includes an NPDES “general permit” (40 C.F.R § 122.28). “Permit” does not include any permit which has not yet been the subject of final agency action, such as a “draft permit” or “proposed permit.”

Person means 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 measured at 25° Centigrade or measured at another temperature and then converted to an equivalent value at 25° Centigrade.

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 C.F.R. § 122.3).

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

(a) Sewage from vessels; or

(b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well 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 C.F.R. Part 122.

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

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

Publicly owned treatment works (POTW) means a treatment works as defined by Section 212 of the Act, which is owned by a State or municipality (as defined by Section 504(4) of the Act). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW Treatment Plant. The term also means the municipality as defined in Section 502(4) of the Act, which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.

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

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

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, semi-solid, or liquid residue removed during the treatment of municipal waste water or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced waste water treatment, scum, septage, portable toilet pumpings, type III marine sanitation device pumpings (33 C.F.R. 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 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 C.F.R. § 122.2.

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; finished materials such as metallic products; 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 Section 313 of title III of SARA; 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 C.F.R. §§ 110.10 and 117.21) or Section 102 of CERCLA (*see* 40 C.F.R. § 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 C.F.R. § 122.1(b)(2).

State means any of the 50 States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, the Commonwealth of the Northern Mariana Islands, the Trust Territory of the Pacific Islands, or an Indian Tribe as defined in the regulations which meets the requirements of 40 C.F.R. § 123.31.

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.

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 that is used for collecting and conveying storm water and that is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant.

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

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

Treatment works treating domestic sewage means a POTW or any other sewage sludge or waste water treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and waste water from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Director may designate any person subject to the standards for sewage sludge use and disposal in 40 C.F.R. 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 C.F.R. Part 503.

Upset see B.5.a. above.

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

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

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

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

(b) All interstate waters, including interstate "wetlands;"

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

   (1) Which are or could be used by interstate or foreign travelers for recreational or other 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 CWA (other than cooling ponds as defined in 40 C.F.R. § 423.11(m) which also meet the criteria of this definition) are not waters of the United States. This exclusion applies only to manmade bodies of water which neither were originally created in waters of the United States (such as disposal area in wetlands) nor resulted from the impoundment of waters of the United States. Waters of the United States do not include prior converted cropland.

Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.

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

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test.

*Zone of Initial Dilution (*ZID) means the region of initial mixing surrounding or adjacent to the end of the outfall pipe or diffuser ports, provided that the ZID may not be larger than allowed by mixing zone restrictions in applicable water quality standards.

2. 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 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
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)
µg/L	Microgram(s) per liter
WET	“Whole effluent toxicity”
ZID	Zone of Initial Dilution

Response to Comments for the National Pollutant Discharge Elimination System (NPDES) Permit No. MA0003557 – Pilgrim Nuclear Power Station (PNPS), Plymouth, MA

Introduction:

In accordance with the provisions of 40 C.F.R. § 124.17, this document presents responses to comments received on the draft NPDES Permit, MA0003557. The response to comments explains and supports the determinations that form the basis of the Final Permit. From May 18, 2016 to July 18, 2016, extended to July 25, 2016, the United States Environmental Protection Agency ("EPA") and the Massachusetts Department of Environmental Protection ("MassDEP") (together, the "Agencies") solicited public comments on a draft NPDES permit, MA0003557, developed pursuant to a permit application from the Permittee, for the reissuance of a NPDES permit to discharge various wastewaters and stormwater to Cape Cod Bay and to withdraw water from Cape Cod Bay for cooling uses. The discharges consist of condenser non-contact cooling water, unheated backwash water for bio-fouling control, intake screen wash water, plant service cooling water, neutralizing sump wastewater, demineralizer reject water, and station heating water. Additionally, there are five stormwater outfalls, which discharge stormwater runoff as well as stormwater that accumulates in various electrical vaults around the property that is periodically pumped out to one of these five stormwater outfalls.

The Agencies conducted a public hearing regarding the issuance of this permit on July 21, 2016. A list of all parties that commented on this draft permit in writing during the comment period or in person at the public hearing via submitted documents or oral testimony is included in Part V of this document. After a review of the comments received, the Agencies have made a final decision to issue this permit authorizing this discharge with the changes described below.

PNPS ceased electricity generation (*i.e.*, shut down) on June 1, 2019. The shutdown of operations has resulted in a 92 % reduction in cooling water intake as compared to the full operation of the plant when it was generating electricity. Therefore, the final permit has been revised to eliminate all pre-shutdown limits and conditions and the majority of comments regarding pre-shutdown conditions no longer warrant a response. In addition, Part I.G of the Final Permit (formerly Part I.H in the Draft Permit) has been changed slightly to comply with changes in federal and state electronic and hard copy reporting procedures that have occurred since the issuance of the Draft Permit in 2016.

The Agencies' decision-making process has benefitted from the comments and additional information submitted. In addition, the Permittee has provided additional clarifying information regarding post-shutdown operations which was not known or made available during the comment period. Therefore, the Agencies have made minor changes in response to some comments. These changes are explained in the responses to individual comments that follow and are reflected in the Final Permit.

Note: Goodwin Procter, LLP, on behalf of Entergy, submitted "supplemental comments" after the close of the public comment period—in particular, on October 31, 2016,[1] and on March 31, 2017.[2] Entergy also submitted an additional letter dated May 20, 2019, this time through its attorneys at Jones Day.[3] The Agencies have reviewed the submittals, but under applicable federal regulations, the permitting authority is only required to respond to significant comments submitted *during* the public comment period. 40 C.F.R. § 124.17(a)(2). "That is, within the interval of time between the beginning and end of the public comment period, not before, not after." *In re Avon Custom Mixing Servs., Inc*., 10 E.A.D. 700, 706 (EAB 2002); *see also In re City of Phoenix, Arizona Squaw Peak and Deer Valley Water Treatment Plants*, 9 E.A.D. 515, 524-31 (EAB 2000); *In re Steel Dynamics, Inc*., 9 E.A.D. 165, 194 n.32 (EAB 2000) ("Permitting authorities are under no obligation to consider comments received after the close of the public comment period."). The permitting authority retains the discretion, however, to consider comments received after the close of public comment. *In re Town of Newmarket*, 16 E.A.D. 182, 234 (EAB 2013) (*citing In re Upper Blackstone Pollution Control Dist.*, 15 E.A.D. 297, 312 (EAB 2011), *aff'd*, (1st Cir. 2012), *cert. denied*, 133 S. Ct. 2382 (2013).

According to Entergy, the October 2016 Supplemental Comments were submitted "for the purpose of clarifying or correcting certain statements, representations, and claims made by certain organizations—in particular, the Jones River Watershed Association ('JRWA'),[footnote omitted] the Association to Preserve Cape Cod ('APCC'),[footnote omitted] the Center for Coastal Studies – Provincetown ('CCS'), and Pilgrim Watch."[4] Thus, according to Entergy, its untimely October 2016 Supplemental Comments were submitted only for the purpose of responding to timely comments submitted by others, rather than raising new issues on the Draft Permit.[5] Despite Entergy's characterization, however, the Agencies note that the October 2016 Supplemental Comments include new issues not raised in the permittee's timely comments: new arguments relating to WET testing proposed in the Draft Permit[6] and a new issue regarding the technological feasibility of retrofitting PNPS to employ closed-cycle cooling ("CCC") to minimize adverse environmental impact.[7] The March 2017 Supplemental Comments address a single topic, amplifying and expanding on Entergy's claims in the October 2016 Supplemental Comments regarding technological feasibility of CCC at PNPS. The May 2019 Letter states that

[1] "Supplemental Comments of Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc., on Draft National Pollutant Discharge Elimination System and Massachusetts Clean Waters Act Permit, Permit No. MA0003557, with Respect to Pilgrim Nuclear Power Station" (October 31, 2016) (hereinafter, "October 2016 Supplemental Comments").

[2] "Supplemental Comments of Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc. on Draft National Pollutant Discharge Elimination System and Massachusetts Clean Waters Act Permit, Permit No. MA0003557, with Respect to Pilgrim Nuclear Power Station" (March 31, 2017) (hereinafter, "March 2017 Supplemental Comments").

[3] Letter from E. Zoli, Jones Day, to D. Webster, Region 1 EPA (May 20, 2019) (hereinafter, "May 2019 Letter").

[4] October 2016 Supplemental Comments, at 1.

[5] *Id.; see also* Comment III.1 (asserting that Entergy "reserves its right to supplement these Comments as appropriate, including for the purpose of responding to comments submitted by other members of the public"); October 2016 Supplemental Comments, at 1 (calling specific attention to that part of its timely comments in which Entergy asserted that it had "reserved its right to supplement those Comments, including for the purpose of responding to timely comments submitted by members of the public").

[6] October 26 Supplemental Comments at 30-32.

[7] *Id.* at 22-24.

it “updates” Entergy’s timely comments regarding flow and chlorine limits and conditions in the Draft Permit applicable to the salt service water system.

First, as noted above, since the submittals were untimely, the Agencies are not required to respond to them at all. 40 C.F.R. § 124.17(a)(2). Second, to the extent the content of the October 2016 Supplemental Comments relates to timely comments raised by others, this Response to Comment document already addresses those issues. Third, with respect to Entergy’s late comments raising the issue of feasibility of CCC at PNPS, the Agencies did not propose in the Draft Permit and Fact Sheet, or conclude in the Final Permit, that CCC is the best technology available (“BTA”) at PNPS for minimizing adverse environmental impact. The Agencies have not made a finding that CCC either is or is not technologically feasible at PNPS, and such a finding is unnecessary. *See also* Response to Comment III.3.1.2. Thus, Entergy’s late comments on this issue are not relevant or significant. For these and other reasons, including that the existing permit is long expired, the Agencies do not provide direct responses herein to each and every point made in the October 2016 Supplemental Comments, March 2017 Supplemental Comments, or May 2019 Letter. The Agencies address the new WET arguments in Response to Comment III.10.3, and the “updated” flow and chlorine comments in Responses to Comment III.4.2 and III.6.2.2, respectively.

A copy of the final permit and this response to comment document will be posted on the EPA Region 1 web site: http://www.epa.gov/region1/npdes/permits listing_ma.html.
A copy of the final permit may also be obtained by writing or calling George Papadopoulos, United States Environmental Protection Agency, 5 Post Office Square, Suite 100 (Mail Code: 06-1), Boston, Massachusetts 02109-3912; Telephone (617) 918-1579.

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

The Permittee’s name has been changed to Holtec Decommissioning International, LLC, as shown on the cover page of the Final Permit. See Response to Comment I.2.5.

The Final Permit has been revised to eliminate all pre-shutdown limits and conditions. The Draft Permit listed pre-shutdown permit conditions in Part I.A, post-shutdown conditions in Part I.B., and conditions that applied under both conditions were listed in Part I.C. Therefore, the Final Permit lists all remaining discharges under Part I.A. See introduction above.

The effluent limits for sodium nitrite and tolytriazole which previously applied to internal Outfalls 011 and 014 now will apply at the discharge canal compliance point for Outfall 001 in Part I.A.1. In addition, the Permittee is now required to report the total hours per month that either circulating water pump operates for Outfall 001. See Response to Comment I.3.6.

The Final Permit has established average monthly and maximum daily limitations for total residual oxidants of 0.1 mg/l at the discharge canal compliance point for Outfall 001. See Response to Comment III.6.2.2.

The average monthly flow limit for Outfall 001 has been changed to a monitor only requirement. See Response to Comment III.4.1.

The effluent temperature and temperature rise (delta T) limits for Outfall 001 have been changed to monitor only requirements. See Response to Comment III.5.1.

For Outfall 010, a maximum daily intake velocity limit of 0.5 feet per second (fps) has been established along with a monthly average monitoring requirement. This velocity applies at the traveling screens. See Response to Comment III.3.2.

At Outfall 010, the average monthly and daily maximum total residual oxidants limits have been changed from 7.5 ug/l and 13 ug/l to 0.5 mg/l and 1.0 mg/l, respectively. See Response to Comment III.6.2.2.

Part I.B of the Final Permit, formerly Part I.E., has been revised to specifically note that the permit does not authorize discharges of pollutants in the spent fuel pool water, stormwater associated with construction activity, or other specific discharges that may be associated with activities performed during decommissioning (e.g., pipeline and tank dewatering). See Response to Comment IV.5.1.

The Whole Effluent Toxicity (WET) Testing that was previously required at internal Outfalls 011 and 014 has been changed to the discharge canal compliance point at Outfall 001. WET sampling at the discharge canal compliance point at Outfall 001 must be conducted when Outfall 011 is discharging and Outfall 014 is not discharging. The reasons for this change are detailed in Response to Comment III.10.3.

The Agencies have added Outfall 013 in Part I.A.6 of the Final Permit but have not established any numeric effluent limits. See Response to Comments I.3.5 and IV.4.4.

A footnote was added to the non-thermal backwash discharge of Outfall 002 to limit the number of non-thermal backwashes to one per week unless more are needed to respond to infrequent, abnormal events where backwashing is necessary to avoid severe property damage. See Response to Comment III.5.1.

The monthly average and daily maximum flow limits for Outfall 010 have been revised from 7.8 MGD and 15.6 MGD, respectively, to 15.6 MGD and 19.4 MGD. See Response to Comment III.4.2.

At Outfall 010, the maximum daily effluent temperature has been changed from 85°F to 90°F and the maximum daily temperature rise (delta T) limit has been changed from 3°F to 10°F. See Response to Comment III.5.2.

The language in the Draft Permit regarding specific delta temperature change limits during load cycling and steady state operations (Part I.D.11) has been removed from the Final Permit since the facility has shut down.

The of list of discharges authorized for Outfalls 011 and 014 has been revised (Parts I.A.8 and I.A.9.) See Response to Comment III.6.

The definition of an unusual impingement event (UIE) at Part I.A.20 (formerly Part I.D.12) has been revised. See Response to Comment III.8.3.

Certain elements of the cooling water intake structure (CWIS) requirements at Part I.C (formerly Part I.F) have been revised to reflect revised permit limits and the shutdown. See Response to Comment III.3.

With the exception of impingement monitoring that is required once per month when the Permittee is operating a circulating pump, all other requirements of the Biological Monitoring Program in Attachment B have been eliminated. See Responses to Comments I.5.6 and III.8.1.

The monitoring requirements for the electrical vaults at Part I.A.7 (formerly Part I.C.3) have been revised to include quarterly monitoring for cyanide, antimony, hexavalent chromium, and total nickel. In addition, quarterly monitoring for internal Outfall 004B (manhole MH-2) has been substituted for the previous monitoring requirement for internal Outfall 007B (manhole MH-2A). See Responses to Comments I.3.6, III.10.1, and III.10.2.

Part I.F (formerly Part I.J) of the Final Permit has been corrected to state that sampling from seven (7) instead of six electrical vaults had previously been conducted. In addition, that would leave 18 vaults to be sampled pursuant to this section of the permit instead of 19. See Response to Comment III.10.4.

The Stormwater Pollution Prevention Plan (SWPPP) requirement formerly in Part I.H. of the Draft Permit is now included in Part I.D.2 of the Final Permit and is listed distinctly from a Best Management Practices requirement of Part I.D.1. The Final Permit includes specific, non-numeric technology-based effluent limitations found in Part 8.O. of the 2015 Multi-Sector General Permit for Stormwater (MSGP) which are associated with Steam Electric Generating Facilities. In addition, the SWPPP has been changed to require areas with industrial materials or activities exposed to stormwater, structural controls, and discharge points be inspected at least once per quarter instead of monthly to be consistent with the inspection requirement of the MSGP. See Responses to Comments I.3.4 and III.10.2.

The SWPPP at Part I.D.2.e has added language requiring the Permittee to design and implement appropriate controls to account for how any decommissioning activities on the site. See Response to Comment I.2.2.

The monitoring and reporting requirements outlined in Part I.G of the Final Permit (formerly Part I.K) have been revised.to include specific DMR submittal instructions and updated contacts for DMR submittals and verbal notifications. See introduction above.

Additional State Permit conditions have been added to Part I.H of the Final Permit. See, for example, Responses to Comments I.2.2 and IV.5.1.

CONTENTS

I. COMMENTS SUBMITTED BY JONES RIVER WATERSHED ASSOCIATION ET AL.[8]

1.0 Introduction

In 2012, a citizen group identified 33,000+ violations of the Federal Clean Water Act (CWA) and issued a Notice of Intent to Sue under the state and federal water pollution controls for these violations.[2] The group refrained from filing suit due to assurance from EPA and MassDEP that the revised NPDES permit would be issued by the end of 2013. The revised permit was not issued in 2013, and EPA and MassDEP have continued to allow PNPS to discharge pollutants and use massive quantities of water from Cape Cod Bay since that time, as well as violate terms of the original permit.

In 2014, EPA and MassDEP were asked to terminate PNPS's NPDES permit due to massive destruction of Cape Cod Bay resources, ongoing since 1972, and the continued delay in issuing a revised permit.[3] It continues to be our position, described in the 2014 letter and subsequent meetings, that the PNPS NPDES permit allowing use of the outdated 'once-through cooling system' should be terminated, and Entergy prohibited from continued use of Cape Cod Bay as a free source of cooling water and a dump for thermal and chemical effluents.[4] The only continued use that should be considered under the draft permit is cooling associated with spent fuel storage in PNPS's wet pool and for site decommissioning operations post power production.

PNPS's own reports show it has used and discharged massive quantities of water, containing numerous chemical pollutants, and killed billions of organisms each year – causing unquantifiable damage to the Cape Cod Bay ecosystem. Recreational, economic, social, health and environmental benefits are directly linked to a clean and unimpaired water source such as Cape Cod Bay. Entergy has destroyed public trust resources under a dissembled "permit to pollute" issued and sanctioned by EPA and MassDEP, and without any viable review for decades.

As described further below, there are no legitimate grounds for allowing PNPS to continue to operate its cooling water intake structure (CWIS). No modifications or upgrades will be sufficient to meet the standards of the Clean Water Act and the State's Surface Water Quality Standards (SWQS). Simply put, the 2016 draft NPDES permit is too little, too late.

In addition, climate change impacts are compounding the damage and risk associated with Entergy's CWIS and continued operations. According to a June 2016 report on climate change released by the Boston Research Advisory Group,[5] Boston area sea level is rising faster than previously projected, and precipitation will become more severe. In 2015, Jones River Watershed Association (JRWA) provided the U.S. Nuclear Regulatory Commission (NRC) with a brief analysis of sea level rise impacts at the PNPS site.[6] This recent science predicting rising

[8] Submitted by the following organizations: Jones River Watershed Association, Earthrise Law Center, Cape Downwinders, Citizens Awareness Network, Cape Cod National Seashore Advisory Commission, Concerned Neighbors of Pilgrim, Whale and Dolphin Conservation, Toxics Action Center, Nuclear Information & Resources Service.

seas and extreme precipitation in the Northeast further supports a sooner closure and decommissioning of PNPS. Ignoring these inconvenient truths as well as PNPS's location relative to sea level is a disservice to the public and is contrary to the duty of EPA and MassDEP to protect the public trust resources. EPA and MassDEP are the regulatory guardians of these essential resources. Allowing PNPS to continue to operate under a NPDES permit will not protect these resources and violates agencies' public trust duties.

If EPA and MassDEP decide nonetheless to proceed with NPDES permit renewal for full operations until 2019 and for decommissioning activities after 2019, then we request consideration of the following comments.

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[1] For full summary of PNPS's contentious history, see: Chronology of Events: PNPS, Plymouth, MA: 1960-2015. <http://www.capecodbaywatch.org/2015/10/pilgrim-chronology-1967-2015/>

[2] 33,253 violations (from 1996 to 2012) of the CWA by PNPS are outlined in: Ecolaw Notice of Intent letter. Oct. 5, 2012. Re: CWA § 505 Notice of Intent to Initiate Citizen Suit for Violations at Pilgrim Nuclear Power Station, Plymouth, Mass. NPDES Permit No. MA 0000355 <http://www.capecodbaywatch.org/wp-content/uploads/2012/10/10.05.12-noi-w-exhibits.pdf?d23684>

[3] CCBW letter to EPA. Jan. 28, 2014. Re: Pilgrim Nuclear Power Station, Plymouth, Mass.: Expired Clean Water Act NPDES Permit No. MA0003557 <http://www.capecodbaywatch.org/wpcontent/uploads/2014/01/NPDESLetter_Final_2014Jan28.pdf?d23684>

[4] JRWA. 2015. Entergy: Our Bay is Not Your Dump <http://jonesriver.org/2015-water-pollution/ >Comments Re: PNPS Draft NPDES Permit; July 2016; Page 2 of 29

[5] Boston Research Advisory Group. Climate Projections Consensus Report: Climate change and sea level rise projections for Boston. June 1, 2016. <http://climateready.boston.gov/findings>; Another 8 in. of relative sea level rise may happen by 2030, almost 3x faster than previously projected. By 2050, sea level may be as much as 1.5 ft. higher than in 2000, and as much as 3 ft. higher by 2070.

[6] Analysis of AREVA Flood Hazard Re-Evaluation Report Pilgrim Nuclear Power Station Plymouth, MA and updated geospatial maps of the site. See http://jonesriver.org/downloads/analysis-of-areva-flood-hazard-re-evaluation-report-for-pilgrimnuclear-power-station/

Response:

In this introductory comment, the Jones River Watershed Association et al. (hereinafter referred to as "JRWA") comment generally that the only continued use that should be considered is cooling associated with spent fuel storage in PNPS's wet pool and for site decommissioning operations post power production. PNPS ceased electricity generation (i.e. shut down) on May 31, 2019, after which the Draft Permit conditions associated with post-shutdown operations will take effect, including use of cooling water for cooling spent fuel. The shutdown of operations results in a 92% reduction in cooling water intake as compared to the full operation of the plant when it was generating electricity.

2.0 General Comments

2.1 EPA Has Failed to Ensure Timely Reissuance of PNPS's NPDES Permit

The draft permit has a 5-year term — a term imposed by the CWA — and expires at midnight, 5 years from the last day of the month preceding the effective date. The 20+ year delay in renewing PNPS's 1991 permit, which expired in 1996, has undermined the intent of the CWA by allowing PNPS to continue to operate for decades under one of the longest expired NPDES permits in the U.S. This delay raises serious concerns about whether EPA and MassDEP will issue a timely renewal of PNPS's new final NPDES permit that is issued for operation of the CWIS and decommissioning activities in a timely manner.

As of 2001, EPA had determined 27% of facilities operating under NPDES had expired permits that were "administratively continued."[7] While EPA is certainly aware of its failure to address permit updates in an appropriate time period, and is apparently working to address this issue,[8] how can EPA assure the public with certainty that this unacceptable backlog of expired NPDES permit will be resolved and that Entergy's new NPDES permit for PNPS will be reviewed and renewed in a timely manner to protect environmental concerns? It seems certain that EPA will not be in a position to conduct a timely review of PNPS's NPDES permit within 5 years after its issuance.

The CWA declares that NPDES permits to pollute waterways were not to be issued after 1985. As the Senate Report accompanying the legislation explained, "[T]his legislation would clearly establish that no one has the right to pollute - that pollution continues because of technological limits, not because of any inherent rights to use the nation's waterways for the purpose of disposing of wastes."[9] EPA and MassDEP's failure to address PNPS's expired permit and failure to require updates to eliminate pollution over the last 30+ years of operations under the CWA means EPA continues to ignore Congress' express "no-pollution" goal.

[7] U.S. EPA. Factsheet: NPDES Permit Backlog Reduction. <http://www.epa.gov/npdes/pubs/factsht.pdf> Accessed 6/10/16.
[8] EPA Proposed Rule. May 18, 2016. NPDES: Applications and Program Updates. <https://www.federalregister.gov/articles/2016/05/18/2016-11265/national-pollutant-discharge-elimination-system-npdesapplications-and-program-updates>
[9] Sen. Rpt. No. 92-414, 92 Cong. 1st Sess. 41 (1971), reprinted in 2 Envtl. Policy Div., Cong. Ref. Serv., A Legislative History of the Water Pollution Control Act Amendments at 1972, at 1460 (Sen. Pub. Works Comm. Print 1973); 1972 U.S. C.C.A.N. 3668, 3709.

Response to Comment 2.1

EPA acknowledges that there was a considerable delay in reissuing this permit. This permit is one of the most complex permits in the Region and has been delayed over the last few years for various reasons, including competing permitting priorities (including for other complex power plant permits), new regulations governing the best technology available for existing cooling water intake structures, complex temperature variance considerations, and multiple consultations with various State and Federal agencies. In addition, a closure announcement by the Permittee during late stages of developing the draft permit required the development of new, post-shutdown permit conditions and altered preliminary determinations pertaining to ongoing operations of the power plant.

NPDES permits have gotten more complex since this permit was last issued. Specifically, power plant permits are especially challenging and require significant technical, legal, and administrative resources to reissue. Due to the limited expertise in the Region regarding the operations of nuclear power plants, EPA also sought contractor assistance for certain aspects of the draft permit. In addition, EPA consulted with the Nuclear Regulatory Commission (NRC) regarding aspects of the draft permit's requirements that could pose a nuclear safety concern for the facility. All of these factors resulted in the drafting of this permit taking an extended period of time.

Regarding the comment about the goals of the CWA, NPDES permits are written to be consistent with Federal regulations and State water quality standards (WQS). The prior NPDES Permit included water quality and technology-based limits and conditions and the Final Permit maintains these conditions or includes more stringent conditions as appropriate. The NPDES Program is credited with eliminating many discharges and significantly reducing the pollutant loads from existing discharges. Each successive issuance of permits can further limit the magnitude of pollutants discharged through the implementation of revised technology- and water quality-based limits.

As already noted, PNPS stopped generating electricity on May 31, 2019. The Final Permit establishes limitations and requirements, consistent with this shutdown of operations, that result in a 92 % reduction in cooling water intake and 98% reduction in heat load as compared to the full operation of the plant. In addition, the Final Permit establishes effluent limitations and monitoring requirements on discharges of miscellaneous "low-volume" type wastes, stormwater, and stormwater that accumulates in electrical vaults. In all, the Final Permit includes a suite of effluent limitations, non-numeric limitations, and monitoring requirements that represents a significant advancement from the 1991 Permit and that will ensure that the aquatic community and designated uses of Cape Cod Bay are protected.

2.2 EPA Has Failed to Adequately Consider the Impacts of Climate Change on PNPS's Operations and Permitted Discharges

To fully understand the impacts of PNPS operations on water resources, EPA must consider climate change with regard to all requirements and conditions in the draft permit. The Northeast experiences significant impacts caused by climate change, such as coastline alterations due to rising sea levels, increased precipitation, increased air and ocean temperatures, more flooding, higher storm surge, more intense storms, and more.[10] These impacts could interfere with CWIS operations, cause further chemical pollutant discharges into Cape Cod Bay, and exacerbate the effects of PNPS's thermal effluent and impingement/entrainment on marine resources.

In July 2013, the U.S. Department of Energy (DOE) published a report outlining vulnerabilities from climate change trends at energy facilities, including nuclear power stations.[11] The report specifically cites climate change patterns such as increasing air and water temperatures, increasing intensity of storm events, sea level rise, and storm surges as having potential negative implications for thermoelectric forms of power generation (including nuclear facilities). Implications for coastally-based nuclear facilities include: 1) reduction in plant efficiencies and generation capacity due to increasing air and water temperatures, 2) increased risk of exceeding thermal discharge limits due to increasing water temperatures, and 3) increased risk of physical damage and disruption due to increasing intensity of storm events, sea level rise, and storm surge.

The National Oceanographic and Atmospheric Association (NOAA) estimates a sea level rise of 3.05 feet by 2065 in the northeastern U.S.[12] However, some have found that sea levels could be rising even faster: sea levels along the northeast coast rose nearly 3.9 inches in just a 2-year period (2009-2010) according to a Feb. 2016 study from the University of Arizona and NOAA.[13] Another recent study[14] found that Boston area sea level is rising faster than previously projected (another 8 in. of relative sea level could occur by 2030 and levels could be as much as 3 ft. higher by 2070).

As sea levels rise, groundwater levels will also rise, which will reduce storage capacity in some areas (i.e., more flooding).[15] Studies also suggest precipitation amounts will increase (and already have increased ~70% from 1958-2012) and storms/nor'easters could potentially become more severe.[16]

Flooding, sea level rise, and rising groundwater tables could increasingly flush contaminates present in groundwater and soil into Cape Cod Bay. As PNPS moves to decommissioning and site cleanup (which could be deferred for up to 60 yrs.), understanding how these impacts will influence contamination of Cape Cod Bay will become more critical. Additional sources of contamination could result from disturbed soils or demolished structures on the site, however decommissioning does not include cleanup or management of non-radiological contaminants. It is up to EPA to ensure that nonradiological contamination present on-site does not flush into water sources over time.

For example, EPA should ensure yard drain and electrical vault testing is done with more frequency after shutdown and until decommissioning is complete to ensure increased flooding, rising groundwater tables, and other climate change impacts are not leaching on-site contaminants into Cape Cod Bay. Furthermore, Outfall 013 is recognized in the new permit but has no monitoring requirements since it's not expected to drain to Cape Cod Bay except during extreme storm events, is not accessible, and drains a relatively small portion of the site. As discussed in more detail in section II.G, more precipitation and storms are expected as a consequence of climate change; therefore, outfall 013 and all outfalls to Cape Cod Bay should be monitored and limits imposed on contaminants with climate change impacts in mind.

EPA and MassDEP should consider that sea level rise and rising groundwater tables could impact buried and underground piping and tanks. Flood proofing was a part of site construction at PNPS more than 40 years ago, however time, salt, and elements have potentially compromised that protection (as evidenced by the levels of tritium in groundwater wells within several hundred feet of the shoreline, as well as the recent NRC report that identified corroded supports for piping that distributes cooling water to the reactor and other plant systems after it is pumped in from Cape Cod Bay[17]). These could become even more vulnerable to saltwater corrosion as saltwater intrusion increases the salinity of the groundwater. These potential sources of contaminants should be considered by EPA and MassDEP in the new permit (i.e., periodic monitoring of buried and underground pipes and tanks that carry non-radiological contaminants). This monitoring should be coordinated with the MassDPH.

In issuing the draft permit, EPA and MassDEP improperly rely on scientific data that are decades old. In particular, the draft permit relies on Entergy's 2000 CWA "Demonstration Report" to set thermal limits on water discharged to Cape Cod Bay. This Demonstration Report is flawed in several ways, discussed in more detail in section II.A. For example, additive and synergistic effects of thermal pollution combined with other existing issues in Cape Cod Bay were not assessed, such as the warming of oceans due to global warming. It would be appropriate for EPA and MassDEP to reassess impacts caused by PNPS's thermal discharge in light of global warming and the recent increase in average water temperatures in Cape Cod Bay. In the Fact Sheet, EPA acknowledges a "statistically significant warming trend in both the intake and in surface waters in Cape Cod Bay over the 37-year period of record." Until a reassessment of PNPS's thermal plume is carried out, we request that the temperature variance be denied and thermal discharges to Cape Cod Bay be terminated.

President Obama's Executive Order 13653[18] promotes risk-informed decision making among federal agencies and requires the consideration of climate change issues. EPA's own Policy Statement on Climate Change Adaption[19] states that EPA is "…committed to identifying and responding to the challenges that a changing climate poses to human health and the environment."; the "…agency must adapt if it is to continue fulfilling its statutory, regulatory and programmatic requirements" and "…plan for changes in climate and incorporate consideration of climate change into many of its programs, policies, rules and operations to ensure they are effective under future climatic conditions.

The draft permit does not adequately address climate change impacts and contradicts EO 13653 and EPA's Policy Statement. EPA's Climate Action Plan, mandated by EO 13653, recognizes that a "…changing climate can affect exposures to a wide range of chemicals. Exposures may change because of changing environmental conditions or changing use patterns." Yet the draft permit does not address how various climate change impacts will influence further chemical pollutant discharges from PNPS into Cape Cod Bay, nor does the science behind the draft permit assess what impacts climate change will have regarding thermal effluent and impingement/entrainment of marine resources.

In view of climate change impacts that will impact PNPS, decommissioning and site decontamination should be completed by 2030 and all NDPES permits should be terminated. No further discharge of pollutants into Cape Cod Bay and the groundwater on-site should be allowed to continue.

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[10] Coastal Risk Consulting. Dec. 2015. Analysis of AREVA Flood Hazard Re-Evaluation Report for Pilgrim Nuclear Power Station. <http://www.capecodbaywatch.org/wp-content/uploads/2012/06/CRC-PNPS-Analysis-Report_Dec2015_FINAL.pdf?d23684>

[11] U.S. Dpt. of Energy. 2013. U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather. 84 pp.

[12] USACE (U.S. Army Corps of Engineers). 2014. Climate Change Adaptation. <http://www.corpsclimate.us/ccaceslcurves.cfm>

[13] Goddard PB, Yin J, Griffies SM, and S. Zhang. 2015. An extreme event of sea-level rise along the Northeast coast of North America in 2009–2010. Nature Communications. 6(6346): doi:10.1038/ncomms7346.

[14] Boston Research Advisory Group. Climate Projections Consensus Report: Climate change and sea level rise projections for Boston. Jun. 1, 2016. <http://climateready.boston.gov/findings>; Another 8 in. of relative rise may happen by 2030, almost 3x faster than previously projected. By 2050 levels may be as much as 1.5 ft. higher than in 2000; and as much as 3 ft. higher by 2070.

[15] Coastal Risk Consulting. Dec. 2015. Analysis of AREVA flood hazard re-evaluation report for Pilgrim Nuclear Power Station.
[16] Stratz S.A. and F. Hossain. 2014. Probable maximum precipitation in a changing climate: Implications for dam design. Journal of Hydrologic Engineering. 19(12): 06014006; Kunkel K.E., Karl T.R., Easterling D.R., Redmond K., Young J., Yin X., and P. Hennon. 2013. Probable maximum precipitation and climate change. Geophysical Research Letters 40(7): 1402-1408; Boston Research Advisory Group. Climate Projections Consensus Report: Climate change and sea level rise projections for Boston. June 1, 2016. <http://climateready.boston.gov/findings>; Melillo J.M., Richmond T.C., and G.W. Yohe, Eds. 2014. Climate change impacts in the United States: the third national climate assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.
[17] NRC. July 6, 2016. PNPS – Evaluation of Changes, Tests, or Experiments and Permanent Plant Modifications Team Inspection Report 05000293/2016007.
[18] Executive Order 13653. 2013. Preparing the United States for the Impacts of Climate Change.
[19] EPA. Policy Statement on Climate Change Adaption. Revised June 2014. <https://www3.epa.gov/climatechange/Downloads/impacts-adaptation/adaptation-statement-2014.pdf.

Response to Comment 2.2:

The comment asserts that the Draft Permit does not adequately address the impacts of climate change on future discharges from PNPS. The comment requests that decommissioning and site decontamination be completed and all NPDES permits be terminated by 2030, after which time no further discharge of pollutants into Cape Cod Bay and the groundwater on-site should be allowed to continue. As explained elsewhere in this Response to Comments, PNPS ceased operations as of May 31, 2019, and no longer operates as a generating facility. As such, the response is limited to post-shutdown discharges. The CWA does not dictate when decommissioning and site decontamination must be completed, and the Final Permit does not impose a deadline for decommissioning or termination of the permit. At the same time, the Agencies have considered the potential impacts of climate change on the discharges from PNPS raised by the commenter and how these impacts are mitigated by conditions and limits of the Final Permit.

As the comment points out, sea levels and water temperatures may rise in the future, and the severity and frequency of storm events may increase. EPA does not presently have sufficient data to attempt to make precise predictions about future water temperatures or sea levels in Cape Cod Bay for the purposes of establishing effluent limitations or conditions. Moreover, such an analysis is currently beyond the scope of this NPDES permit renewal. The Final Permit establishes permit limits and conditions that address wastewater, cooling water, and stormwater discharges from PNPS based on conditions as described by Entergy during the permitting process. The limits and monitoring required by the Final Permit will provide valuable information to evaluate any impacts of PNPS's discharges and climate change going forward.

For example, the comment requests that the Draft Permit's temperature variance be denied and thermal discharges be terminated until a reassessment of PNPS's thermal plume is carried out.[9] Since the facility has shut down, the heat load associated with the reduced cooling water withdrawals is substantially decreased and the Final Permit's temperature limits ensure that the

[9] The comment states that the Draft Permit "contradicts EO 13653 and EPA's Policy Statement." EPA notes that Executive Order 13653 was revoked by Executive Order 13783. *See* 82 Fed. Reg. 16,093 (Mar. 28, 2017). At the same time, EPA has addressed concerns about the impacts of climate change on PNPS's discharges in the response.

Facility maintains a 98% reduction in heat load as compared to the current permit. The temperature limits and reduction in heat load will ensure the protection and propagation of a balanced, indigenous population. Moreover, the remaining source of heat from PNPS is non-contact cooling water from the spent fuel pool. The spent fuel is scheduled to be transferred to the independent spent fuel storage installation (ISFSI) within the next five years, which will eliminate this thermal input from PNPS to Cape Cod Bay. Due both to the substantial and continuing reduction in heat load under the Final Permit and because the thermal discharge related to cooling the spent fuel pool is expected to be discontinued altogether in the near future, the thermal impacts from cooling water discharges are not expected to increase as a result of climate change.

The comment raises concerns that flooding, sea level rise, and rising groundwater tables could increasingly flush contaminants present in groundwater and soil into Cape Cod Bay. The comment also requests that post-shutdown yard drain and electrical vault testing be done with more frequency until decommissioning is complete. An increase in the frequency of flooding could increase the frequency and magnitude of discharges from the permitted stormwater outfalls. The Final Permit establishes effluent limits for total suspended solids, oil and grease, and pH at stormwater outfalls, except Outfall 013. Monthly monitoring will ensure that discharges are sampled in most years over a variety of storm events. The Final Permit also establishes new quarterly, routine monitoring at a subset of electrical vaults and additional monitoring for all vaults. *See* Responses to Comments I.3.5 and I.3.6. The comment does not explain how the monitoring frequency proposed in the Draft Permit is insufficient to respond to any potential impacts from climate change nor does it offer examples of conditions or monitoring requirements that would be more appropriate to address these impacts.

In addition to stormwater limits and monitoring requirements, the Final Permit requires that the Permittee develop and implement stormwater best management practices (BMPs) designed to reduce or prevent the discharge of pollutants in stormwater, including preventative maintenance programs, soil and erosion controls, and runoff management. These requirements are consistent with EPA's most recent Multi-Sector General Permit (MSGP) for stormwater associated with industrial activity. The implementation of BMPs must be documented in the stormwater pollution prevention plan (SWPPP), which includes requirements for additional quarterly inspections of stormwater outfalls and vaults. Based on sampling and quarterly inspections, the Permittee may be required to amend the SWPPP to reflect changes in activities that have a significant effect on the potential for the discharge of pollutants to Cape Cod Bay, including changes necessary to address flooding that occurs from the increased frequency and severity of storm events. The Agencies have determined that these limits and conditions are sufficient to ensure that any potential impacts from increased storm severity or frequency to the discharge of pollutants authorized by the NPDES permit are adequately addressed by the Final Permit. In addition, the Final Permit does not authorize the discharge of stormwater associated with construction activities such as demolition of plant structures and buildings. *See* Parts I.B and I.H.6 of the Final Permit ("Unauthorized Discharges") and Condition 4 of MassDEP's Water Quality Certificate. The Permittee must either seek a modification to its Final Permit or coverage under another NPDES permit to discharge pollutants in stormwater associated with construction activity. *See also* Response to Comment IV.5.1.

The comment requests that the Agencies consider potential sources of contaminants from buried and underground piping and tanks that could be impacted by sea level rise and rising groundwater tables. According to the comment, this infrastructure could become even more vulnerable to saltwater corrosion as saltwater intrusion increases the salinity of the groundwater. The comment requests that the Final Permit include "periodic monitoring of buried and underground pipes and tanks that carry non-radiological contaminants" and that such monitoring be coordinated with the Massachusetts Department of Public Heath (MassDPH). The comment does not explain how buried or underground pipes and tanks would result in discharges to surface waters or what non-radiological pollutants should be regulated. The permit includes routine monitoring at vaults and authorized outfalls that may capture potential sources of contamination from buried or underground pipes to the extent that these sources discharge from one or more authorized outfalls. The integrity of buried piping and tanks may also be regulated under other programs, including RCRA and NRC requirements. In addition, the Final Permit does not authorize the discharge of dewatering from pipelines and/or tanks that are being dismantled during decommissioning. *See* Parts I.B and Part I.H.6 of the Final Permit ("Unauthorized Discharges") and Condition 4 of MassDEP's Water Quality Certificate. The Permittee must either seek a modification to its Final Permit or coverage under another NPDES permit to discharge pollutants from the dewatering of pipelines and tanks. *See also* Response to Comment IV.5.1.

Beyond the NPDES permit, the Nuclear Decommissioning Citizens Advisory Panel (NDCAP) is an additional resource for raising concerns about the decommissioning of PNPS. Finally, the NRC's Decommissioning Planning Final Rule, 76 Fed. Reg. 35,512 (June 17, 2011), also requires licensees to conduct their operations to minimize the introduction of residual radioactivity into the site, which includes the site's subsurface soil and groundwater.

The comment also addresses Outfall 013, which has no monitoring requirements associated with it. The Agencies address the commenter's concerns about Outfall 013 in more detail in Response to Comment I.3.5. In the Fact Sheet, the Agencies acknowledged Outfall 013 and proposed to authorize stormwater discharges from it, but proposed no effluent limits, for a number of reasons, *see* Fact Sheet at 29, none of which the comment disputes. The comment does not provide any other specific explanation why the Agencies must establish effluent limits or monitoring requirements for Outfall 013, except to generalize that climate change will lead to more intense storm events during which stormwater discharges from Outfall 013 may occur. The Agencies have added Outfall 013 to the Final Permit but have not established any numeric effluent limits. The non-numeric, technology-based effluent limitations at Part I.C of the Final Permit are designed to minimize the discharge of pollutants in stormwater discharges associated with industrial activity at PNPS, including in the event of stormwater discharges from Outfall 013. Moreover, as the Agencies noted in the Fact Sheet, the drainage area for Outfall 006 is similar to that for Outfall 013 and the required sampling for Outfall 006 is therefore expected to provide an adequate characterization of stormwater discharges from both outfalls. *See* Fact Sheet at 29.

According to the comment, understanding how decommissioning and site cleanup influence contamination of Cape Cod Bay will become more critical because cleanup or management of non-radiological contaminants resulting from disturbed soils or demolished structures on the site are not managed by decommissioning and EPA is responsible for ensuring that non-radiological contamination present on-site does not flush into water sources over time. The Agencies note that the comment does not request any specific changes to the Draft Permit limits or conditions. As explained above, the Final Permit establishes BMPs and requires that the Permittee develop and maintain a SWPPP to document the implementation of BMPs, including amending the SWPPP to address changes that could result in a significant effect on the potential to discharge pollutants to Cape Cod Bay. In addition, Part I.B of the Final Permit does not authorize discharges of pollutants in stormwater associated with construction activity or other specific discharges that may be associated with activities performed during decommissioning (e.g., pipeline and tank dewatering, discharge of spent fuel pool water). *See* Response to Comment IV.5.1. In accordance with Parts II.D.1.a and II.D.1.b of the Standard Conditions of the Final Permit, the Permittee must report any planned physical alterations or additions to the permitted facility that could significantly change the nature or increase the quantity of pollutants or which could result in noncompliance with permit requirements. *See also* 40 C.F.R. § 122.41(*l*); 314 CMR 3.19(20)(c). If the Permittee expects to discharge these pollutants in the future, it will need to seek a modification of the Final Permit or authorization under another permit (e.g., EPA's Construction General Permit (CGP)). *See* Final Permit Parts I.B and I.H.6 and Condition 4 of MassDEP's Water Quality Certificate. The CGP requires appropriate stormwater controls (*e.g.*, buffers, perimeter controls, storm drain inlet protection) to minimize stormwater discharges of construction-related pollutants. The Agencies may also request additional information to determine if cause exists to modify or revoke and reissue the Final Permit, if necessary, to address new sources of contamination in the future. *See* Final Permit Part II.A.3; *see also* C.F.R. § 122.41(h); 314 CMR 3.19(8).

Finally, the comment requests that decommissioning and site decontamination be completed and all NPDES permits be terminated by 2030, after which time no further discharge of pollutants into Cape Cod Bay and the groundwater on-site should be allowed to continue. The CWA does not dictate when decommissioning and site decontamination must be completed, and the Final Permit does not impose a deadline for decommissioning or termination of the permit.[10] The Final Permit ensures that discharges from the site comply with applicable water quality requirements. In addition, permit termination may not necessarily be appropriate for all facilities that cease operating. Some facilities that are no longer operating but have NPDES Permit coverage, continue to require individual or general permit coverage due to residual pollutants being discharged in stormwater. For example, the former BioEnergy wood-chip fired power plant in West Hopkinton, NH was a shut down in 2009, but residual pollutants in stormwater runoff required the site to obtain coverage, in that case under EPA's MSGP for its stormwater discharges. The law requires the owner or operator of the facility to obtain authorization under the NPDES program and/or the Massachusetts Clean Waters Act as long as there are point source discharges from the site to Cape Cod Bay.

2.3 EPA Should Require Entergy to Mitigate the Past and Continuing Harm Caused by PNPS's Water Intake and Pollutant Discharges

[10] The PSDAR submitted by Holtec, which proposes the DECON decommissioning option, provides a schedule that plans for partial site release (except ISFSI) in early 2025 and license termination in 2063. *See* AR-696 at 17.

The draft permit should require Entergy to fund a mitigation account for environmental restoration and monitoring work in Cape Cod Bay and nearby estuaries, by local public and NGO groups. This account should be a robust dedicated fund used to mitigate the cumulative impacts of PNPS operations since 1972 and for a period after decommissioning ends. Attachment D to the draft permit reads that PNPS's water intake has removed and killed billions of aquatic organisms in Cape Cod Bay. In addition to direct impacts, the loss of aquatic organisms have indirect, ecosystem-level effects, including disruption of aquatic food webs,[20] disruption of nutrient cycles and other biochemical processes, alteration of species composition and overall levels of biodiversity, and degrade the overall aquatic environment. It has been assumed that 100% mortality occurs for entrained zooplankton at PNPS, especially when the cooling water temperature at discharge exceeds 84.2ºF (29ºC) and coincides with chlorination.[21] Entergy's current NPDES permit allows PNPS to continuously chlorinate each service water system.[22] It appears that this chlorinated water is mixed with the condenser discharge cooling water and a review of discharge monitoring reports from 2012-2014 shows that often the discharge temperature is above 84ºF.[23] Thus, 100% of the zooplankton can be assumed to have suffered mortality over the years.

Impacts to the marine environment by PNPS are clear and warrant dedicated monitoring and mitigation until decommissioning is completed (up to 60 years post shutdown). The fund should be used to address:

- Cumulative impacts of past/continued use of PNPS's CWIS, including thermal discharges, on fish eggs/larvae, adult fish, shellfish, crustaceans and other aquatic life.
- Cumulative impacts on the economy, including commercial and recreational uses in Cape Cod Bay, and on recreational, social, and economic interests of the region.
- Restoration and monitoring work in Cape Cod Bay and nearby estuaries to offset PNPS's massive destruction of marine resources and disruption of the local economy.

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20 E.g., PNPS entrainment potentially influences the food chain. Entergy is not required to monitor/report entrainment rates for copepods and other planktonic resources important to North Atlantic right whales and other species. Right whale distribution is directly linked to planktonic resources. See: Memo to JRWA, Kingston, MA from Charles "Stormy" Mayo, Ph.D., Senior Scientist, Director, Right Whale Habitat Studies, Senior Advisor, Whale Disentanglement Program, Center for Coastal Studies, Provincetown, MA. Apr. 12, 2012.

21 This does not include mechanical damage. Bridges W.L. and R.D. Anderson. A brief survey of Pilgrim Nuclear Power Plant effects upon the marine aquatic environment. In: Observations on the ecology and biology of western Cape Cod Bay, Massachusetts. 1984. Eds, Davis, J.D. and D. Merriman. Springer-Verlag, p. 65-76.

22 Permit No. MA 003557, A.1.(a)(2)

23 For example, in Jun. 2011, the temperature was 97.7ºF (36.5ºC) and in Jul. 2010, the temperature 99ºF (37.2ºC) as reported in Entergy's Discharge Monitoring Reports. See Entergy's Jun. 2011 DMR and Jul. 2010 DMRs.

Response to Comment 2.3

JRWA comments that the permit should include a requirement for Entergy to fund a mitigation account for environmental restoration and monitoring work in Cape Cod Bay and nearby estuaries, in light of the impact of PNPS' operation, both since 1972 and until the facility is ultimately decommissioned. The comment does not, however, identify any provision under the federal CWA, the Massachusetts Clean Waters Act, or their respective implementing regulations as requiring such a permit condition. Nor does the comment identify any other NPDES permits that include any such condition. Notably, in responding to public comments on the § 316(b)

Final Rule, EPA disagreed with comments that requested additional permit requirements based on organism losses that occurred in the past. *See* Final Rule RTC at 108.

EPA also noted the potential difficulty in accurately calculating the effects of such past losses on current abundances of organisms and thereby determining an appropriate level of response. *Id.* Furthermore, in general, as part of a negotiated settlement to address past violations of a NPDES permit, the Agencies may require a Permittee to conduct supplemental environmental projects, which could include efforts to mitigate past environmental harm as described in the comment, but such a requirement occurs in the context of an enforcement action to resolve permit violations, not a permitting action.

The Agencies do not disagree with the comment that PNPS's cooling water intake has removed and killed billions of aquatic organisms in Cape Cod Bay since 1972 and indirectly impacted the aquatic environment as a result. Indeed, the Agencies closely examined environmental impacts associated with the facility's intake and discharge of cooling water in determining the appropriate BTA for the facility under CWA § 316(b) and temperature variance under § 316(a), as well as other effluent limitations. EPA's assessment included the assumption that organisms entrained through the cooling system suffered 100% mortality, including zooplankton. See Fact Sheet Attachment D at 15. The past withdrawal and discharge of cooling water, however, occurred in the context of a permitted activity sanctioned by the Agencies under previous permits issued pursuant to federal and state law. The comment does not allege that the impacts resulted from violations of past permits.

For all of these reasons, the Agencies do not agree that including the requested mitigation fund permit condition in the Final Permit is appropriate here. As to the period after May 31, 2019, when the facility stopped generating electricity, the Final Permit contains more stringent flow and temperature limits that are expected to coincide with a roughly 92% reduction in losses from impingement and entrainment and 98% reduction in heat load. These reductions in flow and temperature will significantly reduce the impacts from PNPS' withdrawals and discharges. (See Part III – 2.5)

Although Entergy had funded mitigation efforts in the past, their NPDES permit did not specifically require mitigation projects. Further, impacts to aquatic species will be significantly decreased under the Final Permit, which includes limits and conditions consistent with operation of PNPS after terminating its generation of electricity.

2.4 EPA Should Revise How Pollutant Concentrations are Reported in DMRs

It appears that under the current NPDES permit reporting program, only some pollution discharges are reported in Entergy's monthly Discharge Monitoring Reports (DMRs). For example, pH results for outfalls 001 and 002 have not been included in Energy's past DMRs. The draft permit also requests only select results be recorded and reported in DMRs (e.g., maximum daily flow of all thermal and non-thermal backwashes for outfall 002). Instead, the permit should clearly and explicitly require all effluent limits be recorded and reported in DMRs to ensure transparency and provide information for enforcement purposes. Also, a more accessible system for monitoring results and routine filings to EPA should be provided and maintained on Entergy's or its consultant's website. Data tracking should be provided so that cumulative impacts and chronic issues can be rapidly addressed. The NetDMR system should be made available for public tracking of monitoring efforts and conditions.

Response to Comment 2.4

The requirements for recording and reporting of monitoring results at 40 C.F.R. § 122.48(b) state that "required monitoring including type, intervals, and frequency sufficient to yield data which are representative of the monitored activity including, when appropriate, continuous monitoring." Reporting may be no less frequent than specified in § 122.44(i), which specifies that requirements to report monitoring results shall be established on a case-by-case basis with a frequency dependent on the nature and effect of the discharge, but in no case less than once a year. *See* 40 C.F.R. § 122.48(c).

The Final Permit includes minimum and maximum pH limitations Outfalls 002, 010, 012, 004, 005, 006, 007, 011, and 014 and requires monitoring no less than once per month. The 1991 Permit required that the effluent pH not vary by more than 0.5 standard units from that of the intake water for Outfalls 001 and 002. However, the permit did not specify a pH range or how frequently the effluent pH should be measured and reported for these outfalls. The Permittee has not reported intake or effluent pH levels for these outfalls on their DMRs. Consistent with reporting requirements at 40 C.F.R. § 127 (Subpart B), the Permittee is now required to report the minimum and maximum monthly pH values based on this monitoring. See Parts I.A.2, I.A.2, I.A.3, I.A.4, I.A.5, I.A.8, and I.A.9 of Final Permit.

The monitoring program in the Final Permit specifies the frequency and type of sample required for each listed parameter. The Permittee must report the average monthly (where applicable) and maximum daily observed values in its monthly discharge monitoring reports (DMRs), which are used to monitor compliance with permit limits and conditions. The Permittee is obligated to monitor and report sampling results to EPA and the MassDEP consistent with the time frames specified in the permit, typically on a monthly or quarterly basis. The data from NetDMR are periodically uploaded to EPA's ECHO database, where monitoring results can be accessed by the public at https://echo.epa.gov/. Interested parties may also request DMR data from EPA.

2.5 2012 Relicensing and Future Use

The U.S. NRC extended Entergy's operating license for PNPS in 2012 despite a NPDES permit that had expired in 1996.[24] During relicensing, the NRC failed to complete several environmental assessments (e.g., climate change impacts, ESA section 7 consultations) that are prerequisite to relicensing, making the NRC's environmental impact statement for the relicensing invalid.[25] EPA and MassDEP should have ensured that PNPS was not relicensed until a valid, current NPDES permit was in place. The lack of oversight by EPA and MassDEP of PNPS's CWIS operations and failure to ensure that relicensing did not occur until the NPDES permit was reissued was an egregious failure of the agencies' regulatory duties. Although the draft NPDES permit now in 2016 is stronger in some ways, it does nothing to mitigate these failures. At a minimum the new permit should prevent continued use of Cape Cod Bay prior to any re-fueling (scheduled for spring 2017), and then focus on site decommissioning and decontamination post power production.

The final permit should specify that the permit cannot be transferred to another company (or the same company) for re-use of the site for commercial/industrial purposes, especially without a public review process. In 1999, Entergy inherited PNPS's NPDES permit from Boston Edison, and subsequently did not follow all permit conditions. This new permit should not automatically transfer as the previous permit was in 1999.

[24] As well as pending citizen challenges referred to NRC administrative appeal board, and pressure from the host community, citizens, legislators and organizations to not relicense PNPS. For example, see: Cape Cod National Seashore Advisory Commission letter to NRC. March 30, 2012. Re: Pilgrim Nuclear Facility <http://www.pilgrimcoalition.org/wpcontent/uploads/2012/05/03302012-NatSeashoreAdvisoryCom-to-NRC.pdf>

[25] JONES RIVER WATERSHED ASSOCIATION PETITIONS FOR LEAVE TO INTERVENE AND FILE NEW CONTENTIONS UNDER 10 C.F.R. § 2.309(a), (d) OR IN THE ALTERNATIVE 10 C.F.R. § 2.309(e) and JONES RIVER WATERSHED ASSOCIATION AND PILGRIM WATCH MOTION TO REOPEN UNDER 10 C.F.R. § 2.326 AND REQUEST FOR A HEARING UNDER 10 C.F.R. §2.309(a) and (d) IN ABOVE CAPTIONED LICENSE RENEWAL PROCEEDING. March 8, 2012.

Response to Comment 2.5

The comment points to what it views as several shortcomings of the NRC licensing process in 2012 and states that the Agencies should have ensured that NRC did not relicense PNPS until the Agencies re-issued the NPDES permit. The comment recommends that the Final Permit prevent continued use of Cape Cod Bay prior to any re-fueling and then focus on regulating discharges during the decommissioning process. Finally, the comment requests that the permit prohibit transfer of the permit.

The 2012 relicensing process referred to in the comment was an administrative proceeding before the NRC and is not at issue in this permit proceeding. Even if the comment were correct that EPA and MassDEP had a duty to ensure that NRC not approve the relicensing until the Agencies reissued the NPDES permit,[11] it is not clear what remedy, if any, would be available in the current proceeding to undo that relicensing, and the comment offers no explanation. The comment about use of Cape Cod Bay prior to any re-fueling is moot because the final re-fueling was completed in 2017 and PNPS' NRC license no longer authorizes it to re-fuel the nuclear reactor. 10 C.F.R. § 50.82(a)(2); *see also* Letter from Louise Lund, NRC, to Brian Sullivan, Entergy Nuclear Operations, Inc. (July 5, 2019) (noting that Entergy's certification that the fuel was permanently removed from the reactor has been docketed). As mentioned earlier in the response to comment I.2.1, this Permit has been in process for several years, with many delays caused by a variety of circumstances. As a result, the Final Permit focuses on regulated discharges following the plant's cessation of electricity generating operations. The Final Permit does not, however, authorize discharges of stormwater associated with construction activity and certain other discharges that may be related to decommissioning (e.g., pipeline and tank

[11] The NPDES permit for PNPS was administratively continued in 1996, meaning that PNPS did possess a valid NPDES permit at the time of the relicensing. *See* 40 C.F.R. § 122.6; Fact Sheet at 6.

dewatering) or to dismantling and demolition of plant buildings and structures. *See* Parts I.B and I.H.6 of the Final Permit and Condition 4 of MassDEP's Water Quality Certificate.

The Final Permit includes effluent limitations and CWIS requirements to ensure that the continued intake and discharge of water from and to Cape Cod Bay after shutdown (consistent with activities disclosed by Entergy at the time of the Draft Permit) will meet the requirements of the CWA and any more stringent surface water quality standards for Massachusetts, including, to the extent applicable to the permitting decisions at issue, climate change impacts and Section 7 consultation with the Services for any listed species in the action area. *See, e.g*., Responses to Comments in Sections I.2.2, I.4.1, and I.5.5.

Entergy was the Permittee at the time the Agencies issued the Draft Permit. Entergy announced in 2018 that it would seek to sell the site and seek approval from the NRC to transfer its license to another entity to oversee the decommissioning process. The comment requests that transfer of this permit be prohibited. EPA regulations recognize, however, that a permitted facility may change ownership during the term of a NPDES permit and, in such a case, provide for the transfer of a permit after notice to the permitting authority. 40 C.F.R. § 122.41(*l*)(3). For instance, the automatic transfer of permits is authorized where the current permittee notifies the permitting authority at least 30 days in advance of the proposed transfer date and the notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage and liability between them. 40 C.F.R. § 122.61(b). A permit may also be transferred to a new owner or operator through a minor modification of the permit after notice to the permitting authority. 40 C.F.R. § 122.62(b)(2). Neither an automatic transfer nor a transfer pursuant to a minor modification requires public participation. *See* 40 C.F.R. §§ 122.61, 122.62, 122.63. Similarly, MassDEP's regulations at 314 CMR 3.19(25)(c) allow for automatic transfers of surface water discharge permits.

According to the comment, upon transfer of the NPDES permit for PNPS from Boston Edison to Entergy in 1999, the new owner failed to comply with all permit conditions, and that, consequently, the Final Permit should prohibit transfer. Under the EPA regulations discussed above, however, the responsibility and liability for the NPDES permit transfers to the new owner upon transfer of the permit. Thus, any violation of effluent limitations or permit conditions by the new owner is subject to enforcement action explained in Part II.A (Duty to Comply) and may incur the same penalties. *See* Final Permit Part II.A.1. In other words, the new owner has a duty to comply with the permit, and many remedies for any noncompliance are available, including enforcement, permit modification, permit revocation and reissuance, permit termination, or denial of a permit renewal application. 40 C.F.R. § 122.41(a). Moreover, assuming the comment's assertion is correct that Entergy failed to live up to its responsibilities under the permit following the transfer from Boston Edison, it is unclear why it would necessarily be beneficial for Entergy to remain the permittee of record.

In any event, EPA regulations at §§ 122.61, 122.62, and 122.63, and MassDEP regulations at 314 CMR 3.19(25)(c), specify the conditions under which the transfer of an NPDES permit may be achieved through minor modification of the permit or automatically (*i.e.*, without public notice). The Agencies do not agree that the comment's concern about subsequent permit compliance provides a basis under the regulations to prohibit any future transfer of the permit.

Moreover, on June 18, 2019, pursuant to 40 C.F.R. § 122.61.(b), Entergy notified EPA by letter of a pending transaction targeted to occur no later than December 31, 2019, that would transfer PNPS to Holtec International ("Holtec"). *See* AR-732. The letter also included a written agreement between the existing and new permittees to transfer permit responsibility, coverage, and liability to Holtec on the closing date. On August 23, 2019, Entergy notified EPA that the closing would occur on August 26, 2019, effective at 11:59 p.m. *See* AR-727. Consequently, the NPDES permit was transferred to Holtec automatically on that date and time. On August 22, 2019, the NRC approved the transfer of the operating license from Entergy to Holtec. *See* AR-759. The NRC's decision to transfer the license to Holtec is being contested by the Commonwealth of Massachusetts, and MassDEP has included a note in the Final Permit to reflect the fact and the condition upon which it has joined the Final Permit. With that caveat being noted, EPA has changed the name of the authorized permittee from "Entergy Nuclear Generation Company" on the Draft Permit to "Holtec Pilgrim, LLC" on the Final Permit to reflect the automatic transfer of the NPDES Permit effective August 26, 2019.

2.6 Increased EPA Engagement

We are not aware of EPA or MassDEP programs or efforts to address the significant threat posed by nuclear waste fuel stockpiles. EPA and MassDEP must become more fully engaged in this issue despite the long standing policy to defer to NRC, which does not yet have a long-term program for waste stockpiles, but rather defers to DOE which has not established a clear policy or practice for handling the tons of nuclear waste that threatens our environment and more. Although DOE is working on a "consent-based siting" plan, hundreds of tons of enriched nuclear waste is stored close to the shoreline at PNPS, and will continue to be in that location for an unknown period of time. At this location, there is high risk of salt water corrosion or storm damage. Efforts to manage ice, snow, and debris build-up is likely to include chemical, as well as mechanical, means. Run-off from the waste storage facility will ultimately end up in Cape Cod Bay.

Even though NRC is charged with handling radiological safety, EPA and MassDEP should address related issues such as siting and maintenance to ensure the potential for environmental impact is minimized. Here, we ask that EPA and MassDEP take a stand to require storage of nuclear waste, both spent nuclear fuel and stranded Greater-than-Class-C waste, to be stored beyond the reach and level of climate change impacts. Entergy has multiple options and should be required to engage in the safest handling of nuclear waste and avoid of any need for a permit to pollute. This stockpile of nuclear waste should not be allowed to impact the marine environment. EPA and MassDEP should issue an order to move it or to formally address management activities.

Response to Comment 2.6

Siting decisions about nuclear waste at this site are outside the scope of the CWA permit. As the commenter correctly notes, this is DOE's responsibility and is not a case of EPA deferring to the NRC. The Final Permit specifies that the discharge of radioactive materials must be in accordance with NRC requirements. *See* Final Permit at Part I.A.23; *see also* Response to Comment III.7.0.

To the extent that any pollutants associated with any nuclear waste storage area on the site and regulated under the CWA may be carried into the receiving waters by stormwater, the permittee would address such contaminants in its SWPPP and implement best management practices (BMPs) to reduce or prevent their discharge. BMPs designed to reduce stormwater discharges at the Facility must be documented in the Facility's SWPPP. *See* Parts I.D.1 and I.D.2 of the Final Permit. See Responses to Comments I.2.2 and IV.5.1.

3.0 Comments Specific to Draft Permit Effluent Limitations

3.1 Conditions and Effluent Limitations Applicable to Outfall 001 Must Be Revised (Discharge of Non-Contact Cooling Water to Cape Cod Bay)

Part 1.A: Permit effective date until shutdown

We support the draft permit's reduction in maximum daily flow rate from 510 million gallons per day (MGD) to 447 MGD until May 31, 2019 or before, and the preservation of flow limits despite requests by the permittee that these limits be removed for outfall 001.

The temperature rise (delta-T) in the draft permit is the same as the current permit (32°F). While we do not support any thermal pollution discharged into Cape Cod Bay, we at least recommend that this limit be reassessed in order to be granted a variance under CWA § 316(a) and we are strongly opposed to any increase in this limit in the final permit.

The delta-T limit is based on the CWA § 316(a) variance that was granted in the current 1991 permit. However, this variance is based on Entergy's outdated and flawed Demonstration Report. Much of information from the 1975 Demonstration Report was seemingly carried over to the updated 2000 report, with some exceptions. The 2000 Demonstration Report:

1) relies on outdated and incomplete data -- studies are mostly from the 1970s and the newer 1995 study was cut short and meaningful data were only collected for 2.5 days.
2) The 1975 report states that there are no rare and endangered species in the vicinity of PNPS, which is false (e.g., the entirety of Cape Cod Bay has recently been deemed critical habitat for critically endangered North Atlantic right whales); and the 2000 report does not discuss endangered species at all.
3) Representative Species (chosen due to biological importance, whether they are affected by operations, and commercial/recreational interest) are likely different 20 years later.
4) Additive and synergistic effects of thermal pollution combined with other existing issues in Cape Cod Bay was not assessed (e.g., invasive species, other pollution, and the warming of our oceans due to global warming was not considered at all).

Thermal pollution harms marine life and poses a serious threat to ecological health and individual species.[26] An average annual increase in water temperature of only about 1.8ºF (1ºC) can have significant effects on coastal marine community dynamics by impacting a variety of biological and ecological processes.[27] According to one study used in Entergy's 2000 Demonstration Report, hundreds of acres of Cape Cod Bay could increase by at least 1°C due to the thermal discharge. In its Demonstration Report, Entergy did not adequately demonstrate how this temperature increase would affect the development/survivorship of ichyoplankton or affect the reproduction of adult fish in the long-term.[28] Not only is the Demonstration Report flawed for the reasons mentioned above, but Entergy did not adequately show that no significant impacts occur due to the heated discharge – not in 2000, and certainly not today.

Entergy has to reapply for its variance and has chosen to make the case for a variance "retrospectively"– showing that monitoring data collected during the plant's operations show no evidence of appreciable harm to balanced, indigenous populations attributable to the thermal discharge. This is in contrast with making the case "prospectively," where an extensive modeling of the thermal plume would be required. Entergy should be required to prospectively prove no harm and new modeling of the plume should be required.

Cape Cod Bay is different than it was when the studies in Entergy's Demonstration Report were carried out. Reassessing impacts from PNPS's thermal discharge in light of global warming, the recent increase in average temperatures in Cape Cod Bay,[29] among other more current information would be appropriate. Until this is done, we strongly recommend that the variance be denied.

CWA § 316(a) provides a mechanism for a variance from applicable thermal water quality standards where the permittee is able to demonstrate to EPA's satisfaction that the thermal effluent limit that would otherwise apply would be "more stringent than necessary to assure the projection [sic] and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made[.]" 33 U.S.C. § 1326(a). Such demonstration must take into account "the cumulative impact of [the discharger's] thermal discharge together with all other significant impacts on the species affected[.]" 40 C.F.R. § 125.73(a). Further, the discharger's variance request must show:

(i) 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 a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge has been made; or
(ii) That despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.

Id. § 125.73(c)(1). EPA guidance emphasizes the need for current information to support a renewed § 316(a) variance request.[30] The granting of a variance should not be automatic; rather, "the burden imposed by CWA section 316(a) is a stringent one[.]" In Re Dominion Energy Brayton Point, L.L.C., 12 E.A.D. 490 (E.P.A. Feb. 1, 2006).

The permit record does not support EPA's proposed renewal of PNPS's § 316(a) thermal variance. First, it is apparent from the § 316(a) Determination included as Attachment A to the Fact Sheet that the limited and outdated data relied upon by EPA in its decision to grant a renewed § 316(a) variance does not meet the "stringent" standard imposed by the Clean Water Act. Much of the data relied upon by EPA were derived from decades-old studies. For example, all of the studies regarding benthic fauna relied upon by MassDEP and EPA (including studies of the commercial lobster fishery, benthic fish assessments by otter trawl, and near-shore benthic assessments via shrimp trawl) occurred during the 1970's and 1980's, and the MassDEP Marine Organisms Impact Assessment does not mention a single benthic fauna study that is less than 25 years old. Further, the bulk of the inshore fish assessments relied upon by MassDEP and EPA are from the 1970's and 1980s, and the more recent studies (Gill Net studies at PNPS, which apparently continued "through the early 1990s") found "large differences . . . in pelagic species caught in the gill net deployed in the direct path of the thermal discharge[.]" *Id*. at 18. Prior to considering whether a § 316(a) variance is appropriate for PNPS, EPA should require the discharger to obtain new relevant data to support its assertion that a balanced, indigenous community of shellfish, fish and wildlife has been and will continue to be preserved in western Cape Cod Bay.

Second, the § 316(a) Determination does not adequately take into account "the cumulative impact of [PNPS's] thermal discharge together with all other significant impacts on the species affected[.]" 40 C.F.R. § 125.73(a). Although the § 316(a) Determination pays brief lip service to the "cumulative impact" of PNPS's thermal discharge, id. at 8-9, the language used by EPA throughout its § 316(a) Determination makes clear that the agency was considering the effects of PNPS's thermal plume in isolation. See, e.g., *id*. at 9 ("There have not been detected any changes in the zooplankton community that could be attributed to the thermal plume."); *id*. at 10 ("There has been no evidence of impaired/reduced reproduction in fish resulting from exposure to the thermal plume."). EPA should revise its § 316(a) Determination after performing the requisite cumulative impacts analysis. This is especially relevant given the increasing temperatures in Cape Cod Bay due to climate change, which are only compounded by PNPS's thermal discharge. Indeed, as MassDEP's Marine Organisms Impact Assessment[31] notes, "there has been a statistically-significant warming trend in both the intake and in surface waters in Cape Cod Bay over the 37-year period of record." *Id*. at 6.

Third, in its § 316(a) Determination EPA either minimized or ignored certain impacts to aquatic communities discussed elsewhere in the permit record which, taken together, indicate that there has been and will continue to be appreciable harm to the community of shellfish, fish and wildlife in Western Cape Cod Bay. For example, EPA states that there are no rare and endangered species in the vicinity of PNPS, which is false; the entirety of Cape Cod Bay has recently been designated as critical habitat for critically endangered North Atlantic right whales. Further, the Fact Sheet does not acknowledge that MassDMF scientists investigating the abundance of Irish moss in the vicinity of PNPS "estimated that about 10% of the test area (one of the harvest zones) had been negatively affected by the PNPS discharge." MDEP Marine Organisms Impact Assessment at 12.

In sum, the permit record - including the Fact Sheet, PNPS's § 316(a) Demonstration Report, MassDEP Marine Organisms Impact Assessment, and documents referenced therein - do not support the conclusion that PNPS's thermal discharge, in combination with other pollutant discharges and thermal impacts, results in "no appreciable harm" to the aquatic community of western Cape Code Bay. Thus, a renewed CWA § 316(a) variance is inappropriate at this time, and PNPS should be required to comply with all applicable thermal effluent limitations pursuant to CWA § 301.

Page 8 of EPA's Fact Sheet states, "the discharge temperature is almost entirely a function of the intake water temperature." EPA also asserts that that effluent temperature and delta-T have never exceeded required limits. However, Entergy has shut PNPS down (or powered down) on several occasions due to the incoming water being too warm. For example, on August 9, 2015, PNPS's discharge water was very close to exceeding the permitted limit of 102ºF (reaching 101.2ºF), and incoming water temperature exceeded the NRC's permitted limit of 75ºF – forcing the plant to power down. As an increasingly warming climate heats the water temperature of our oceans, the water in Cape Cod Bay will continue to periodically (and likely more frequently) become too warm for PNPS's cooling system. EPA should monitor the discharge temperature and delta-T limits with more scrutiny in the future to ensure all limits are met, and it should be prepared to impose enforcement actions when they are not.

Temperature readings should be electronic and continuous, and public access to real-time monitoring data should be provided online.

We support EPA and MassDEP efforts to clarify how delta-T is calculated. The current NPDES permit is poorly written and this provision is unclear and allowed Entergy to provide less than transparent DMR reporting since at least 1994. It is now understood that Entergy will be required to report the "highest level recorded" for temperature each month in the DMRs – for both the daily maximum discharge temperature and delta-T. The draft permit should require the DMRs to explicitly state this methodology and how its applied in each instance.

For effluent limits related to Total Residual Oxidants (TRO; to measure chlorine dosing), in the current permit TRO is reported in mg/L while the new permit limits are reported in ug/L. There is also some inconsistency throughout the draft permit – some TRO limits are reported in ug/L (e.g., outfall 001) while some are reported in mg/L (e.g., outfall 002). We request that the draft permit be modified by keeping all units consistent. It appears that the TRO limit has been lowered for outfall 001 to 0.0075 mg/L (7.5 ug/L) as a monthly average and 0.013 mg/L (13 ug/L) daily maximum, and we support this reduction. EPA's Fact Sheet explains that the daily maximum for TRO has been exceeded on three occasions (but the monthly average limit has not been exceeded). We support the reduction, but EPA should ensure all limits are met and should be prepared to impose enforcement actions when they are not.

Oil and Grease (O&G) limits do not appear in the current 1991 permit, and we support the inclusion of these limits in the new draft permit. However, we are unclear why numeric limits are not included (only "report" is listed in the requirements). While the associated footnote states that EPA's testing method 1664A is to be used, which has a minimum level of quantification of 5 mg/L, it is still unclear why a specific limit is not included. EPA should include a specific limit for O&G for outfall 001, or at least explain why one is not included.

It appears that pH limits are more stringent (from 0.5 standard units to 0.2 standard units) and there is now specific monitoring requirements (weekly) added to the new permit. We support these changes.

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[26] Azmi S., et al. 2015. Monitoring and trend mapping of sea surface temperature (SST) from MODIS data: a case study of Mumbai coast. Environmental Monitoring and Assessment. 187:165; Oviatt C.A. 2004. The changing ecology of temperate coastal waters during a warming trend. Estuaries. (27)6: 895-904.

[27] Including metabolic rates, population growth, distribution and abundance of prey, including phenology and productivity, and population connectivity; Oviatt C.A. 2004. The changing ecology of temperate coastal waters during a warming trend. Estuaries. (27)6: 895-904.; Hoegh-Guldberg O., et al. 2010. The impact of climate change on the world's marine ecosystems. Science. (328): 1523-1528.

[28] Letter to EPA from MassCZM, Jun. 27, 2000. Re: MCZM review of the Entergy-Pilgrim Station §316 Demonstration Report.

29 As outlined by EPA in Attachment C to the draft permit.

[30] Memorandum from James Hanlon, Director, Office of Wastewater Management, to Water Division Directors, Regions 1 – 10, Implementation of Clean Water Act Section 316(a) Thermal Variances in NPDES Permits (Review of Existing Requirements) (Oct. 28, 2008) (hereinafter, "Hanlon 316(a) Memo"), available at https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-338.pdf.

[31] See Massachusetts Department of Environmental Protection's Assessment of Impacts to Marine Organisms from the Pilgrim Nuclear Thermal Discharge and Thermal Backwash, included as Attachment C to the Fact Sheet.

Part 1.B: From shutdown until permit expires

After PNPS shuts down, scheduled to be no later than May 2019, the draft permit provides that flow rate for outfall 001 is reduced from 447 MGD to 11.2 MGD (average monthly) and 224 MGD (maximum daily) to support shutdown operations. We support this flow rate reduction, but there should be a date certain upon which withdrawals must end. The permit should outline what the 224 MGD will be used for.

We also support continued pH and O&G limits for discharges after shutdown. Since Entergy will be prohibited from chlorinating the water that is withdrawn to support shutdown operations, EPA has removed the TRO limits from outfall 001 after shutdown. We support prohibiting chlorination post shutdown and therefore the removal of TRO limits in the permit after that time.

Since 001 will no longer be used for cooling the main condenser after shutdown, the maximum daily temperature is reduced from 102°F to 85°F (and a monthly average is added = 80°F). Although we do not support any thermal discharge to Cape Cod Bay, we do not object to these reduced temperature limits. However, the delta-T limit, which is reduced from 32°F to 3°F, seems arbitrary and should instead be consistent with the MA SWQS's delta-T limit of 1.5°F. EPA also states in the Fact Sheet that it is unclear what will cause the 3°F increase in temperature, and at no point is cooling of the spent fuel pool mentioned in this section. In order to effectively set thermal limits in the final permit, EPA should clearly understand and outline which activities at PNPS will create thermal effluent at 001 and not set limits based on assumptions.

Response to Comment 3.1

The comment identifies issues with effluent limitations and conditions from the Draft Permit that apply prior to and following the cessation of power generation at PNPS (the "pre-shutdown" and "post-shutdown" limits, respectively). The Agencies have reviewed and considered comments on both the pre- and post-shutdown limits. However, as explained in the Introduction to this Responses to Comments, PNPS ceased generating electricity on May 31, 2019. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the electric generation facility, which would have been effective prior to the shutdown date, are no longer applicable. For this reason, the Agencies have not included the pre-shutdown effluent limitations and conditions in the Final Permit. As such, we do not address the comments specific to the pre-shutdown limits in the Draft Permit except where a concern or issue about the pre-shutdown limit would also be relevant to the post-shutdown limit. The comment also requests public access to real-time, on-line monitoring database. The Agencies have already considered and responded to comments on the availability of monitoring data. See Responses to Comment I.2.4.

The comment supports the post-shutdown reduction in circulating water flow from 447 MGD to an average monthly flow of 11.2 MGD and maximum daily flow of 224 MGD to support shutdown operations, which represents a 97.5% reduction from the current permitted flow. PNPS ceased operations on May 31, 2019 and as such, no longer operates the circulating water pumps to withdraw cooling water for the condenser on a continuous basis. The Draft Permit authorized limited operation of the circulating water pumps not to exceed 5% of the time on a monthly basis, which results in flow limits of average monthly and maximum daily flow limits of 11.2 MGD and 224 MGD, respectively. These limits were based on pre-Draft Permit communications with Entergy about the anticipated need for circulating water after shutdown. During the comment period, Entergy provided additional explanation for running the circulating water pumps and clarified its need to operate a circulating water pump for up to 48 hours at a time, once each rolling 28-day period. Water withdrawn using the circulating water pumps will be used as dilution water in compliance with NRC regulations, for backwashing the condenser lines, and for fire protection. The reporting cycle for permit conditions is monthly, not every 28 days. EPA considered the request and determined that authorization to operate a circulating water pump for up to 48 hours during a single calendar month is appropriate for the reporting period while still allowing PNPS to fulfill its shutdown operational needs. Part I.C.4 of the Final Permit authorizes the Permittee to operate one circulating water pump at a time for up to 48 hours during a single calendar month. This change still limits the maximum daily flow to 224 MGD but could result in an average monthly flow up to 16 MGD (based on 28 days in February), which, although slightly higher than the 11.2 MGD monthly average limit proposed in the Draft Permit, still results in a 96% reduction in water withdrawals through the circulating water pumps as compared to the current permit. Thus, the difference between this limit and the average monthly limit proposed in the Draft Permit is relatively minor but maintains consistency with the facility's requirements under the NRC. Because the Final Permit includes a maximum daily flow limit of 224 MGD and limits the duration of operation to no more than 48 hours in a calendar month, the average monthly limit has been changed to an hours of operation limit and reporting requirement.

The comment requests that the Final Permit include a date certain upon which withdrawals must end and asks for more explanation about what the 224 MGD will be used for. Circulating water flow is necessary to support shutdown operations for purposes other than cooling the spent fuel pool. Because the circulating water pumps are not connected to the spent fuel pool, this water will not be used for that purpose. According to Entergy, the circulating water is primarily used for dilution to meet the NRC's requirements for the liquid radiological waste disposal system and for fire protection purposes, as well as for backflushing the circulating water pump lines to manage biofouling. While PNPS has ceased generating electricity, it is not certain at this point how long post-shutdown activities that require use of the circulating pumps will last. For this reason, the Final Permit does not include a date certain upon which the use of the circulating water pumps must cease. The Agencies conclude that the proposed operation, which results in a 96% reduction in flow from the circulating water pumps will ensure that the impacts from impingement and entrainment are minimized consistent with § 316(b) of the CWA. *See* Response to Comment I.4.2.

The commenter reiterates that, while it does not support any thermal discharge to Cape Cod Bay post-shutdown, it also does not object to the more stringent maximum daily and average monthly temperature limits for Outfall 001 proposed in the Draft Permit. According to the commenter, however, the proposed delta-T limit (reduced from the previous permit's limit of 32°F to the Draft Permit's limit of 3°F) "seems arbitrary" and should instead be consistent with the MA SWQS's delta-T limit of 1.5°F. The commenter also states that EPA should clearly explain the source of the post-shutdown thermal effluent at Outfall 001 and "not set limits based on assumptions." In the Draft Permit, we proposed a delta-T limit of 3°F based on EPA discussions with PNPS staff about post-shutdown operating needs which indicated that the circulating water pumps "may be run for *more than just* cooling water." AR-521 (emphasis added); *see also* Response to Comment III.4.1. In other words, the information from the permittee at the time suggested that the circulating water pumps would be needed to supply water for cooling, among other possible uses, and that, consequently, the permittee would discharge heat from Outfall 001. Furthermore, PNPS staff indicated that this thermal component was likely to result in a delta-T under 3°F based on the permittee's projections for the facility. *See* AR-520. The Agencies proposed the 3°F delta-T limit based on these projections and because it would satisfy the requirements for a CWA § 316(a) variance. *See* Fact Sheet at 23-24. More specifically, the Agencies proposed that, since a limit of 1.5°F 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 receiving water (aka, the "BIP") and a limit of 32°F would assure the protection and propagation of the BIP, then a more stringent limit of 3°F would logically also assure the protection and propagation of the BIP. *Id.* Entergy has since informed EPA that the circulating water pump discharge from Outfall 001 will <u>not</u> be used for cooling (for the spent fuel pool or any other systems) and will not be heated. Rather, Entergy states that there is no source of heat for the discharge from the system formerly used to cool the condenser and that this water will be used for dilution and for fire protection. *See* Comment III.4.1. Consequently, we have removed the temperature limits for Outfall 001 (including the delta-T limit) from the Final Permit, meaning that the Final Permit does not authorize the discharge of heat from Outfall 001. The Final Permit continues to require reporting the temperature and delta-T at the monitoring location for Outfall 001. See Response to Comment III.5.2.

The Final Permit retains thermal limits for the discharge from Outfall 010, which serves as the discharge of cooling water for the spent fuel pool. Spent fuel cooling needs were at their height during the initial months immediately following shutdown and transfer to the spent fuel pool of the fuel rods then in the reactor and will decline over time. Entergy's comments and the PSDARs[12] submitted to the NRC describing the post-shutdown and decommissioning phase of PNPS recognize that the operational demand for cooling water and the thermal effluent has substantially declined following shutdown and will continue to do so as the radioactivity of the spent fuel decays and as it is relocated from the spent fuel pool. AR-692 at 22 and AR-696 at 21.

The comment expresses support for the post-shutdown continued pH limits for discharges at Outfall 001 following shutdown. The commenter also supports prohibiting use of chlorination, and as a result, elimination of the TRO limits following shutdown. The Final Permit prohibits chlorination at Outfall 001, but includes end-of-pipe limits for TRO at Outfall 010, which is continuously chlorinated. The Final Permit includes a water quality-based TRO limit of 0.1 mg/L, applied at the sampling location for Outfall 001, to ensure that effluent from Outfall 010 meets water quality standards for chlorine. *See* Response to Comment III.6.2.2. The Draft Permit included a pH limit at Outfall 001 of 6.5 to 8.5 standard units (S.U.) based on the surface water quality standards for Class SA waters. 314 CMR 4.05(4)(a)(3). In its comments on the Draft Permit, Entergy comments that, post-shutdown, Outfall 001 will consist only of seawater drawn through the facility by the circulating water pumps and used either for dilution water, for fire protection, and to flush out the system from any biofouling that may have occurred. *See* Comment III.4.1. Entergy states that this water will not be used for cooling or any other processes, and as such, there will be no change in the pH at Outfall 001 from intake to discharge. PNPS has ceased operating and its water use has been substantially altered as a result of the material change in the Facility. Post-shutdown, the discharge water from Outfall 001 is essentially the same as the intake water, with no intervening use that would alter the pH. For these reasons, the Final Permit eliminates the proposed pH limit for Outfall 001. While the prior permit included a requirement that the pH shall not vary by more than 0.5 S.U from that of the intake water, the elimination of such a pH requirement from the Draft Permit is consistent with the anti-backsliding requirements of CWA § 402(o), which provides for an exception where "material and substantial alterations . . . to the permitted facility occurred . . . which justify the application of a less stringent effluent limitation." CWA § 402(o)(2)(A); 33 U.S.C. § 1342(o)(2)(A). In this case, the permitted facility no longer generates electricity and has eliminated the prior use of Outfall 001 that justified the pH limit (*i.e.*, a material and substantial alteration). This removal of the uses that previously justified the pH limit similarly justifies removal of the pH limit. At the same time, the Fact Sheet explains that the sampling point for Outfall 001 is downstream from where the flow from Outfall 001 commingles with the discharges from a number of other outfalls, including Outfalls 004, 005, 010, 011, and 014. Fact Sheet at 20. The Fact Sheet also explains that the minimum pH limitations at the stormwater outfalls (6.0 S.U.) and Outfalls 001 and 014 (6.1 S.U.) are slightly below the water quality standards for Class SA waters (6.5 S.U.), but that there is sufficient dilution of these discharges when combined with the non-contact cooling water flow from Outfall 010. Fact Sheet at 33. The Final Permit includes reporting the minimum and maximum daily pH at the Outfall 001

[12] On November 16, 2018, the permittee and entities controlled by Holtec International ("Holtec") submitted a request to the NRC to approve a transfer of the PNPS Renewed Facility Operating License and the general license for the PNPS Independent Spent Fuel Storage Installation from the permittee to Holtec. Consequently, the permittee and Holtec both submitted PSDARs to NRC, the latter to be applicable only in the event the NRC approves the license transfer request.

compliance monitoring point when discharging stormwater or from Outfalls 011 and 014 to ensure that the water quality standard is met in the discharge canal.

The comment expresses support for the oil and grease (O&G) "limits" in the Draft Permit for discharges at Outfall 001 before and after shutdown, but indicates confusion as to why the Agencies proposed O&G monitoring without numeric limits. To be clear, the Draft Permit included a reporting requirement for O&G at the sampling point for Outfall 001 but did not propose a limit. The Fact Sheet explains that the sampling point for Outfall 001 is downstream from where the flow from Outfall 001 commingles with the discharges from a number of other outfalls, including Outfalls 004, 005, 010, 011, and 014. Fact Sheet at 20. The proposed O&G monitoring at the sampling location for Outfall 001 was not based on an expectation that O&G would be present in the wastestream from Outfall 001, because the Steam Electric Effluent Limitation Guidelines do not include technology-based limits for O&G for cooling water discharges and because the Agencies had no pre-shutdown data that O&G would be present in PNPS' cooling water in particular. *See id.* at 20. Furthermore, as explained above, the post-shutdown discharge from Outfall 001 is essentially seawater; there is no significant source that the Agencies expect would introduce O&G to this wastestream between the intake and discharge. Thus, the Draft Permit did not propose numeric O&G limits for the pre- or post-shutdown discharge from Outfall 001. Rather, the Agencies established the O&G reporting requirement to provide data to enable the Agencies to assess whether there are detectable levels of O&G at a point after which the discharges from all of the other Outfalls to the discharge canal (*i.e.*, 004, 005, 010, 011, 014) have combined. *See id.* at 24, 34.

While the basis of the O&G monitoring requirement in the Draft Permit was to monitor these combined O&G levels in the discharge canal, when the circulating pump is operating, the flow from Outfall 001 (155,500 gpm) comprises about 72% of the discharge at the monitoring location.[13] In other words, the flow at the sampling location when a circulating pump is in use is dominated by the flow from Outfall 001, which will dilute the contributions of O&G from the commingled outfalls. The Draft Permit proposed water quality-based, numeric O&G limits for stormwater from Outfalls 004 and 005 and technology-based, numeric O&G limits for discharges from Outfalls 010, 011, and 014. The numeric limit for O&G at stormwater Outfalls 004 and 005 is non-detect, consistent with the water quality standards for Class SA waters. 314 CMR 4.05(4)(a)(7). *See* Fact Sheet at 32. The numeric limit for O&G at Outfalls 010, 011 and 014 is a maximum daily concentration of 20 mg/L and an average monthly concentration of 15 mg/L based on best professional judgement (BPJ) and looking to the regulation of low volume wastes under the Steam Electric ELGs as guidance. *See* Fact Sheet at 38. Each of these outfalls will be monitored prior to commingling with any other wastestream. These maximum daily concentrations will be diluted after commingling with the cooling water discharge at Outfall 010, and, when the circulating pumps are running, by the discharge from Outfall 001. At a minimum, monitoring O&G at the Outfall 001 sampling location when the circulating water pumps are operating is not expected to be representative of the levels in the combined flows because it is at

[13] This value is based on a worst-case assumption that Outfall 010 is discharging at the maximum daily flow (13,500 gpm) and that the batch discharges from both Outfalls 011 and 014 discharge 15,000 gallons at the same time, which is higher than the maximum recorded daily discharge from January 2008 through March 2016 (12,200 gallons). See Fact Sheet Attachment A.

this point when the levels are at their most dilute.[14] For this reason, the Final Permit modifies slightly the proposed monitoring requirement for O&G at Outfall 001 to specify that such monitoring may not occur when a circulating pump is in use.

According to the comment, "EPA states that there are no rare and endangered species in the vicinity of PNPS, which is false…" The comment does not provide a citation for this statement, and the Fact Sheet does not support this statement. Section 11 of the Fact Sheet describes in detail the federally threatened and endangered species in the vicinity of Pilgrim Station, including sea turtles, whales, and Atlantic sturgeon. *See* Fact Sheet at 56. Section 11.2.1 of the Fact Sheet evaluated the potential impacts of the heated thermal discharge on ESA species and critical habitat in the vicinity of PNPS. Based on its assessment of the proposed alternative effluent limits for the Draft Permit and NMFS' evaluation of the thermal plume during the ESA consultation for the 2012 relicensing of PNPS, EPA concluded that the thermal plume is not likely to adversely impact threatened and endangered species or their critical habitat in the action area. See AR-465. EPA requested concurrence from NMFS on this conclusion. The Fact Sheet (at 60-61) also specifically identifies the newly expanded critical habitat for right whales in the North Atlantic raised in the comment. Because NMFS already considered the impacts of the thermal discharge on North Atlantic Right Whale critical habitat, the subsequent expansion of the designated critical habitat in Cape Cod Bay did not affect the Services' conclusion from 2012. NMFS concurred with EPA's finding that the 2012 consultation already considered the effects to critical habitat in the action area and, because no changes proposed in the Draft Permit would change the analysis of effects previously considered, the effects analysis in the 2012 consultation remains valid. See AR-694 and AR-698. NMFS's concurrence with EPA's preliminary findings would also apply to the post-shutdown effluent limitations, as the temperature limits at Outfall 010 are substantially more stringent in the Final Permit.

3.2 Conditions and Effluent Limitations Applicable to Outfall 002 Must Be Revised (Discharge of Thermal and Non-Thermal Backwash Water to Intake Structure and Out to Cape Cod Bay)

Part 1.A: Permit effective date until shutdown

The draft permit reduces the maximum daily flow limit from 255 MGD to 28 MGD. We support this reduction, especially since it appears that Entergy never used close to the 255 MGD limit. The temperature limit is reduced from 120°F to 115°F in the draft permit. While we support a reduction, 115°F is higher than that allowed by the MA SWQS and requires a variance to be granted from these standards. Entergy should be required to meet the MA SWQS limits (maximum daily temperature limit of 85°F and a monthly average limit of 80°F). Additionally, if a variance is needed for outfall 002, we reiterate our comments in the outfall 001 section: Entergy's Demonstration Report is flawed and Entergy has not adequately shown that no significant impacts occur due to the thermal discharge. Impacts from PNPS's thermal effluent needs to be reassessed in light of global warming and more current information now being

[14] As an example, the O&G concentration in the discharge canal after combining with flows from the circulating and salt service water pumps, based on a worst-case maximum daily concentration of 20 mg/L in a batch discharge of 15,000 gallons from both Outfalls 011 and 014, would be 3 mg/L. This value is less than the minimum detection level of 5 mg/L in the specified test method.

available. Entergy should be required to conduct a comprehensive assessment of the impact of the thermal discharge before a variance is granted or the variance should be denied.

The draft permit provides that the frequency of thermal backwash operations is reduced from 2x per week to 1x per week, with the same duration (3-hour maximum) as the current permit. While most thermal backwash operations last for about 1 hour, the draft permit indicates that under certain conditions three hour durations would be necessary. The supporting information for the draft permit should specify under which specific conditions a 3-hour backwash is allowed. Furthermore, EPA reports that thermal backwashes are performed 4-5 times per year and non-thermal backwashes are performed 3-4 times per year. It is unclear why the draft permit allows backwash operations up to 1x per week (50+ per year), if roughly 10 operations per year are occurring. This should be explained, and this requirement made more stringent.

The draft permit does not adequately address the range of tides at the site. A thermal backwash discharge at low tide could have a greater impact on the benthic environment than one at high tide. Backwash operations should not only be limited in terms of length of time and frequency, but also potentially to tide cycles to avoid superheating the near shore environment. If, during decommissioning, PNPS engages in restoration of the benthic environment, this will encourage more appropriate and thoughtful management of thermal and polluted discharges.

We support the draft permit's more stringent limit for pH for outfall 002. As for TRO, again, we request that numeric limits be established and not just that the licensee "reports" TRO results.

Part 1.B: From shutdown until permit expires

We support that thermal backwash operations are prohibited post shutdown at outfall 002. Limits for 002 only apply to non-thermal backwash water after shutdown. However, if Energy can prove thermal backwashes are needed post shutdown, then limits should be quickly reinstated in the permit via a formal amendment process.

Entergy should be required to meet the MA SWQS limits (maximum daily temperature limit of 85°F and a monthly average limit of 80°F). Entergy's Demonstration Report is flawed and Entergy has not adequately shown that no significant impacts occur due to the thermal discharge.

The supporting information for the draft permit should specify under which specific conditions a 3-hour backwash is allowed. It is unclear why the draft permit allows backwash operations up to 1x per week (50+ per year), if roughly 10 operations per year are occurring. This should be explained, and this requirement made more stringent.

Response to Comment 3.2

The comment identifies issues with effluent limitations and conditions from the Draft Permit that apply prior to and following the cessation of power generation at PNPS (the "pre-shutdown" and "post-shutdown" limits, respectively). EPA has reviewed and considered comments on both the pre- and post-shutdown limits. However, as explained in the Introduction to this Responses to Comments, PNPS ceased operating on May 31, 2019. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the electric generation facility, which would have become effective prior to the shutdown date, are no longer applicable. The pre-shutdown effluent limitations and conditions have been eliminated from Final Permit. As such, EPA has not addressed the comments specific to the pre-shutdown limits which were removed from the Final Permit except where a concern or issue about the pre-shutdown limit would also be relevant to the post-shutdown limit.

The comment supports the Final Permit's prohibition of post-shutdown thermal backwashes and requests that, if thermal backwashes are needed, limits on such backwashes should be quickly reinstated in the permit via a formal amendment process. (During thermal backwashes, heated water from the condenser is directed back through the intake structure to clear debris and help prevent biofouling). As noted in the comment, the Draft Permit proposed to authorize only unheated backwashes after Entergy shut the Facility down. *See also* Fact Sheet at 25. Furthermore, the Agencies understand from a conversation with Joe Egan of Entergy on May 17, 2019, that the Facility is no longer capable of conducting a thermal backwash, because the condenser, which was the source of heat, is shut down. Therefore, only unheated backwashes are possible, and only unheated backwashes are authorized in the Final Permit. Therefore, the comments about thermal backwash discharges no longer apply. *See also* Response to Comment III.5.1.

The comment also requests that the Agencies specify the conditions under which a 3-hour backwash is allowed and explain why the permit authorizes backwashes up to once per week (50+ per year), if only roughly 10 operations per year occur. The comment requests that this requirement be made more stringent (i.e., allow less frequent unheated backwashes). PNPS uses unheated backwashes similar to heated backwashes—to clear seaweed and other materials from the intake structure to assure that flow through the structure is not impeded. The current permit limited backwashing to once per week due to concerns over potential thermal impacts from multiple, heated backwashes during any particular week. The Final Permit also limits the number of unheated backwashes to one per week. In addition, there are no temperature limits at Outfall 002 because, after shutdown, there is no source of heat (due to elimination of the condenser) and the backwash water will be at ambient temperature. EPA expects the Permittee to backwash as necessary up to once per week and for a period of up to 3 hours to assure the maintenance of uninterrupted cooling water flows through the intake screens for nuclear safety reasons.

Based on DMR flow data for Outfall 002 from 2000 through 2018, the Permittee conducted about 3-5 backwashes per year prior to shutdown. The commenter requests that EPA limit the number of backwashes that occur per year that aligns with the actual needs of the Facility. Post-shutdown, backwashes will be conducted to assure the intakes are not impeded and maintain a reliable flow of water to continuously cool the spent fuel pool. Authorizing backwashing to keep the screens are free from debris will also ensure that the Permittee maintains a through-screen velocity no greater than 0.5 fps consistent with the BTA requirements for impingement mortality. The need to backwash the screens is demand-based; in other words, when accumulation of material warrants backwashing to maintain cooling water flow. PNPS was authorized to backwash the screens up twice per week in the 1991 Permit and still only discharged from Outfall 002 about 3-5 times per year. Since the permittee will be withdrawing considerably less water now that the facility is shutdown, the frequency of backwashes is not expected to increase and will likely decrease. Moreover, post-shutdown the backwash water will be ambient temperature and will not impact the temperature of the receiving water. The comment has not provided any justification for restricting post-shutdown backwashes other than to align with the actual operations. An abnormal or infrequent event could arise that would warrant more frequent backwashing for a limited period to ensure that cooling water is not disrupted. In such a case, the risk of disrupting cooling water for the spent fuel is substantially higher than the potential impacts of more frequent, non-thermal backwashing of the intake screens. Regardless of the permit limit, PNPS is not expected to perform backwashing any more frequently than necessary to assure that the intakes are not impeded by biological growth, seaweed, or debris, which, under past operations, has been less frequent than once per week.

3.3 Conditions and Effluent Limitations Applicable to Outfalls 003 and 012 Must Be Revised (Discharge of Intake Screenwash Water To Cape Cod Bay Via the Main Fish Sluiceway)

Part 1.A: Permit effective date until shutdown & Part 1.B: From shutdown until permit expires

While flow limits are the same in the current and draft permits (4.1 MGD average monthly and 4.1 MGD daily maximum), the pH limits are more stringent, which we support. Again, we support TRO limits being added to the draft permit, but the draft permit should set actual numeric limits as opposed to Entergy being allowed to simply "report" test results.

Outfall 012 will continue after shutdown, but 003 will not. Entergy requested that the dechlorination requirement be omitted when screenwash water is discharged to outfall 012, but EPA has kept the dechlorination requirement in the draft permit to protect organisms washed from the screen. We support this decision. (Use of Beaudrey WIP technology could reduce the need for chlorination and protect species even more – see section III.B for more information.)

Response to Comment 3.3

The comment expresses support for the pH limits and dechlorination requirements at Outfall 012.[15] These limits and conditions have been included in the Final Permit. The comment also states that the TRO limit for Outfall 012 should be a numeric limit rather than a reporting requirement, but it does not explain why a numeric limit is required.

Water from the salt service water system, which is chlorinated, is used to wash the screens and directed to the sluiceway designated as Outfall 012. The Final Permit requires that salt service water used as screen wash water be dechlorinated prior to being sprayed on the traveling screens and discharged via these Outfalls. Final Permit at Part I.A.4. Moreover, the facility already employs a screenwash dechlorination system for this purpose. Fact Sheet at 26-28; AR-489 at 12. The prior permit also required dechlorination of the screen wash water, but it did not require the

[15] EPA has not responded to comments on Outfall 003, because this outfall is no longer in operation as of June 1, 2019 (when PNPS ceased electricity generating operations).

permittee to monitor and report TRO for these outfalls. Fact Sheet at 28. Thus, the Agencies do not have TRO data for these outfalls. The Agencies expect, however, that concentrations of TRO will not be detectable in the effluent as a result of the dechlorination of this water.[16] Therefore, the Agencies carried forward to the re-issued permit the dechlorination requirement from the prior permit and added a monitoring requirement to ensure compliance. The comment does not explain why a numeric limit is required. Because the Draft Permit already proposed to require dechlorination and confirmatory monitoring, and because the Agencies do not have any data to support the need for a numeric limit at this time or for use in calculating one, we have not added one to the Final Permit. The monthly reporting requirement will allow the Agencies to evaluate any potential need for a TRO limit in a future modified or re-issued permit.

EPA has addressed comments about the intake technology, including use of Beaudrey WIP technology in Response to Comment I.4.2. below. The comment above does not explain how the use of WIP screens would alter the need for chlorination. The water used for spraying the facility's existing intake screens comes from the salt service water system, which is chlorinated for other purposes. Washing of organisms and debris from the screens is accomplished not by chlorination but by the pressure of the screen wash water. As far as EPA understands, WIP screens still require occasional washing, which, in the case of PNPS, would likely use the same chlorinated source water. Thus, although the comment asserts that the use of Beaudrey WIP technology at PNPS "could reduce the need for chlorination," it is not clear that mandating WIP screens would reduce the need for chlorination, and the comment provides no basis for its conclusion.

3.4 Conditions and Effluent Limitations Applicable to Outfall 010 Must Be Revised (Discharge of Non-Contact Cooling Water From the Salt Service Water System (Low Volume Waste) to the Discharge (Canal/Cape Cod Bay))

Part 1.A: Permit effective date until shutdown

The flow rate in the draft permit is the same as current permit (19.4 MGD average monthly), however a daily maximum flow rate was added to new permit (also 19.4 MGD). This monthly average flow rate could be reduced further, especially since Energy doesn't appear to use more than about 14 MGD via outfall 010. Based on our review of DMRs from 2015-2016,[32] Entergy never used more than 14 MGD. The draft permit supporting documents indicates that, based on a review of DMRs, Entergy never reported a rate higher than 14.5 MGD. The monthly average flow rate should be reduced further to 15 MGD.

[16] PNPS uses sodium thiosulfate in its dechlorination system, which is widely used in the industry and, at the correct dosage, effectively removes total residual chlorine (TRC) to levels protective of aquatic life. For example, the standard protocol for marine acute toxicity testing in MA and NH requires effluent samples to be measured for TRC and, if detected, dechlorinated with sodium thiosulfate prior to toxicity testing. The EPA Region 1 Marine Acute Toxicity Test Procedure is available at https://www3.epa.gov/region1/npdes/permits/generic/marinewateracutetoxtest-rev.pdf.
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In contrast to the outfalls discussed so far (001, 002, 003, 012), there is an actual TRO numeric limit listed for outfall 010 (0.5 mg/L average monthly and 0.1 mg/L maximum daily). The permit's supporting documentation should clarify why it has listed a numeric limit for 010 but no other outfalls. These limits are the same as the current permit, and EPA reports that the daily maximum TRO limits have been exceeded 5 times at PNPS, but monthly averages have not. Just because one limit has not been exceeded does not excuse other violations. Violations should be taken seriously and EPA should hold Entergy accountable for any past exceedances, and be ready to impose enforcement actions for future exceedance under the new permit.

We support the addition of new limits added to the draft permit (TSS, O&G, pH) that were not in the current 1991 permit.

[32] For DMRs, this includes all 2015 months except Sept.; and Jan. and Feb. 2016.

Part 1.B: From shutdown until permit expires

We support the reduced flow rate from 19.4 MGD (both average monthly and maximum daily) before shutdown, to 7.8 MGD (average monthly) and 15.6 MGD (maximum daily) after shutdown. We also support the TSS, O&G, and pH limits remaining in the permit post shutdown.

As discussed above, TRO units are inconsistent. Before shutdown, TRO limits are reported in mg/L, but then after shutdown are reported in ug/L. Units should remain consistent or at least add a footnote with the conversion. Aside from this, we support the reduction in TRO limits (before shutdown: 0.5 mg/L or 500 ug/L (average monthly) and 1.0 mg/L or 1000 ug/L (max daily); after shutdown: 0.0075 mg/L or 7.5 ug/L (average monthly) and 0.013 mg/L or 13 ug/L (max daily)).

After shutdown, outfall 010 will be the sole continuous remaining outlet in the discharge canal for heated effluent. We agree that it is important to establish temperature limits for this outfall for that reason and support the draft permit requirement that Energy identify limits that meet the state's SWQS (80°F average monthly and 85°F maximum daily). The delta-T limit of 3°F should be changed to 1.5°F for outfall 010 in order to meet state SWQS.

Response to Comment 3.4

As explained in the Introduction to this Response to Comments, PNPS ceased operating on May 31, 2019. EPA has reviewed and considered comments on both the pre- and post-shutdown limits. However, pre-shutdown permit conditions and effluent limitations from the Draft Permit are no longer applicable and have been eliminated from the Final Permit. As such, EPA has not addressed the comments specific to the pre-shutdown limits except where a concern or issue about the pre-shutdown limit would also be relevant to the post-shutdown limit.

The salt service water (SSW) pumps provide water used to cool the spent fuel rods in the spent fuel pool until all of the fuel is removed from the pool. The comment supports the post-shutdown average monthly and maximum daily flow limits for SSW at Outfall 010 of 7.8 MGD and 15.6 MGD, respectively. These limits were based on communication with Entergy about the anticipated need for cooling water after shutdown. *See* AR-520. During the comment period, Entergy provided additional explanation about cooling water needs after ceasing electrical generation and requested higher average monthly and maximum daily flow limits. *See* Comment III.4.2. In addition, in a letter to EPA in May 2019 (AR-687), Entergy requested that the Final Permit authorize an average monthly and maximum daily flow limit of 19.4 MGD, which is equivalent to the design flow with all five SSW pumps operating. At the same time, Entergy indicated to NRC that service water use "after the plant is shut down and defueled…will be much less than during normal operation of the plant." AR-692 at 22. *See also* AR-696 at 21 ("The amount of water used by the service water system after shutdown will also be reduced."). Entergy has not adequately justified the need for maximum cooling water flow for the remainder of the period of spent fuel cooling in its comments or letter. As explained elsewhere, *see* Response to Comment III.4.2, the Agencies have included in the Final Permit a maximum daily flow limit of 19.4 MGD (five pumps operating) at Outfall 010 and an average monthly flow limit of 15.6 MGD. *See* Final Permit at Part I.A.3. In addition, the Agencies may consider modifying the permit to establish more stringent flow limits at Outfall 010 that more closely align with actual operating conditions based on the Permittee's experience during post-shutdown operations. For example, since shutting down on May 31, 2019, PNPS has reported a maximum daily flow of 6.6 MGD (in June 2019) at Outfall 010. The most recent available DMR submitted (for September 2019) reported a maximum daily flow of 3.8 MGD at Outfall 010.

The comment supports the pH, oil and grease ("O&G") and total suspended solids ("TSS") limits proposed in the Draft Permit. These limits have been retained in the Final Permit. The Final Permit has been changed to require reporting TRO concentration in mg/L at all outfalls after shutdown in response to the inconsistency identified in the comment. See Responses to Comments III.6.2.2 for a complete discussion of the Final Permit limits for TRO.

The comment also requests that EPA clarify why there is a numeric TRO limit for Outfall 010 "but no other outfalls." The Agencies explain elsewhere in this document the basis for the TRO-related requirements for the other Outfalls in the Final Permit. *See, e.g.*, Responses to Comments I.3.1, I.3.2, I.3.3, III.6.2.2. As for Outfall 010, even now that PNPS has ceased operations, the SSW system still requires continuous chlorination to control biological growth in the cooling equipment serving the spent fuel pool. As such, a numeric limit at this outfall is warranted. When PNPS was operating, Outfall 001 included condenser cooling water, which was also chlorinated. Part I.A.1 of the Draft Permit included water quality-based, pre-shutdown numeric TRO limits at Outfall 001 to ensure that chlorination of this outfall was consistent with water quality standards. Because the compliance point for Outfall 001 is downstream of where Outfall 010 discharges, the water quality-based numeric limit captured the comingled TRO discharge from both sources.

Since PNPS has ceased operations, the Permittee no longer chlorinates the wastewater at Outfall 001. The Final Permit prohibits chlorination of the intake water from either circulating water pump. At the same time, the effluent from Outfall 010 continues to be chlorinated and no longer has the benefit of dilution from combining with the discharge from Outfall 001. After considering comments on the Draft Permit, including Entergy's comments regarding the need for chlorination of the salt service water as a nuclear safety measure and to meet NRC mandates, Part I.A.3 of the Final Permit establishes less stringent TRO limits at Outfall 010 than proposed in the Draft Permit. In addition, the intermittent discharges from Outfalls 011 and 014 may contain purified city water and salt service water, both of which could contain chlorine. To ensure that water quality standards continue to be met with the post-shutdown combined discharges from Outfalls 010, 011, and 014, Part I.A.1 of the Final Permit establishes a TRO limit of 0.1 mg/L at the sampling location for Outfall 001 consistent with the current permit.

Outfalls 004, 005, 006, 007, and 013 discharge only stormwater. Stormwater is not itself a source of TRO and there are no exposures at the site that are reasonably expected to contribute TRO to stormwater. No limits are warranted for the stormwater outfalls because there is no known or expected source of chlorine. The Final Permit includes a post-shutdown reporting requirement for TRO at screenwash Outfalls 003 and 012. The Final Permit requires dechlorination of the intake screenwash prior to using it at the screens. A reporting requirement is appropriate here to ensure compliance with this permit condition. *See* Response to Comment I.3.3.

Also with respect to TRO, the commenter states that EPA should not excuse the permittee for any past or future exceedances and that "[j]ust because one limit has not been exceeded does not excuse other violations." The Fact Sheet states: "Review of DMR data reveals that daily maximum TRO, in the form of TRC, has been exceeded on five (5) occasions, with a highest recorded daily maximum TRO concentration of 2.4 mg/L. The monthly average TRO effluent limitation has not been exceeded on any occasion." Fact Sheet at 35. EPA reviewed additional DMR data reported between April 2016 and March 2019 and noted an average value of 0.56 mg/L and no additional violations of the TRO limitations at Outfall 010. Part II.A.1 of the Draft Permit states that the permittee must comply with all conditions of the permit, and that permit noncompliance is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application. *See also* 40 C.F.R. § 122.41(a)(2) ("Duty to Comply"). At the same time, EPA has discretion to enforce noncompliance with permit conditions. In the event of non-compliance, EPA exercises its enforcement discretion consistent with relevant law and guidance.

Finally, the comment supports the proposed post-shutdown temperature limits in the Draft Permit for Outfall 010 (80°F average monthly and 85°F maximum daily), but requests that the delta-T limit of 3°F should be changed to 1.5°F for Outfall 010 in order to meet surface water quality standards (SWQS). The proposed delta-T limit of 3°F and maximum daily limit of 85°F were based on the anticipated cooling needs of the spent fuel pool. As discussed elsewhere, after the Agencies issued the Draft Permit, Entergy re-evaluated the discharge from Outfall 010 and commented that it is unclear whether an 85°F maximum daily limit for service water can reasonably support the use of service water for necessary nuclear-safety functions post-shutdown, particularly given that this period will represent a greatly reduced flow dynamic compared to PNPS's historic electric-generating operations. See Comment III.5.2 and corresponding response. For the reasons discussed here and in Response to Comment III.5.2, Part I.A.3 of the Final Permit retains the average monthly temperature of 80°F but raises the maximum daily temperature limit from 85°F to 90°F and the maximum delta-T from 3°F to 10°F at Outfall 010. Even at a maximum daily flow of 19.4 MGD and delta-T of 10°F, the thermal effluent from Outfall 010 is expected to mix quickly with the receiving waters in the discharge canal and will be protective of the aquatic community of Cape Cod Bay. The heat load of the pre-shutdown thermal discharge and under the Final Permit limits can be calculated using the following equation:

$$Q_{plant} = c_p m_p \Delta T_p$$

Where:
Q_{plant} = heat load discharged from Facility
C_p = heat capacity of water = 1.0 btu/lb°F
M_p = volume of effluent (MGD)
ΔT_p = effluent rise in temperature

Under the current permit, which reflects operating conditions for generating electricity at PNPS, the total heat load to Cape Cod Bay from the circulating water pumps was about 14,336 mmBTU/day. EPA and MassDEP determined that the proposed pre-shutdown delta-T limit of 32°F, upon which the calculation is based, is protective of the balanced indigenous population. *See* Fact Sheet Attachments B and C. After shutdown and under the Draft Permit's temperature and flow limits for Outfall 010 (maximum daily flow of 15.6 MGD and delta-T of 3°F), the heat load to Cape Cod Bay was expected to decrease by 99.7% to 46.8 mmBTU/day. The Final Permit limits (maximum daily flow of 19.4 MGD and delta-T of 10°F) still result in a 98.6% decrease in the heat load to Cape Cod Bay (194 mmBTU/day). A delta T of 10°F will assure the protection and propagation of the BIP after shutdown, since the volume and overall rise in temperature have both substantially decreased, resulting in a substantial decrease in the heat load to Cape Cod Bay. The temperature monitoring at Outfall 001 will confirm the extent to which the effluent from Outfall 010 mixes as it transits the discharge canal.

3.5 Conditions and Effluent Limitations for PNPS's Stormwater Discharges (Outfalls 004, 005, 006, 007) Must Be Revised

Part 1.C: Permit effective date until permit expiration date

Under the current permit Entergy is supposed to test for O&G and TSS at 4 stormwater drain outfall locations twice per year (April and September, or "next possible opportunity") at PNPS when rainfall of >0.1" occurs after at least 3 days of dry weather, and in accordance with EPA's protocol and as required under 40 CFR 136. The draft permit supporting materials state that Entergy failed to conduct required sampling over roughly the past 10 years. Our research confirms this: After reviewing Entergy's DMRs from Jan 2009-Feb 2016, we found that sampling has only occurred 3 times since January 2009 and this only includes 3 of the 4 drains:

- June 9, 2009 Entergy sampled 3 of the 4 storm drain outfall locations (discharge points #005, #006 and #007). Discharge point #004 was omitted.
- November 4, 2010 Entergy sampled 2 of the 4 storm drain outfall locations (discharge points #005 and #006). Discharge points #004 and #007 were omitted.
- October 16, 2014 Entergy sampled 3 of the 4 storm drain outfall locations (discharge points #005, #006 and #007). Discharge point #004 omitted.

Entergy's claims that there was inadequate rainfall and therefore not enough flow are inaccurate. NOAA precipitation data from the Plymouth airport station (Jan. 2009-Apr. 2016) shows that Entergy missed 53 opportunities to test storm drains in the screening seasons they did not test (screening the months Apr.-Dec. of each year and using a conservative value of >0.5" of precipitation). Using EPA's storm event criteria of >0.1" of precipitation, Entergy missed 28 opportunities to test storm drains just in the months of Apr. and Sept. (in seasons with no testing). In other words, Entergy failed to test drains in the months of Apr. and Sept. between January 2009 and April 2016 but had 28 opportunities to do so. This constitutes a violation of the NPDES permit and EPA and MassDEP should initiate enforcement action and seek penalties.

Page 29 of the Fact Sheet states that Entergy has indicated some of its stormwater outfalls are difficult to access and its often unclear whether a particular storm event triggers the monitoring requirement. However, in every DMR where the required testing was not reported, at no time does Entergy explain this. Instead, Entergy often states in DMRs – which it certifies to be accurate – that testing was not possible due to "environmental conditions" or "insufficient water flow." If Entergy has been unclear about certain NPDES requirements or was unable to test at a specific drain, it has had more than twenty years to clarify questions, formally amend the current permit, and/or remedy the methodology. Instead, Entergy, EPA, and MassDEP have allowed a decade to pass with minimal testing. This is wholly unacceptable and we strongly believe that EPA should impose the maximum penalty for every season that testing was not done in the past 10 years.

Even more concerning is, on page 31 of the Fact Sheet, EPA states that when storm drain sampling was done more frequently (from 1998-2007) certain parameters (e.g., TSS) were exceeded on many occasions. Not only has testing not been done, but exceedances were likely regularly occurring at the outfalls and went unreported to EPA and MassDEP. Maximum penalties should be imposed.

The draft permit supporting materials also indicate a "significant storm event" was not defined under the current permit, which contributed to Entergy's failure to conduct sampling. However, from our understanding grab sampling was supposed to occur when a "sudden onset of daytime rainfall" occurred after at least 72 hours of dry weather. According to EPA storm event criteria, this precipitation must amount to greater than 0.1" and the precipitation event must be preceded by at least 72 hours of dry weather. The rainfall criteria are clearly defined; and it is the common standard for stormwater sampling. Both professional sampling companies and volunteer monitoring programs conduct this type of sampling routinely throughout the U.S. Entergy's unfounded excuse for failing to conduct the sampling, which is required by law under the permit, warrants maximum penalties.

To address Entergy's failure to conduct the sampling required by the current permit, EPA has redesigned PNPS's storm drain sampling regime. We support the increase in sampling frequency in the draft permit, particularly given Entergy's minimal sampling in the past. This sampling will also be important post shutdown. When PNPS closes in 2019 or sooner, yard drains and storm water runoff could continue or increase pollution into Cape Cod Bay. The permit should require increased sampling frequency and contain stipulated penalties for failure to sample. The draft permit allows Energy to use undefined "unsafe conditions to evade sampling requirements. While we understand the safety of employees should be a priority, Entergy's track record of using unfounded excuses to evade sampling requirements raises concerns that "unsafe conditions" will be used as an unfounded excuse in the future. The conditions that relieve Entergy of sampling requirements should be detailed, and EPA and MassDEP should monitor this with heightened scrutiny and be prepared to impose enforcement actions when testing is not done or limits are exceeded.

Outfall 013 is addressed on page 29 of the Fact Sheet and is identified as a miscellaneous stormwater outfall that was never covered under the current permit. EPA states that this discharge is now acknowledged and authorized by the draft permit, but is still not listed in the permit language and no monitoring requirements apply since it is inaccessible. Although Entergy reports that it is not often used and it is not expected to drain to Cape Cod Bay except during extreme storm events, it should be included in the final permit and effluent limits should apply. This will be particularly important after decommissioning begins (when structures are demolished and soils disturbed), as these outfalls could become channels for contaminates entering Cape Cod Bay. Furthermore, the consequences of climate change are being experienced in the Northeast, including more intense storm events, precipitation and storm surge. If outfall 013 only drains to Cape Cod Bay during extreme storm events, there is no better time than now to apply effluent limits.

Response to Comment 3.5

The commenter identifies circumstances in which it believes the Permittee violated the current permit, both by not monitoring stormwater outfalls when the permit required and by violating numeric effluent limitations including, for example, TSS. While the comment requests that the Agencies "initiate enforcement action" and impose "maximum penalties" based on these instances, the Agencies pursue such actions outside the context of a permit renewal proceeding and the comment does not explain why such an approach is inappropriate here. The Agencies acknowledged in the Fact Sheet the limited sampling of these outfalls and have included permit conditions to improve sampling frequency. *See* Fact Sheet at 29. Between 1998 and 2007, the average monthly TSS limit of 30 mg/L in the current permit was exceeded during four sampling events at Outfall 005, one event at Outfall 006, and three events at Outfall 007. The maximum daily TSS limit of 100 mg/L in the current permit was exceeded once at each of Outfalls 005 and 007. *See* Fact Sheet at 31. EPA Region 1's Environmental Compliance Assurance Division (ECAD) tracks permit violations and determines the appropriate enforcement action based on the frequency, magnitude, and severity of violations.

Between April 2016 and April 2019, the Permittee conducted stormwater sampling twice at Outfalls 005, 006, and 007 (in September 2016 and April 2018). For all April and September sampling events at Outfall 004 and the remaining 5 events at Outfalls 005, 006, and 007, the Permittee reported "F" for insufficient flow for sampling. No samples exceeded the average monthly or maximum daily limit for TSS (Table 1, below).

Table 1. Results of Total Suspended Solids (TSS) monitoring results (in mg/L) for reported stormwater outfall sampling from April 2016 through May 2019. Permittee entered value of "F" to indicate insufficient flow for sampling.

	2016		2017		2018		2019
Outfall	Apr	Sep	Apr	Sep	Apr	Sep	Apr
004	F	F	F	F	F	F	F
005	F	0.1	F	F	3.6	F	F
006	F	0.3	F	F	4.6	F	F
007	F	0.1	F	F	13.8	F	F

The 1991 Permit required monitoring of the four stormwater outfalls twice per year, during significant storm events but did not define "significant storm event" in the permit. The Permittee often explained that outfalls were inaccessible for sampling and reported the NODI codes C (No Discharge) and F (Insufficient Flow), such as above in Table 1.

Again, in the Fact Sheet, the Agencies acknowledged that limited stormwater sampling had occurred and that vague language in the 1991 permit regarding such sampling contributed to this lack of data. Consequently, in the Draft Permit, the Agencies included more specific sampling language that should yield stormwater sampling on a regular and more frequent basis. These more detailed requirements, including the language defining storm events, have been carried through to the Final Permit. The Agencies do not agree, however, that these more detailed requirements in the "draft permit allow[] En[t]ergy to use undefined 'unsafe conditions['] to evade sampling requirements." The Final Permit (like the Draft Permit) provides that, "[i]f sampling within the first hour of a storm event is not feasible, the permittee <u>shall sample</u> as soon as is practicable after the start of a storm which meets th[e storm] definition [in the permit] and provide a brief explanation on the DMR or cover letter for that month as to why <u>a first flush sample</u> was not taken." Final Permit at Part I.A.5 n.3 (emphases added); *see also id.* Part I.A.6 n.3. Furthermore, the Final Permit (like the Draft Permit) provides that, "[i]f an outfall is inaccessible or submerged, the permittee <u>shall</u> proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with its analytical results." Final Permit at Part I.A.5 n.1; *see also id.* Part I.A.6 n.1 (emphasis added).

As noted above, the Final Permit also increases the monitoring frequency for four stormwater outfalls (004, 005, 006, and 007)—from twice a year to monthly. To the extent the comment requests a further increase,[17] the Agencies note that the comment fails to specify just how much of an increase the commenter believes is necessary or to explain why the frequency proposed by the Agencies is insufficient. Requiring monitoring on a monthly basis will ensure that stormwater will be sampled in most years, because there is likely to be sufficient flow for sampling during at least some months of the year, where the current permit only required sampling during two months. Moreover, the increase in sampling frequency to monthly will ensure that representative storm water samples will be collected over a variety of storm events. Increasing the monitoring frequency, specifying storm event criteria for outfall sampling, and

[17] The comment is not clear on this point; on the one hand, the commenter states: "We support the increase in sampling frequency in the draft permit," but later states: "The permit should require increased sampling frequency."

allowing sampling from a more accessible location (e.g., the first accessible upstream manhole rather than at the outfall) will limit the conditions under which the Permittee may report "C" or "F".

The comment also states that Outfall 013 "should be included in the Final Permit and effluent limits should apply." In the Fact Sheet, the Agencies acknowledged Outfall 013 and proposed to authorize stormwater discharges from it, but proposed no effluent limits, for a number of reasons, *see* Fact Sheet at 29, none of which the comment disputes. Furthermore, the comment does not provide any other specific explanation why the Agencies must establish effluent limits or monitoring requirements for Outfall 013, except to generalize that climate change will lead to more intense storm events during which stormwater discharges from Outfall 013. While the Agencies agree that Outfall 013 should be added to the Final Permit—and have done so,[18] *see* Final Permit at part I.A.6—we still have not established any numeric effluent limits. The non-numeric, technology-based effluent limitations at Part I.C of the Final Permit are designed to minimize the discharge of pollutants in stormwater discharges associated with industrial activity at PNPS, including in the event of stormwater discharges from Outfall 013. These include best management practices (BMPs) to address exposure of stormwater to industrial activities, spill prevention, runoff management, proper materials handling, training, and specific BMPs for steam electric generating facilities. The comment raises concerns about discharges "after decommissioning begins (when structures are demolished and soils disturbed), [the stormwater] outfalls could become channels for contaminants entering Cape Cod Bay." Part I.B.3 and 4 of the Final Permit do not authorize the discharge of pollutants in stormwater associated with construction activity (such as demolition of buildings) or other discharges of pollutants associated with the dismantlement and decontamination of plant systems and structures and/or the demolition of buildings. The Permittee must seek a permit modification or alternative NPDES permit coverage for these discharges. Moreover, as the Agencies noted in the Fact Sheet (and the comment does not gainsay), the drainage area for Outfall 006 is similar to that for Outfall 013 and the required sampling for Outfall 006 is therefore expected to provide an adequate characterization of stormwater discharges from both outfalls. *See* Fact Sheet at 29.

It is not unusual for EPA to require monitoring of a limited number of outfalls as representative of stormwater and other industrial discharges. See, for example, Parts 6.1.1 and 6.2.2.2 of EPA's 2015 Multi-Sector General Permit. The Agencies may decide in a future permit proceeding to establish limits for Outfall 013 if the results from required monitoring of Outfall 006 warrant such a decision. Furthermore, the Agencies understand that Outfall 013 does not typically discharge directly to Cape Cod Bay. In short, the Agencies have not added limits or monitoring requirements for Outfall 013, because Outfall 013 drains an area that is similar in character to that drained by a monitored outfall and other permit conditions are applicable to both areas that are designed to minimize the discharge of pollutants in stormwater discharges, and because the permittee reports that Outfall 013 is inaccessible and rarely discharges directly to Cape Cod Bay.

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[18] The Fact Sheet acknowledges and discusses Outfall 013 and purports to authorize it. *See* Fact Sheet at 5, 29. Its omission from the Draft Permit, *see* Draft Permit at Part I.C.2, has been corrected in the Final Permit, so that authorization to discharge stormwater from this outfall is clear. *See* Final Permit at Part I.A.6.

3.6 Conditions and Effluent Limitations for PNPS's Discharge of Stormwater Via Electrical Vaults (Manholes) to Cape Cod Bay (Outfalls 004A 005A 005B 007A 007B) Must Be Revised

Part 1.C: Permit effective date until permit expiration date

As outlined by EPA in the draft permit supporting documentation, stormwater from 25 electrical vaults on the property is pumped to the closest stormwater outfall locations and discharged to Cape Cod Bay. These vaults are only now being considered for monitoring in the draft permit; they have gone unmonitored for years. Monitoring these vaults should have been added as a permit requirement via a formal amendment as soon as EPA and MassDEP learned of these outfalls. The draft permit supporting documentation does not specify exactly when the agencies learned of these vaults, only that it was "during the permit term." This vague language could mean that agencies knew about these discharge locations for two decades but failed to make them subject to the NPDES permit program. EPA and MassDEP should clarify when they learned of these discharges and explain why the vaults were not added to the permit until now.

The Draft Authorization indicates that EPA sent PNPS a CWA Section 308 letter on March 24, 2015 requiring water sampling from only seven of its 25 electrical vaults for a variety of pollutants.[33] While the draft permit requires a 1-time test of all 25 vaults, quarterly monitoring for only 5 vaults is considered representative of discharges from the 25 vaults.

- The draft permit lacks a basis for choosing the 5 test vaults without knowing whether (and which) pollutants are present in the other 18 vaults. All 25 vaults should be tested before representative test vaults are selected and the list of sampling parameters are finalized. At a minimum, the draft permit should provide an explanation that assures the public that all the vaults produce the same pollutants.
- A greater number of vaults should be tested regularly to ensure the tests are an appropriate representative of all 25 vaults -- testing only 5 vaults (20%) is not enough.
- All 25 vaults should be tested at least annually and frequency of testing in the representative vaults should be increased to monthly post shutdown. Testing of representative vaults should be adaptive; if annual tests show certain vaults are trending higher for pollutants, then these vaults should subsequently be tested monthly. While quarterly testing for representative vaults seems sufficient from the time the permit goes into effect until PNPS shuts down, the monitoring frequency should be increased to monthly post shutdown. As discussed previously, when decommissioning commences in 2019, yard drains and stormwater runoff could become conduits for pollution into Cape Cod Bay and it will be a critical time for monitoring these outlets. Furthermore, as sea level rises and storm severity increases, a more frequent and severe level of flooding is anticipated, which will lead to inundation and leaching of on-site contaminants to the environment. This will not be controlled without proper monitoring.

Water sampling from the 7 vaults found TSS, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, hexavalent chromium. Lead, copper, and zinc were all exceeding marine water quality criteria. EPA states that the parameters listed in the draft permit reflect those pollutants that were detected in at least 1 vault. However, not all of these pollutants are included in the draft permit. Cyanide, antimony, nickel, and hexavalent chromium appear to be omitted. EPA should test all 25 vaults, develop a complete list of parameters, then the complete list of parameters should be included in the final permit.

The presence of these pollutants in PNPS's discharge warrants further investigation for violations of the current permit, which prohibits discharge of metals. Page 3 of the current permit reads, "There shall be no discharge of treated or untreated chemicals which result from cleaning or washing of condensers or equipment wherein heavy metals may be discharged." The electrical vault sample results show that, for an unknown length of time, PNPS has been discharging heavy metals via the vaults and stormwater outfall locations to Cape Cod Bay. This is a further reason why a comprehensive study of the impacts of PNPS's discharges on marine life is needed before any further discharges are allowed. Entergy never documented that discharging these contaminants are consistent with the CWA and SWQS. In addition, the cumulative impact of these pollutants on the environment have never been studied.

Hexavalent chromium (Cr(VI)) is particularly harmful to aquatic life. One study[34] conducted research on eels, trout, and winter flounder (species present at PNPS) and found that Cr is highly toxic to fish and can cause physiologic, histologic, bio-chemical, enzymatic, and genetic problems, even upon short-term exposure. Cr(VI) induced "alterations in the morphology of gills and liver in fish in a dose and time-dependent manner." The permit should require monitoring and impose limits for hexavalent chromium to ensure this pollutant is not causing harm in Cape Cod Bay.

Cyanide was also found in one vault, at an estimated concentration of 5.3 ug/L. It is our understanding that EPA's limit for cyanide in saltwater is 1.0 ug/L based on effects to aquatic organisms. It is unclear how the 5.3 ug/L relates to EPA's saltwater limit, and why cyanide was omitted from the monitoring requirements in the draft permit. Limits for cyanide, and all other pollutants, should be assessed not only in terms of impacts to aquatic life, but also to the public. There is a popular public swimming beach located approximately 1-2 miles down current from PNPS. The recent revelation of the discharge of these harmful pollutants reflect Entergy's blatant disregard for the public health and the environment. The fact that EPA and MassDEP have allowed these discharges to occur for an unknown length of time and are only now subjecting PNPS's electrical vaults to the NPDES permit program is an egregious failure of regulatory oversight.

PNPS's current permit (page 3) states that "there shall be no discharge of polychlorinated biphenyl compounds commonly used for transformer fluid." National effluent limitation guidelines (ELGs) for Steam Electric facilities also appear to prohibit discharges of PCBs (see page 15 of the Fact Sheet: "for all discharges: no discharge of polychlorinated biphenyl compounds (PCBs)"). However, as reported by EPA in the draft permit supporting documentation, PCBs were found in 1 of the 7 electrical vaults tested on the PNPS site, which drain to the closest stormwater outfall and then to Cape Cod Bay – a violation of the current permit and ELGs. If agencies are aware that PCBs could be discharging to Cape Cod Bay, all electrical vaults should be tested immediately; and is even more reason that the number of vaults tested regularly should be increased and testing should be adaptive depending on monitoring results. Agencies need to impose enforcement actions when PCBs are found to be discharging to Cape Cod Bay.

There are only monitoring requirements included in the draft permit in order to assess the need for effluent limitations for these toxic pollutants. The fact that these pollutants were found in the vaults should be enough evidence to implement effluent limitations in the final permit. Shockingly, the draft permit only requires Entergy to monitor these pollutants; instead, the permit should immediately impose pollutant limits for these parameters. Further, if stormwater from these 25 vaults is being discharged to stormwater outfalls 004, 005, 006, and 007, then the stormwater outfalls themselves should also tested for the full list of pollutants discussed above (quarterly until shutdown, then monthly post shutdown) and pollutant limitations implemented immediately.

[33] Draft Authorization to Discharge under the National Pollution Discharge Elimination System (Fact Sheet at 30).
[34] Velma V, Vutukuru SS, and PB Tchounwou. 2009. Ecotoxicology of hexavalent chromium in freshwater fish: a critical review. Reviews on Environmental Health. 24(2): 129-145.

Response to Comment 3.6

The comment states that monitoring of the electrical vaults "should have been added as a permit requirement via a formal amendment as soon as EPA and MassDEP learned of these outfalls" and requests that the Agencies "clarify when they learned of the [electrical vault] discharges and explain why the vaults were not added to the permit until now." In its October 2014 DMR (dated November 21, 2014), Entergy noted that water that had accumulated in several electrical vaults on the property was being pumped out and directed to the storm drain system, eventually discharging to one or more NPDES permitted outfalls. *See* AR-730. In a follow-up phone conversation with George Papadopoulos on 12/5/14, as noted in AR-501, Entergy requested the authorization to discharge water that periodically collects in the electrical vaults through existing, permitted stormwater outfalls. The 1991 Permit had expired and was administratively continued (*i.e.*, remained in effect) at the time Entergy's request was made. Since an expired permit cannot be modified, any permit limits or conditions for this water from the electrical vaults could only be established in the reissued permit (*i.e.*, this permit proceeding, which was already underway at the time). In the December 5, 2014, call noted above and referenced in AR-501, Entergy confirmed that water from the vaults was being temporarily collected in above-ground storage containers or allowed to infiltrate on the property grounds and was not being directed to stormwater outfalls. As noted in the comment, in March 2015, EPA sent the Permittee an information request letter (AR-501) pursuant to CWA § 308 requiring certain sampling to characterize the water in the vaults. In a June 9, 2015, letter (AR-506), following a subsequent meeting between EPA and Entergy, EPA refined the list of parameters for analysis and clarified that, since the 1991 Permit authorizes discharge of only stormwater from outfall serial numbers 004, 005, 006, and 007, to the extent that the water in the vaults consists only of stormwater, the 1991 Permit authorizes these discharges, provided that the effluent limits and other conditions in the permit were adhered to. On June 30, 2015, Entergy provided a written response (AR-507), including the results of sampling from seven vaults. AR-507.

As stated in the Fact Sheet, the Agencies determined that additional information beyond the 2015 sampling results was necessary to assess the need for effluent limits—specifically, a one-time sampling of the remaining vaults and regular sampling of a subset of all the vaults from different portions of the site. The Draft Permit proposed conditions related to the discharge from electrical vaults to Cape Cod Bay via internal outfalls connected to Outfalls 004, 005, and 007, including sampling requirements, based on the 2015 sampling. Final Permit at Part I.A.6; Fact Sheet at 30-31. The comment raises concerns about the number of vaults that are required to be routinely monitored in the Draft Permit, the frequency of monitoring, the parameters included in the routine monitoring requirements, and the impacts of the discharges on aquatic life and public health. The comment requests that the Draft Permit establish limits for some parameters rather than just monitoring requirements. The Agencies address each of the concerns below.

The comment states that the Draft Permit lacks a basis for choosing the 5 test vaults without additional data from testing the other vaults. Like the Draft Permit, the Final Permit requires that, within 180 days of the permit's effective date, the Permittee collect a sample from each of the vaults that was not tested in 2015 and analyze it for the complete list of pollutant parameters that was required in 2015, as shown in Attachment C of the Final Permit. The Final Permit also establishes quarterly monitoring requirements at five vaults. Both of these monitoring requirements (*i.e.*, the one-time sampling of all remaining vaults and the routine sampling of five vaults) are intended to work together to provide the Agencies with data on potential pollutants pumped from these vaults to the stormwater outfalls and to inform future permitting decisions. In establishing these vault-related requirements, the Agencies balanced the need for additional data against the generally low concentrations for many, though not all, of the parameters detected in the initial sampling event and the availability of dilution in the discharge canal and intake embayment. Thus, the Permittee will be required to provide sampling data for all of the vaults. Depending on results from this new monitoring regime, the Agencies may request/require additional monitoring data from the Permittee, modify Part I.A.7 of the Final Permit to revise monitoring requirements for certain vaults, or both. *See* 40 C.F.R. § 122.62. The results of any additional or revised monitoring would also inform future NPDES permitting at the site.

The comment states that all 25 vaults should be tested before representative test vaults are selected and indicates that regularly testing only 5 vaults (20%) is insufficient. The Agencies selected the five vaults for quarterly sampling based on a map Entergy provided of electrical vault locations, *see* AR-507, choosing vaults to represent different portions of the property. Thus, the five particular vaults were chosen to be representative of the various locations of vaults as they are spread across the property, not based on the results of monitoring performed, since only a relatively small portion of the 25 vaults had been sampled. As explained above, depending on results from the regular and one-time monitoring requirements, the Agencies may request/require additional monitoring data from the Permittee, modify Part I.A.7 of the Final Permit to revise monitoring requirements for certain vaults, or both.

The commenter also requests that the monitoring frequency be increased to monthly post shutdown. The commenter speculates that when decommissioning commences in 2019, yard drains and stormwater runoff could become conduits for pollution into Cape Cod Bay and it will be a critical time for monitoring these outlets. The commenter has not provided specific evidence to support the substantial increase at this time in monitoring frequency during post-shutdown conditions from quarterly to monthly. Entergy has communicated to EPA that, as part of the decommissioning process, all of the electrical conduits and transmission equipment will be dismantled by 2024. See AR-690, AR-696. As stormwater exposures change and flows are redirected, the Permittee must continue to implement measures that will reduce or prevent the presence of pollutants in stormwater discharges authorized by Part I.A.7 of the Final Permit. At this time, the Agencies expect that, until the electrical vaults are dismantled, the quarterly monitoring requirements in the Final Permit will provide data sufficient to characterize these discharges, although the Agencies have not ruled out the possibility of requesting/requiring more frequent sampling in the future, if warranted.

The comment states that EPA should test all 25 vaults, develop a complete list of parameters, and then include the complete list of parameters in the Final Permit. The list of parameters in the Draft Permit was determined by EPA to be representative of pollutants that may be associated with the discharges from the vaults based on discussions with Entergy about the function and operation of the vaults. See AR-501, AR-506. Monitoring of seven electrical vaults in 2015 indicated detectable levels of total suspended solids (TSS), cyanide (once), phenols, phthalates, PCBs (once), antimony, iron, copper, zinc, lead, nickel, cadmium, and hexavalent chromium (once). As the comment correctly points out, the Fact Sheet explains that the parameters listed in the Draft Permit were intended to reflect those pollutants that were detected in at least 1 vault, however, not all of these parameters were included in the Draft Permit. Cyanide,[19] antimony, nickel, and hexavalent chromium were also detected in at least one vault and were not included in the Draft Permit. For the ongoing quarterly monitoring that is required for five (5) specific vaults in the Final Permit in Part I.A.7, the Agencies have added all parameters that were detected in the initial CWA § 308 response at least once. This includes parameters that were detected between the method detection limit (MDL) and the laboratory reporting limit (RL). See detailed discussion of test methods in the response to comment III.10.2. As noted in that response, observations of pollutants above the MDL [even when below the minimum level of detection (ML)] indicate with 99% accuracy that the true concentration of the constituent in the effluent is greater than zero. The Final Permit includes monitoring for cyanide, antimony, nickel, and hexavalent chromium in addition to the other parameters that were included in the Draft Permit.

The comments states that sampling data indicate that PNPS has been discharging heavy metals via the electrical vaults and stormwater outfall locations to Cape Cod Bay for an unknown length of time and that these results provide "further reason why a comprehensive study of the impacts of PNPS's discharges on marine life is needed before any further discharges are allowed." Although some parameters in the samples from the vaults were detected above their respective water quality criteria, these discharges are subject to dilution in the discharge canal when combined with stormwater at Outfalls 004 and 005 and/or effluent from Outfalls 010 and 011. For example, copper was detected in all 7 samples at estimated values between 4.1 and 28.6 µg/l.

[19] The comment suggests that limits for cyanide (and all other pollutants) should be assessed not only in terms of impacts to aquatic life, but also to the public. In most cases, the Agencies use the aquatic life criteria to assess the impacts of the discharge. Aquatic life criteria are typically more stringent than human health criteria for a given parameter. For example, the aquatic life criterion for cyanide is 1 µg/L and the human health criteria (for the consumption of water and organism) is 4 µg/L. Where human health criteria are appropriate, or are more stringent than the aquatic life criteria, the Agencies evaluate the human health criteria to ensure public safety. Finally, EPA notes that the WQS for cyanide is expressed in terms of "free cyanide" and Entergy sampled and reported 5.3 µg/L of total cyanide, of which free cyanide is one component.

In Massachusetts, the current chronic and acute saltwater criteria for copper in Cape Cod Bay, which are consistent with the nationally recommended aquatic life water quality criteria (expressed in terms of dissolved metal), are 3.1 and 4.8 µg/l, respectively. At the maximum observed concentration, the effluent from Vault MH-4 (28.6 µg/l) would require dilution of about 1:6 to meet the acute water quality standard and about 1:10 to meet the chronic water quality standard. Available data indicate that the depth of water in the vaults at the time of sampling was relatively small (in the range of 0.25 feet to 3.35 feet), which suggests that the vaults contained low volumes of water. *See* AR-507 Table 1. It is reasonable to expect that a relatively small discharge from such a vault would be substantially diluted when combined with seawater or other discharges. For example, a single salt service water pump operating continuously discharges 2,700 gallons per minute through Outfall 010, and the permit limit is significantly higher (a maximum daily flow of 13,500 gpm). Based on the relatively high available dilution and limited data from existing sampling, the Agencies conclude that it is more reasonable at this time to require continued monitoring of discharges from the vaults for metals (including copper, cadmium, lead, zinc, iron, and nickel) to better characterize the discharges, rather than to immediately prohibit further discharge until the Permittee conducts a "comprehensive study of the impacts" to marine life. *See* Final Permit Part I.A.7.

The comment requests that the Final Permit impose limits for hexavalent chromium (Cr(VI)) to ensure this pollutant is not causing harm in Cape Cod Bay, presumably because Cr(VI) is "particularly harmful to aquatic life."[20] Hexavalent chromium was detected in 1 of the 7 samples at the estimated level of 8.6 µg/l, which was between the RL and MDL. The chronic and acute saltwater criteria for hexavalent chromium are 50 and 1,100 µg/l, respectively. The maximum contaminant level goal for total chromium (i.e., the level of a contaminant in drinking water below which there is no known or expected risk to health) is 100 µg/l. Therefore, the discharge of stormwater from the vault at the detected level would not be expected to violate criteria, even before taking dilution into account. The Agencies conclude that it is reasonable to require continued monitoring of hexavalent chromium discharges from the vaults, including routine quarterly monitoring of MH-2 in which chromium was initially detected, *see* Final Permit Part I.A.7, but that limits are not warranted at this time.

The commenter asserts that the detection of an isomer of PCB in one of the seven 2015 vault samples (MH-2) is "a violation of the current permit and [Steam Electric] ELGs." The comment further asserts that this detection warrants immediate monitoring of all of the vaults, an increase in the number of regularly monitored vaults, and adaptive testing based on the monitoring results. As noted earlier, *see* Response to Comment I.3.5, the Agencies pursue enforcement actions outside the context of a permit renewal proceeding. EPA Region 1's Environmental Compliance Assurance Division (ECAD) tracks permit violations and determines the appropriate action based on the frequency, magnitude, and severity of violations. In the event of non-

[20] The commenter references a study that "found that Cr is highly toxic to fish and can cause physiologic, histologic, bio-chemical, enzymatic, and genetic problems, even upon short-term exposure." While hexavalent chromium is a toxic pollutant and is listed as one of 126 priority pollutants under 40 C.F.R. Part 423 Appendix A, EPA notes that generally the exposure durations and concentrations observed in the studies reviewed by Velma et al. 2009 (AR-731 cited as footnote 34 in the comment) were substantially higher than the concentration reported in the sample from MH-2. For example, in the study cited in the comment (Roberts and Oris, 2004), rainbow trout exposed to 10 mg/L Cr over 28 days exhibited alterations in the morphology of gills and liver. The exposure concentration in the study was more than 1,000 times the observed concentration in MH-2 (8.6 µg/l).

compliance, EPA exercises its enforcement discretion consistent with relevant law and guidance. In addition, the permit already includes a condition that requires PCB testing (within the first 180 days of the permit term) of all 18 vaults that were not previously sampled, based in part on the detection of PCBs in one vault during the 2015 sampling event. *See* Fact Sheet at 30; Final Permit at Part I.F. The Final Permit retains the prohibition against the discharge of PCBs and requires quarterly monitoring for PCBs in the discharges from the electrical vaults. See Final Permit at Parts I.A.7 and I.A.18. In consideration of this comment, the Agencies have revised the Final Permit to require the quarterly sampling of the one vault in which PCBs were detected during the 2015 sampling event, designated MH-2, to be sampled quarterly. This replaces the vault designated MH-2A that was proposed for quarterly sampling in the Draft Permit.

The comments states that "the fact that these pollutants were found in the vaults should be enough evidence to implement effluent limitations" in the Final Permit. Part I.A.7 of the Final Permit includes ongoing monitoring for parameters detected during the initial round of vault sampling in 2015, but the Agencies do not agree that effluent limits are necessary at this time, for a number of reasons. As noted earlier, discharges from the electrical vaults are relatively small volumes that generally would be subject to considerable dilution once combined with the other flows being discharged to Cape Cod Bay or the intake embayment through Outfalls 004, 005, 006, and 007. The receiving water in the intake bay (for vaults discharging via Outfalls 006 and 007) and the cooling water discharge from Outfall 010 (for vaults discharging to the discharge canal) provide additional dilution for the vault discharges. The one-time sampling of all remaining vaults and the routine sampling of five vaults are intended to work together to provide the Agencies with data on potential pollutants pumped from these vaults to the stormwater outfalls and to inform future permitting decisions. In establishing these vault-related requirements, the Agencies balanced the need for additional data against the generally low concentrations for many, though not all, of the parameters detected in the initial sampling event and the availability of dilution in the discharge canal and intake embayment. Depending on results from this new monitoring regime, the Agencies may request/require additional monitoring data from the Permittee, modify Part I.A.7 of the Final Permit to revise monitoring requirements for certain vaults, or both. *See* 40 C.F.R. § 122.62. The permit could also be revised to include effluent limitations in the future, if appropriate. The results of any additional or revised monitoring would also inform future permit re-issuance proceedings.

Finally, the commenter requests that stormwater outfalls 004, 005, 006, and 007 also be tested for the full list of pollutants discussed above (quarterly until shutdown, then monthly post shutdown) since all discharges from the electrical vaults are discharged to one of these particular outfalls. EPA expressed concern in its March 2015 monitoring request that the stormwater that collects in the electrical vaults has come into contact with electrical wires and associated equipment and may contain pollutants that may not be representative of stormwater discharges from the site. AR-501 at 2. EPA also theorized that some of these vaults may be deep enough so as to possibly contain some groundwater through infiltration of the vaults themselves. *Id*. Therefore, EPA requested monitoring for a broader range of pollutants. *See* AR-506. Although the Permittee discharges the water in the vaults via its stormwater outfalls, the parameters at issue, which, as explained, may not be representative of other stormwater discharges from the site, are best sampled from the vaults themselves prior to any dilution provided by mixing with additional stormwater. For these reasons, the Final Permit does not include additional parameters associated with the vaults at the stormwater outfalls. As explained in Response to Comment I.3.5, discharges from the stormwater outfalls 004 through 007 are subject to limits for TSS, oil & grease, and pH, which are pollutants commonly found in stormwater associated with industrial activity. Together with the non-numeric, technology-based requirements in Part I.D of the Final Permit, the proposed limits are believed to be appropriate to control the discharge of pollutants in stormwater from these outfalls.

3.7 Conditions and Effluent Limitations for PNPS's Internal Outfall: Demineralizer Reject Water, Station Heating, and Service Water Systems (Outfall 011) and Various Process Water/Wastewater from Waste Neutralization Sump (Outfall 014) to Cape Cod Bay Must Be Revised

Part 1.C: Permit effective date until permit expiration date

While some of the criteria in the draft permit are the same as the current permit (e.g., flow rate, TSS, sodium nitrite), tolyltriazole has been added. PNPS has been discharging tolyltriazole for years but it was not formally permitted until now. Entergy's discharge of tolyltriazole was "approved" in a letter from the EPA in 1995, after PNPS's permit was finalized and outside of the normal permit modification process. Beginning in February 2014, a leak was discovered that discharged trace amounts of sodium nitrite and tolyltriazole into Cape Cod Bay from PNPS's outfall #001. Even if the discharges were lawfully within the NPDES permit, the discharges are allowed only through outfall #011, not outfall #001, where the leak occurred. EPA should hold Entergy accountable and impose the maximum penalty for these unlawful past discharges of tolyltriazole.

EPA should not allow any further releases of tolyltriazole into Cape Cod Bay – it should be filtered and/or treated, as opposed to diluted, before discharge to Cape Cod Bay. EPA should require extraction of all of the most environmentally harmful pollutants, including tolyltriazole, from water before discharge to Cape Cod Bay. If EPA does move forward with formally permitting tolyltriazole without filtering/treatment, then it should monitor the discharge of tolyltriazole with more scrutiny to ensure limits are met, should ensure tolyltriazole is only discharged via the approved outfall, and should be prepared to impose enforcement actions when violations occur.

EPA merely asks Entergy to calculate the concentrations of sodium nitrite and tolyltriazole in the discharge canal by using a dilution factor. The idea that "dilution is a solution" is a flawed, unacceptable way to permit discharges of pollutants to Cape Cod Bay and undermines the fundamental "no-pollution" goal of the CWA.

While we know that many pollutants (including industrial chemicals) can be harmful to people and wildlife even in small amounts, the full effects of most manufactured chemicals are still unknown due to the sheer number of contaminants, the lack of information on biological effects of complex mixtures, and the fact that chemical effects are often species-specific. Dilution cannot render most pollutants harmless. These, and other, industrial chemicals have been discharged into Cape Cod Bay for more than 40 years since PNPS began operating. The draft permit should require all pollution to be treated and removed before being dumped into Cape Cod Bay.

According to the draft permit, Entergy will need to carry out WET tests in Apr. and Oct. every other year (years 1, 3, and 5), or if no discharge occurs in these months, as soon as a discharge from these outfalls does occur. If this new permit is "administratively extended" as the current permit has been for two decades, EPA should be clear that testing would not end at year 5 and would continue despite an expired permit if needed, especially since decommissioning will be a critical time for the environment.

Response to Comment 3.7

The commenter states that the permit should not "allow any further releases of tolyltriazole" without filtering or treatment and requests that, at a minimum, EPA "should monitor the discharge of tolyltriazole with more scrutiny to ensure limits are met, should ensure tolyltriazole is only discharged via the approved outfall, and should be prepared to impose enforcement actions when violations occur." The Draft Permit proposed maximum daily limits for tolyltriazole and sodium nitrite with a monthly monitoring frequency.

Tolyltriazole is a common corrosion inhibitor for copper and copper alloy heat exchanger components in power plant cooling water systems. At PNPS, and at the recommendation of the Institute of Nuclear Power Operations, tolyltriazole is used in the reactor building and turbine building cooling water systems, station heating, and the emergency diesel generator cooling water system. *See* AR-164, AR-379. Although the use of tolytriazole associated with the turbine and reactor buildings has decreased now that the facility no longer generates electricity, it continues to be used in the remaining discharges authorized in the Final Permit for Outfalls 011 and 014. *See* AR-164. EPA authorized the use of tolyltriazole subject to the conditions and concentrations as stated in the letter from Boston Edison. *See* AR-379.

The proposed maximum daily tolyltriazole limit of 1.48 mg/L in the Draft Permit limit is based on a worst-case concentration of 20 mg/L, a maximum flow of 200 gpm from Outfall 011, and assuming initial dilution from one salt service water (SSW) pump (2,700 gpm). *See* Fact Sheet at 40-41. According to the Permittee, a tolyltriazole concentration of 2 mg/L is expected after the initial conditioning of the systems (which occurred in 1995), which would reduce the concentration after combining with just a single SSW pump running to 0.148 mg/L. *Id.* Acute toxicity (LC50) for rainbow trout is 23.7 mg/L and chronic toxicity to daphnia is 5.8 mg/L. *Id.* at 41. The concentration of tolyltriazole in the discharge canal with just one SSW pump running is well below the acute and chronic toxicity values. The Final Permit establishes a maximum daily tolyltriazole limit of 1.48 mg/L, which ensures that concentrations in the discharge canal will be below known toxicity values.

The commenter suggests that calculating the concentrations of sodium nitrite and tolyltriazole in the discharge canal using a dilution factor is inappropriate. The maximum daily limit is water quality-based. Under federal regulations, water quality-based limitations are to account for dilution of the effluent in the receiving water. 40 C.F.R. § 122.44(d)(1)(ii). Therefore, the Final Permit appropriately establishes a water quality-based limit considering minimal dilution once combined with the flow from a single SSW pump in the discharge canal. As the commenter points out, the Draft Permit proposed that the limit would apply at Outfalls 011 (and 014) but would be reported as a calculated value based on the observed concentration divided by the available dilution at the time of discharge. The same condition applies to the proposed maximum daily limit for sodium nitrite. *See* Draft Permit Part I.C.4 and I.C.5 (footnote 5). In response to this comment, the Agencies have reconsidered how to ensure compliance with these limits. Because the limits account for dilution in the discharge canal, we have moved the compliance point to the discharge canal rather than require calculating values using a dilution factor, since the former will provide a more accurate measure of the dilution available during a discharge containing tolyltriazole and/or sodium nitrite. Therefore, the Draft Permit's proposed effluent limitations for tolyltriazole and sodium nitrite have been moved from Outfalls 011 and 014 to a compliance point at the monitoring location for Outfall 001. The Final Permit at Part I.A.1 establishes a maximum daily tolyltriazole limit of 1.48 mg/L and maximum daily limit of 2.0 mg/L for sodium nitrite, which must be monitored and reported at the compliance point for Outfall 001 in the discharge canal. Monitoring for these parameters must be conducted when PNPS is discharging from Outfall 011 and/or Outfall 014. If PNPS plans to discharge from Outfalls 011 and 014 at the same time, monitoring at the compliance point must be representative of the combined discharge.

Although the comment requests that the Final Permit prohibit any further releases of tolyltriazole into Cape Cod Bay, it provides no specific justification for such a prohibition, instead merely articulating without citation or support only general assertions about the harmful effects of "many" pollutants and that dilution cannot render "most" pollutants harmless. The commenter states that effluent containing tolyltriazole should, therefore, be filtered and/or treated, as opposed to diluted, before discharge to Cape Cod Bay, but similarly points to no technological solution for removing tolyltriazole from the effluent. The Agencies are aware of no technology that can completely remove tolyltriazole, and, as explained above, the effluent limitation in the Final Permit will ensure the concentration in the discharge canal is well below that known to result in toxic effects on aquatic organisms. The Final Permit requires whole effluent toxicity (WET) testing for Outfall 011 to be sampled from the compliance point at the Outfall 001 monitoring location. *See* Response to Comment III.10.3. This discharge is likely to be variable in quality and could potentially contain metals and other pollutants that individually or cumulatively could be toxic to aquatic life. WET testing is conducted to assess whether an effluent contains a combination of pollutants which produces toxic effects and is used in conjunction with pollutant specific effluent limits to control the discharge of toxic pollutants.

Finally, the commenter requests that testing required under the Final Permit not end at year 5 but continue during the period for which the permit is administratively continued, if needed. As was the case with the 1991 Permit, if a Permittee submits a timely application for reissuance and a new permit is not issued immediately after a permit expires, an expired permit is administratively continued until a new permit is issued. A Permittee must continue to comply with all conditions, limitations, and requirements of an administratively continued permit until a new permit is issued. In other words, the Final Permit already requires the Permittee to continue testing beyond the permit expiration date, if it is administratively continued.

4.0 Additional Permit Provisions

4.1 Part I.D Provisions

Section 5.d. states that toxic components of PNPS's effluent shall not result in any demonstrable harm to aquatic life, and section 10 states that the thermal plume shall not block, severely restrict, interfere with spawning, or change the balanced indigenous population of the receiving waters. However, PNPS's operations have already impacted marine life and will continue to do so. Page 45 of the Fact Sheet discusses 2 events of gas bubble disease (e.g., in 1973 an estimated 43,000 menhaden died from gas bubble disease) and occurrences when dissolved nitrogen exceeded 115% (2005 and 2009). Entergy's thermal effluent has also interrupted the fall migration of those species that are attracted to the thermal plume (e.g., striped bass).[35] In a 2000 letter to EPA,[36] the Massachusetts Office of Coastal Zone Management addressed Entergy's Demonstration Report by stating that the report "does not provide adequate evidence to determining how a temperature increase of just a few degrees may affect the development and survivorship of eggs and larvae or how a temperature increase may affect the future fecundity of adults exposed to the discharge plume in Cape Cod Bay." We reiterate this point – Entergy has not sufficiently shown that it's thermal effluent has no effect on marine species and communities, nor that there is no increase in toxicity of other chemicals present. Entergy should be required to fund an independent comprehensive study of the impacts of the CWIS and discharges before the permit can be renewed. In the meantime, discharges and use of the CWIS should cease. The thermal discharge variance in the draft permit cannot be supported on the basis of the outdated Demonstration Report.

Section 8 states that Entergy must notify EPA/DEP as soon as possible if activity occurs that will result in a toxic pollutant discharged that is not limited in the permit and that will exceed the highest of the notification levels. It seems that any unpermitted pollutant should be reported if it will exceed the lowest of the notification levels.

Section 12 requires that Energy continue to report "unusual impingement events," as defined in the permit provisions. We support this requirement. EPA only states that Energy should report these usual events to EPA and MassDEP by phone, but it should be clear that these events should also be reported in DMRs, and in fact be made more publicly available (immediately upon reporting to EPA and MassDEP) via a designated online reporting page. Part 12.c. requests that Entergy provide its opinion of why an unusual event occurs. In most past DMRs, Entergy only reports "natural causes," which is at best a disingenuous explanation. EPA should require Entergy to address migration and spawning seasons of the effected species and the status of the thermal effluent right before and during an event. Weather, tide and sea conditions should also be included in the report. If the Pilgrim Administrative-Technical Committee is reestablished (see below), then it should address this.

The draft permit fails to acknowledge that the 1991 permit that is still in place has a requirement for the Pilgrim Administrative-Technical Committee (PATC; sometimes also referred to as the Pilgrim Technical Advisory Committee). This science-oriented PATC is a cornerstone of PNPS's current NPDES permit, and supervised marine impacts and recommend technology improvements or mitigation efforts as needed from 1991-2001. The PATC was disbanded in 2001, shortly after Entergy bought PNPS. This is in violation of PNPS's current permit, which requires Entergy to "carry out the monitoring program under the guidance of the Pilgrim Technical Advisory Committee."

The new permit should require the PATC – or a similar advisory committee or third-party consultant – to provide independent, transparent oversight of Entergy's compliance with the permit. It should also provide guidance for practical adjustments during the remainder of operating years as well as during decommissioning. A monitoring program is only as valuable as the periodic evaluations that assess the program and the data generated.

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[35] Letter to Boston Edison from MassDEP (PATC), Oct. 15, 1998, regarding a number of recent recommendations of the A-T Committee regarding monitoring, plant impacts and fisheries habitat restoration.
[36] Letter to EPA from MassCZM, Jun. 27, 2000. Re: MCZM review of the Entergy-Pilgrim Station §316 Demonstration Report.

Response to Comment 4.1

The comment identifies several issues related to the provisions of Part I.D, specifically the requirement at Part I.D.10 that the thermal plume resulting from discharges at PNPS not block or severely restrict fish passage, nor interfere with spawning of indigenous populations of fish, nor change the balanced indigenous population of the receiving water. According to the comment, Entergy has not sufficiently shown that its thermal effluent has no effect on marine species and communities, nor that there is no increase in toxicity of other chemicals present. EPA notes that Part I.D requires that the thermal plume not interfere with migration, spawning, or change the balanced, indigenous population. There is no requirement to demonstrate that the thermal plume has *no* effect on marine species; rather, the effect of the plume on aquatic organisms must not rise to a level that the protection and propagation of a balanced, indigenous population is not assured. Attachments B and C of the Fact Sheet present MassDEP's and EPA's assessment of the potential impacts of the thermal plume and the determination that the Draft Permit temperature limits, which were based on a variance under § 316(a) of the CWA, would assure the protection and propagation of the balanced, indigenous population consistent with Part I.D.10.

Having said that, PNPS ceased operating as of June 1, 2019. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the electric generation facility, which would have been effective prior to the shutdown date, are no longer applicable. The pre-shutdown effluent limitations and conditions have, therefore, been eliminated from the Final Permit. The post-shutdown limits, which are included in the Final Permit, represent more than a 98% reduction in heat load to Cape Cod Bay. *See* Response to Comment I.3.4. These thermal limits regulating the remaining heated effluent from the spent fuel pool will continue to ensure the protection and propagation of the balanced, indigenous population, including not interfering with passage or spawning. The post-shutdown thermal effluent contributes about 98% less heat to Cape Cod Bay than the thermal effluent when PNPS was generating electricity, which the Agencies had found would not result in appreciable harm at the pre-shutdown temperature limits in the Draft Permit. The Final Permit includes temperature limits consistent with post-shutdown operations at Outfalls 001 and 010 and includes the provisions in Part I.D of the Draft, now numbered Part I.A.19, associated with maintaining passage and spawning for aquatic organisms.

The comment also questions why the requirement under Part I.D.8 of the Draft Permit requires notification when activity would result in an exceedance of the highest of the notification levels, and requests that notification be required when an activity would result in exceedance of the lowest of the notification levels. This permit requirement is consistent with the regulation at 40 C.F.R. § 122.42(a). The Final Permit is likewise consistent with 40 C.F.R. § 122.42(a) and has not been changed.

The comment supports Part I.D.12 of the Draft Permit, which requires reporting "unusual impingement events," defined as more than 20 fish per hour. According to the comment, the Final Permit should require that unusual impingement events be reported in DMRs. EPA agrees that reporting unusual impingement events that occur within the month should be reported electronically in the monthly DMRs. The Final Permit at I.A.20 requires the Permittee to report the occurrence of an unusual impingement event in the DMR for the monitoring period. The trigger for reporting an unusual impingement event has been changed slightly from 20 fish per hour to 250 fish in a single 12-hour period (an average of about 21 fish per hour) or more than 1,000 fish in a single impingement event to better match the actual operation of the screens. In addition, the Final Permit requires that the traveling screens be continuously rotated (in the event that they are not already required to because the circulating pumps are operating) until the impingement rate drops below 5 fish per hour. The Permittee must submit an attachment to the DMR for that month that includes additional information about the total number of individuals entrained, the length of the event, the intake volume at the time of the event, and the weather and tidal conditions at the time of the event.

The commenter also requests that the Final Permit require the Permittee report its opinion of why an unusual event occurs, address migration and spawning seasons of the affected species, and provide the status of the thermal effluent before and during an event. The comment offers no suggestions for how the Permittee is to know the cause of the event and points out that in the past it has typically reported "natural causes." In comment III.8.3, the Permittee asserts that large impingement events, which typically involve clupeid fish, are likely caused by cold shock or secondary consequences of predation, rather than by the operation of the CWIS. This is not to say that only cold shock or predation could cause large impingement events, but to highlight that determining the cause of unusual impingement events is extremely challenging. The Final Permit requires that the actual through-screen velocity at the CWIS be no greater than 0.5 fps as the BTA for impingement, with the exception of up to 48 hours per month when one of the circulating pumps is operating and during which time the traveling screens must be continuously rotated. EPA has determined that this technology is the BTA to minimize impingement mortality, including during any unusual impingement events.

The 1991 Permit, at Part I.A.8.b. requires that the Permittee "conduct such studies and monitoring as are determined by the EPA and the State to be necessary to evaluate the effect of the operation of the Pilgrim Station, on the balanced, indigenous community of shellfish, fish, and wildlife in and on Cape Cod Bay." The creation of the Technical Advisory Committee does not appear as a requirement in either the 1991 Permit or the 1994 Modified Permit. The current permit does require biological monitoring and, until 2000, the monitoring plans were reviewed by an advisory committee. Since 2000, Entergy has continued to submit the following year's monitoring plan to EPA and MassDEP for approval and revisions. The Agencies have continued to consult with appropriate State Agencies where appropriate, consistent with Part I.A.8.d of the 1991 Permit. The biological monitoring required by the current permit, including the recommendations of the advisory committee, was intended to evaluate the effect of operation of PNPS on the balanced, indigenous community. PNPS is no longer operating as of May 31, 2019, and the Final Permit, which reflects the substantially altered post-shutdown operations, includes limitations and conditions that will result in a 98% reduction in the heat load to Cape Cod Bay and a 92% reduction in water withdrawals from Cape Cod Bay. These requirements are consistent with the best performing technologies to minimize the impacts from heat and cooling water intake structures in the industry. As such, the Final Permit requires monitoring to ensure compliance with the temperature, intake, and flow limitations but does not require continued biological compliance monitoring. *See* Response to Comment III.8.

4.2 Part I.F: The Draft Permit Does Not Comply with the CWA § 316(b) Because It Fails to Ensure that PNPS's CWIS Uses the BTA for Minimizing Adverse Environmental Impact

Under § 316(b) of the Clean Water Act, "any standard established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available [BTA] for minimizing adverse environmental impact." 33 U.S.C.A. § 1326(b). PNPS's once-through cooling system is undeniably not BTA – even before operations began, in the 1970s, the Commonwealth requested closed-cycle cooling be installed at PNPS, which would cause less environmental damage and comply with state laws. Boston Edison sued to prevent having to install a closed-cycle system, winning the case and installing the cheaper, perennially destructive once-through CWIS that PNPS still uses today. Continuing to allow PNPS to operate with the same CWIS that was installed in the 1970s is a clear violation of the CWA requirement for BTA.

Failure to implement BTA causes massive environmental destruction through impingement, entrainment, thermal pollution, and scouring of the sea floor. PNPS's impingement impacts alone include twenty-one "large impingement events," where 1,000 to 107,000 fish have been killed in, oftentimes, a matter of a few days. The marine species affected are part of the larger ecosystem of Cape Cod Bay, and impingement impacts extend far beyond the mere number of fish killed. The same is true for entrainment – the cumulative and ecosystem-wide impacts of entraining large numbers of fish eggs and larvae has largely been ignored. Extensive impingement and entrainment of marine organisms will continue under the new draft permit.

In Attachment D to the draft permit, EPA states that the withdrawal of cooling water by PNPS's CWIS removes and kills billions of aquatic organisms, predominantly fish eggs and larvae, but also adult fish, shellfish, crustaceans and other aquatic life, from Cape Cod Bay. In addition to these direct impact, the loss of aquatic organisms due to CWISs can have indirect, ecosystem level effects, including disruption of aquatic food webs, disruption of nutrient cycle and other biochemical processes, alteration of species composition and overall levels of biodiversity, as well as degradation of the overall aquatic environment. While Entergy claims that impingement and entrainment mortality at PNPS are not of a magnitude to constitute an adverse environmental impact, we agree with EPA that Entergy's adverse impacts are clear. These impacts warrant terminating the permit that allows use of the destructive CWIS; impacts also warrant dedicated monitoring and mitigation until the time of shutdown and until decommissioning is complete (up to 60 years).

Despite the dictates of § 316(b), the EPA has taken an impermissibly broad reading of §1326(b) that expands BTA to include the operational measures of a facility, here, those of PNPS. The EPA considers PNPS's proposed cessation of electricity generation by June 1, 2019 to represent BTA at PNPS because it will lead to a 96% reduction in flow. Draft Authorization to Discharge under the National Pollution Discharge Elimination System (see attachment D at 86).

In short, the EPA inappropriately treats the implementation of no new technology at PNPS as reflective of BTA. The EPA finds its justification in *Entergy Corporation v. Riverkeeper, Incorporated*, which held that the phrase, "best technology available," does not preclude cost-benefit analysis. 556 U.S. 208 at 220. As a consequence, the EPA has determined that:

> 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.

40 C.F.R. § 125.98(f)(4). The EPA does just this when it dismisses the inclusion of cooling towers, assisted recirculation, and variable frequency as potential BTA for entrainment. However, the EPA's rule and application is not supported by the Supreme Court decision nor is it supported by the dictates of the Clean Water Act. For one, the Supreme Court decision permits the inclusion of a cost benefit analysis, but it does not permit a complete disregard for the dictates of 1326(b) which requires the location, design, construction, and capacity of CWIS to reflect the BTA.

In the present case, the CWIS at PNPS does not reflect BTA because it utilizes a once-through cooling system that is detrimental to aquatic life. Furthermore, the EPA's dismissal of potential BTA is not supported by the Supreme Court decision and runs afoul of the CWA. This is because the EPA's draft authorization leads to the absurd result that a power plant can sit on its outdated technologies, and its structures can still be considered to reflect BTA.

Technologies exist today that could entirely replace Entergy's CWIS or at least mitigate some of the environmental damage and pollution from PNPS. For example, approximately 40% of U.S. nuclear reactors use closed-loop, or some other type of recirculating system for cooling. Closed-cycle cooling is easily available for PNPS.[37] The draft permit Fact Sheet (page 46) addresses the applicability of closed-cycle cooling and the technology is discussed at length in Attachment D. Entergy not surprisingly came to the self-interested conclusion that converting to a closed system is not feasible because it would substantially impact the capacity of PNPS to generate electricity and is generally not consistent with a nuclear power plant designed for baseload generation. This is not an adequate justification for Entergy's refusal to install closed cycle cooling.

More than 40 years ago, prior to construction of PNPS, and before the CWA, the Commonwealth of Massachusetts's predecessor to MassDEP sought to require that PNPS's original owner, Boston Edison, install a closed-cycle cooling water system. Boston Edison filed a legal challenge to avoid implementing a closed-cycle system, and eventually prevailed. Yet in 2011, the Massachusetts Superior Court of Appeals found that "the Clean Waters Act, G. L. c. 21, §§ 26-53, confers on the Department of Environmental Protection (department) the authority to protect the water resources of the Commonwealth, and that that authority is broad enough to permit the department to regulate not only water pollution in the traditional sense (i.e., the discharge of harmful substances into a body of water) but also the intake of water, specifically, the components of industrial facilities that withdraw water from surface waterbodies."[38] Despite this, PNPS continues to use the more environmentally destructive, and outdated once-through cooling system.

If operations continue until 2019 as planned, and if EPA is unwilling to require a closed-cycle cooling system, there are other systems not considered here by EPA that have been implemented and could reduce impacts at PNPS. For example, the Beaudrey[39] water intake protection (WIP) system was approved by EPA in 2014 as BTA pursuant to 316(b) and has been in use in other electrical generating facilities. This system is presently under review in the Taunton River estuary for water intake up to 20 MGD to supply raw water to the water supply desalination plant. It is a system that is used world-wide, including in nuclear facilities' CWIS.[40] The Beaudrey WIP is a system designed to retrofit existing intake screening methods, and appears to achieve improved results to reduce mortality from impingement and entrainment, and is capable of handling velocities of 0.5 fps. The fish return system appears to be an improvement over the travelling screens and backwashing system, providing a gentler return for live organisms to their source water. Entergy apparently dismissed this alternative in a 2008 report to EPA (report in response to an EPA §308 letter) due to the fragility of species impinged by PNPS and the system had not yet been proven at U.S. facilities.[41] WIP screens have been used at non-U.S. based nuclear facilities, and at other electricity generating facilities in the U.S. Further, additional studies have come out (as recently as 2016) that look at impacts to species that are found near PNPS. PNPS should be required to evaluate and consider this, and other alternatives, to upgrade its antiquated and non-conforming once-through cooling system that has led to significant mortality of marine organisms over 40+ years of operation. The Beaudrey WIP system could designed to retrofit PNPS and be installed during PNPS's shutdown for refueling in 2017, and if the alternatives analysis suggests, could be required for the period post shutdown, and during decommissioning activities and site clean-up.

Modified Traveling Screens are another option that EPA must consider for PNPS. The EPA has determined in its Final Rule for existing facilities that the BTA for minimizing the adverse impacts of impingement mortality is modified traveling screens with a fish friendly return. 79 F.R. 48337. Additionally, the EPA has concluded that the existing traveling screens at PNPS lack specific measures for the protection of fish. Nevertheless, the EPA has excused PNPS's obligations because it determined that PNPS "may not complete the necessary upgrades and impingement technology performance optimization study before the facility would comply with the actual through-screen velocity BTA." Draft Authorization to Discharge under the National Pollution Discharge Elimination System (See Attachment D at 90).

There is no support for the contention that PNPS is unable to install upgrades and perform the accompanying study before June 1, 2019, and that contention should not excuse PNPS's obligations for the next three years. Modified traveling screens with a fish friendly return have already been established as BTA and the installation of a modified traveling screen with a fish friendly return will decrease impingement. The EPA overlooks the benefits of requiring modified traveling screens when it claims that "such improvements to the traveling screen and fish return are not expected to provide as great a reduction in impingement mortality as that associated with shutdown. Draft Authorization to Discharge under the National Pollution Discharge Elimination System (See Attachment D at 90). While shutdown will provide greater benefits than fish screens, it will not do so for another three years. On the other hand, modified traveling screens with fish friendly return can minimize the destruction of aquatic life during this time.

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[37] Bechtel Power Corporation. 2013. Final Technologies Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant (Draft). Report No. 25762-0003H-G01G-0001.

[38] ENTERGY NUCLEAR GENERATION COMPANY vs. DEPARTMENT OF ENVIRONMENTAL PROTECTION. 459 Mass. 319. February 7, 2011 - April 11, 2011. Superior Court, Suffolk.

[39] E. Beaudrey & Cie.

[40] See: https://beaudrey.securesites.com/page.php?language=English&file_name=products-wip.html

[41] See: Letter from EPA to NRC, July 10, 2014. Re: Clean Water Act Permit for Pilgrim Station in Plymouth, MA, and Nuclear Safety Issues Alleged by the Facility. <http://www.capecodbaywatch.org/wp-content/uploads/2012/10/Pilgrim-EPA-letter-to-NRC-071014-1.pdf?d23684>

Response to Comment 4.2

As the comment states, Section 316(b) of the CWA provides that any standard established pursuant to section 301 or 306 of the CWA and applicable to a point source must require that the location, design, construction, and capacity of cooling water intake structures (CWISs) reflect the best technology available (BTA) for minimizing adverse environmental impact. 33 U.S.C. § 1326(b). Adverse 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 CWISs screens as water is withdrawn from a waterbody) and entrainment (the process by which early life stages of aquatic organisms are killed or injured when they are pulled into the CWIS and sent through a facility's cooling system along with water withdrawn from the waterbody for cooling purposes). *See, e.g.*, 40 C.F.R. § 125.92(h), (n). EPA clearly identifies the impacts from impingement and entrainment mortality at the CWIS at PNPS as adverse both in the Fact Sheet and Attachment D accompanying the Draft Permit, and in this Response to Comments. *See, e.g.*, Response to Comment III.2.1.

The comment generally asserts that "PNPS' once-through cooling system is undeniably not BTA" and that "[c]ontinuing to allow PNPS to operate with the same CWIS that was installed in the 1970s is a clear violation of the CWA requirement for BTA."[21] Section 316(b) of the CWA requires that the location, design, construction and capacity of CWISs reflect the BTA, but does

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[21] The comment is not particularly clear on this point, but to the extent it relies for this assertion on an earlier "request" by the Commonwealth for closed-cycle cooling to be required at PNPS, it fails to explain why, if the erstwhile owner sued to avoid having to install CCC and won, the historic request should have preclusive effect on the Agencies' BTA determination now.

not further define the standard of BTA nor does it set forth the specific factors that EPA must consider in determining BTA. In the absence of applicable regulations implementing § 316(b), the decision as to what represents the BTA for each individual facility is one that EPA has been making on a case-by-case basis since the 1970s. On August 15, 2014, EPA published *Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities*, 79 Fed. Reg. 48,300 (Aug. 15, 2014) (codified at 40 C.F.R. part 122 and part 125, subpart J) (hereinafter, the "Final Rule"). The Final Rule became effective on October 14, 2014, prior to issuance of the Draft Permit, and, in 2018, was upheld by the U.S. Court of Appeals for the Second Circuit. *Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49. The Final Rule includes a national performance standard as the BTA to address impingement mortality and a framework for site-specific determination of entrainment mitigation requirements at existing facilities like PNPS. These national requirements reflect the BTA for minimizing adverse environmental impact at existing facilities consistent with CWA § 316(b). As explained below, the Draft Permit's determination of the BTA for PNPS was made consistent with the requirements of the Final Rule and, as such, is not a violation of the requirements of the CWA. And while we agree with the comment that PNPS' CWIS has caused adverse environmental impact over the years, *see* Fact Sheet, Att. D at 23-30, we do not agree that the same level of impact will continue under the Final Permit, in part because the facility has stopped generating electricity and limits on flow and temperature have been significantly reduced compared to such limits in past permits for the facility. [22] Moreover, the cooling needs of the facility are expected to continue to decrease further as the spent fuel cools, thereby further reducing the volume and/or temperature of heated discharges. *See* Response to Comment III. 4.2.

The comment argues that EPA has taken an "impermissibly broad reading" of § 316(b) by expanding BTA to include "operational measures of a facility," and that in doing so, "EPA inappropriately treats the implementation of no new technology at PNPS as reflective of BTA." First, EPA maintains that including operational measures as a component of the BTA is contemplated in the Final Rule and is not an "impermissibly broad reading" of the statute, as explained more below. Second, the conclusion that no additional technology is required to meet the BTA for impingement mortality and entrainment is not reflective of the BTA determination; rather, the permit conditions that restrict cooling water flow and through-screen velocity after cessation of generation represent the BTA at PNPS. That PNPS is not required to implement any additional technology to meet these post-shutdown conditions is not inconsistent with the 2014 Final Rule. We determined that the "maximum reduction in entrainment warranted," 40 C.F.R. § 125.98(f), was that achieved by maintaining the once-through system without additional controls but with the flow reductions that accompanied the cessation in electrical generating operations. The comment does not explain how such a determination conflicts with the Final Rule.

[22] The Agencies have reviewed and considered comments on both the pre- and post-shutdown BTA. As explained elsewhere, *see, e.g.*, Responses to Comments in Section I.3.0, the Agencies have not included in the Final Permit the limits and conditions of the Draft Permit applicable to the pre-shutdown period, because the facility is no longer generating electricity. As such, the Agencies have not addressed comments specific to pre-shutdown limits removed from the Final Permit except where a comment indicates that a concern or issue about a pre-shutdown limit would also be relevant to the post-shutdown limit.

Under CWA § 316(b), one element of a CWIS that must reflect the BTA is capacity. In the Final Rule and in prior § 316(b) rulemakings, EPA assumes that entrainment and impingement (and associated mortality) are proportional to a source water intake volume. A reduction in intake flow, or capacity, results in a similar reduction in the number of organisms subject to impingement and entrainment. *See* 79 Fed. Reg. 48,331. In the Final Rule, EPA describes "variable speed pumps, seasonal operation or seasonal flow reductions, unit retirements, use of alternate cooling water sources, water reuse, and closed-cycle cooling systems" as common flow reduction technologies that could be considered as the BTA for reducing impingement and entrainment. *Id*. For example, under the Final Rule, a facility could scale back its operation (or not operate at all) during specific peak entrainment periods to reduce or eliminate the volume of cooling water withdrawn and, in turn, the numbers of organisms entrained or impinged. In addition, flow reduction due to unit closures could be included as part of a facility's impingement and entrainment mortality reduction strategy. *See id.* at 48,332. In addition, under 40 C.F.R. § 125.94(c)(6), an existing facility may comply with the impingement mortality BTA standard by implementing a system of technologies, management practices, and operational measures. Another compliance alternative, at § 125.94(c)(12), considers the annual average capacity utilization rate of a generating unit. Operational measure, as defined at 40 C.F.R. § 125.92(w), means "a modification to any operation that serves to minimize impact to all life stages of fish and shellfish from the cooling water intake structures." Thus, the Final Rule clearly contemplates operational measures including, but not limited to, flow reductions, as methods for complying with the BTA requirements of § 316(b). Considering operational measures in the determination of the BTA for PNPS is not an "impermissibly broad" reading of § 316(b).

The comment states that "EPA considers PNPS's proposed cessation of electricity generation by June 1, 2019 to represent BTA at PNPS" and argues that that this inappropriately treats implementation of no new technology as reflective of BTA. Attachment D of the Fact Sheet (at 86) states:

> EPA proposes that, considering the applicable factors at § 125.98(f)(2) and (3) and in light of Entergy's announcement to shut down the facility thereby drastically reducing its cooling water intake, instituting no additional entrainment control requirements prior to the earlier of the cessation of electricity generation or June 1, 2019 and, thereafter, eliminating water withdrawals for the main condenser and reducing other cooling water and other miscellaneous water withdrawals, resulting in a 96% reduction in flow, represents the best technology available for minimizing entrainment at PNPS.

The cessation of electrical generation is not the BTA. The reduction in the withdrawal of cooling water flow is the BTA, and Part I.F of the Draft Permit establishes technology-based BTA standards for the operation of the CWIS to minimize impingement and entrainment consistent with the Final Rule. In other words, EPA followed the framework established in the Final Rule and determined that the "maximum reduction in entrainment warranted," 40 C.F.R. § 125.98(f), was that achieved by the once-through system with the flow reductions accompanying the cessation in electrical generating operations. EPA described in the Fact Sheet why it had "rejected any entrainment control technologies or measures [e.g., closed-cycle cooling, assisted recirculation] that perform better than the selected technologies *or measures*." *Id.* § 125.98(f)(1) (emphasis added); *see* Fact Sheet, Att. D at 37-86. In consideration of this and other comments received on the Draft Permit, Parts I.A.1, I.A.3, and I.C of the Final Permit limit flow for the service water pumps and circulating water pumps. Compliance with these flow limits enables PNPS to achieve a flow reduction greater than 92% as compared to the current permit, which is commensurate with the anticipated flow reduction that would have been achieved if the Permittee installed and operated closed-cycle cooling. *See* Fact Sheet, Att. D at 45. For impingement, the BTA is an actual through-screen velocity of no more than 0.5 fps consistent with 40 C.F.R. § 125.94(c)(3). The Draft Permit proposed continuous or near-continuous rotation of the traveling screens as an interim BTA prior to shutdown, but because PNPS has ceased generation this interim requirement has been eliminated. Post-shutdown, the Final Permit does require continuous rotation of the traveling screens during unusual impingement events and when operation one of the circulating water pumps (pump operation not to exceed 48 hours in a calendar month). The BTA determination appropriately adheres to the framework established in the Final Rule.

PNPS, as a result of the proposed shutdown, will not require installation of a *new* technology to meet the BTA standards; nonetheless, the resulting flow reduction and through-screen velocity are consistent with the highest performing technologies to reduce the adverse impacts of impingement and entrainment. The comment argues that this BTA determination "inappropriately treats the implementation of no new technology at PNPS as reflective of BTA." Neither the CWA § 316(b) nor the implementing regulations under the Final Rule require that a facility install any specific technology to minimize adverse environmental impact, rather, the design, location, construction, and capacity of the CWIS must reflect the BTA.[23] That PNPS will minimize the adverse impacts of its CWIS by drastically reducing its flows, rather than by installing new technology, does not diminish the environmental benefits of the permit requirements for impingement and entrainment mortality.

The comment asserts that the Draft Permit does not represent BTA because it continues to allow use of a once-through cooling system that is detrimental to aquatic life. Under the Final Rule, a permittee can meet the BTA standards for impingement mortality at 40 C.F.R. § 125.94(c) by complying with one of 12 alternatives, only one of which (i.e., (c)(1)) would necessarily prevent the use of a once-through cooling system. The BTA standards for entrainment are established on a site-specific basis and similarly do not prohibit use of a once-through cooling system. 40 C.F.R. §§ 125.94(d), 125.98(f). The Final Rule, which implements requirements for existing CWISs under § 316(b), explicitly recognizes that closed-cycle cooling will not be the BTA at every facility, based in part on the remaining useful life of the facility at issue, among other potential considerations. 79 Fed. Reg. at 48,342 ("Considering the long lead time to plan, design, and construct closed-cycle cooling systems, EPA determined that the [permitting authority] should have the latitude to consider the remaining useful plant life in establishing entrainment mortality requirements for a facility."); *id.* ("[G]iven that EPA estimates that 25 percent of

[23] EPA takes a similar approach in the Phase I Rule, which establishes requirements for cooling water intake structures at new facilities. 66 Fed. Reg. 65,278 (Dec. 18, 2001). A new facility may comply with the BTA requirements by achieving a flow reduction commensurate with closed-cycle cooling and a through-screen velocity no greater than 0.5 fps. See 40 C.F.R. § 125.84(b). The reuse and recycling of cooling water for purposes other than steam electric condensing (*e.g.*, for process water) are considered analogous to flow reduction for the purposes of meeting these capacity requirements. In other words, a facility is required to meet the performance standard in the rule and is provided some flexibility in how that standard is achieved. *See* 66 Fed. Reg. 65,278.

existing facilities may face some geographical constraints on retrofitting closed-cycle cooling and concerns about air emissions and the remaining useful life of a facility, EPA rejected the option of requiring uniform entrainment controls based on closed-cycle cooling."). Operation of a once-through cooling system at PNPS pursuant to the Final Permit is not inconsistent with the Act or regulations, and the comment offers no support for its statement suggesting otherwise. The Agencies determined that the BTA at PNPS is a 92% reduction in flow and an actual through-screen velocity no greater than 0.5 fps and that together, these measures will minimize the adverse environmental impacts from the CWIS on Cape Cod Bay. EPA established that these requirements represent the maximum reduction in entrainment warranted after consideration of the relevant factors at 40 C.F.R. § 125.98(f)(2) and (3). 40 C.F.R. § 125.98(f). *See* Fact Sheet, Att. D at 74-86.

As we have already noted, one of the relevant factors a permitting authority must consider when establishing site-specific requirements for entrainment under the Final Rule is useful plant life. *See* 40 C.F.R. § 125.98(f)(2)(iv). As explained in Attachment D of the Fact Sheet (at 75-76), major structural and operational changes may not be an appropriate response for a facility that will not be operating in the near future. During the development of the Draft Permit, Entergy announced its decision to close PNPS before or during 2019. In fact, PNPS ceased electricity generating operations and shut down on May 31, 2019. Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019), AR-691; Press Release, Entergy Corp., Pilgrim Nuclear Power Station Shut Down Permanently (May 31, 2019), AR-688. Further, on June 9, 2019, Entergy "permanently removed [the fuel] from the PNPS reactor vessel," acknowledging that its license therefore "no longer authorizes operation of the reactor." Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019). The relatively limited lifespan of the plant, and the dramatic changes in operations and, particularly, in water withdrawals, that result from this shutdown were properly considered as part of the BTA determination. Retrofitting a nuclear power plant with closed-cycle cooling is a complex process that requires a lengthy construction timeline. Entergy estimated that a retrofit at PNPS would require a minimum of 4 years. The plant was scheduled to, and did, cease operations less than four years after the Agencies issued the Draft Permit, before any reduction in entrainment would have been realized from operation of cooling towers based on the anticipated schedule.[24] In addition, to the extent the comment asserts that EPA eliminated closed-cycle

[24] The comment indicates that closed-cycle cooling is used at many nuclear reactors in the U.S. and that closed-cycle cooling is "easily available" at PNPS. EPA agrees that nuclear facilities may elect or be required to install closed-cycle cooling to comply with requirements under § 316(b), but the comment does not provide any site-specific evidence to support the claim that a retrofit at PNPS would be easy. Instead, the comment cites a study of closed-cycle cooling at Diablo Canyon Nuclear Power Station in California. EPA notes that Bechtel's 2012 *Third-Party Technical Assessment for Closed-cycle Cooling Water Technologies for the Diablo Canyon Power Plant* (AR-709) did not indicate that closed-cycle cooling was easily achievable at that facility either, stating (at 52) that "closed cooling systems…are considered feasibly constructible based on current day construction methods practice, and knowledge. However, all of the systems will have their own challenging issues and degree of difficulty." While none of the closed-cycle systems evaluated for the Diablo Canyon Power Plant had fatal flaws that would render them unavailable, neither did the study conclude that a closed-cycle cooling system retrofit would be easy. Thus, the comment does not provide support for its claim that closed-cycle cooling is "easily available" at PNPS. As the Fact Sheet acknowledges, Fact Sheet, Att. D at 37-46, the challenges to installing closed-cycle cooling at PNPS are not insignificant, even if the technology is technically available. Having said that, EPA eliminated closed-cycle cooling from further consideration on the basis of useful plant life, rather than feasibility/infeasibility of the technology or

cooling and assisted recirculation as available technologies for reducing entrainment based solely on social costs, it is incorrect.[25] EPA considered the social costs of retrofitting PNPS with closed-cycle cooling and assisted recirculation but rejected the two options as available technologies largely because they could not be built and put into service before the facility shut down. In other words, EPA determined that closed-cycle cooling and assisted recirculation were not available based in large part on the limited remaining useful life of the plant. 40 C.F.R. § 125.98(f)(1), (2)(iv).

The comment asserts that the Final Rule and its application in this permit proceeding "is not supported by the Supreme Court decision" in *Entergy Corporation v. Riverkeeper, Inc.*, 556 U.S. 208 (2009), "and runs afoul of the CWA" because an analysis that does not determine that a facility must install additional entrainment technologies is an "absurd result." The comment fails to explain, however, how the Supreme Court decision in *Entergy v. Riverkeeper* or the CWA foreclose a determination that no additional entrainment technologies are warranted, particularly where, as here, the remaining useful life of the facility is so limited. As noted earlier, EPA followed the framework established in the Final Rule, which the U.S. Court of Appeals for the Second Circuit has since upheld as a reasonable interpretation of the Clean Water Act, including the rule's consideration of remaining useful life in determining availability. *Cooling Water Intake Structure Coal.*, 905 F.3d at 58, 67. Additionally, and as also noted earlier, the Final Rule recognizes that flow reductions resulting from changes in operation and unit closures are properly considered in a BTA determination. 79 Fed. Reg. at 48,331-32. And to the extent that the comment asserts that the Massachusetts Supreme Judicial Court's ("SJC") decision in *Entergy Nuclear Generation Co. v. Department of Environmental Protection*, 944 N.E.2d 1027 (Mass. 2011), requires a determination that closed-cycle cooling is the BTA at PNPS, the comment does not point to anything in that opinion that would support such an assertion. We agree that the SJC held that MassDEP has the authority under the Massachusetts Clean Waters Act to regulate cooling water intake structures, but the opinion does not dictate what specific BTA determination must be made for PNPS. Nor does the opinion ever consider the issue of remaining useful life as a consideration in the DEP's exercise of that authority.

The commenter suggests that the BTA determination in the Draft Permit ignores the cumulative and ecosystem-wide impacts of entraining large numbers of fish eggs and larvae and suggests that these impacts merit both the termination of a permit that "allows use of the destructive CWIS" and "dedicated monitoring and mitigation until the time of shutdown and until decommissioning is complete (up to 60 years)." Attachment D of the Fact Sheet (at 13-30) plainly describes the adverse impacts associated with operation of the CWIS. EPA describes the impacts of entrainment and impingement in terms of the loss of billions of individual early life stages and hundreds of thousands of juvenile and adult fish, invertebrates, and adult equivalent fish, and the ecological impacts as a result of the loss of prey base. EPA also assessed the site-specific impacts of the CWIS on several individual species, including winter flounder, river herring, rainbow smelt, and Atlantic cod. Finally, EPA evaluated the direct impacts of the CWIS

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some other factor. Like PNPS, the owner of Diablo Canyon announced its decision to close the plant in 2016, which was approved by the California Utilities Commission in 2018.

[25] Nor did EPA necessarily accept Entergy's conclusion regarding feasibility and eliminate closed-cycle cooling on that basis. *See* Fact Sheet, Att. D at 37-46, 62-63.

as one of multiple, cumulative stressors affecting the aquatic community in Cape Cod Bay. In each case, EPA identified impingement and entrainment as adverse impacts that must be addressed by implementing the best technology available consistent with § 316 and the 2014 Final Rule. EPA notes that the comment does not identify any specific deficiency in the Fact Sheet's evaluation of the adverse impacts. The Fact Sheet (at 79-85) evaluates the potential environmental benefits of implementing technologies to minimize entrainment and impingement at PNPS. The comment also fails to identify any deficiencies in this analysis to support its statement that any benefits were ignored. The Final Permit includes BTA requirements that ensure that PNPS will achieve a reduction in flow greater than 92% and will consistently operate the CWIS at an actual through-screen velocity no greater than 0.5 fps. The actual through-screen velocity may increase to 0.9 fps when PNPS must operate one circulating water pump. The Final Permit limits operation of a circulating water pump to no more than 48 hours over a 28-day period, which allows PNPS to achieve an actual through-screen velocity of less than 0.5 fps about 93% of the time. When one of the circulating water pumps is operating, the Permittee must rotate the traveling screens continuously, which has been observed to reduce impingement mortality of non-fragile species in PNPS-specific studies. *See* AR-460. Together, these requirements reflect the BTA for minimizing the impacts from impingement and entrainment at PNPS's CWIS. *See* 40 C.F.R. § 125.94(c)(6) and 125.94(d). The monitoring requirements in the Final Permit, which are consistent with the Final Rule, are sufficient to ensure compliance with the BTA to minimize impingement mortality and entrainment at PNPS. *See* 40 C.F.R. §§ 125.94(c)(1) and (3), and §§ 125.96(a) and (b). With respect to the comment's assertion, without elaboration, that the impacts of PNPS' CWIS "warrant dedicated monitoring and mitigation . . . until decommissioning is complete (up to 60 years)," we provide further explanation for the basis for post-shutdown monitoring requirements in other responses, *see, e.g.*, Response to Comment I.5.5, and address the commenter's specific comments on "mitigation" above, *see* Response to Comment I.2.3.

Finally, the commenter asserts that other available technologies to reduce impingement and entrainment at PNPS, such as the Beaudrey Water Intake Protection (WIP) screen or modified traveling screens, were not fully considered. WIP screens are designed with large disks divided into pie-shaped wedges that rotate around a center axle perpendicular to the intake flow (Figure 1). A stationary suction scoop mounted over one section of the disk vacuums debris and organisms as each wedge rotates under the scoop. A fish-friendly pump transports the organisms and debris to a return trough. *See* AR-717 at 2-7. This design eliminates "carryover" because the screen face, vacuum, and pump are all located on the same side of the screen. The screen material is designed to minimize impacts and organisms remain submerged for the duration of impingement and transport to the source water body. The commenter supports this technology, noting that the WIP screen "appears to achieve improved results to reduce mortality from impingement and entrainment and is capable of handling velocities of 0.5 fps." The comment states that the WIP screen's fish return system is gentler than the traveling screen and backwash system and that studies have observed benefits to species found at PNPS.[26]

[26] A WIP screen has not been demonstrated to achieve measurable reductions in impingement and entrainment mortality of early life stages of species common to Cape Cod Bay. A recent study of the effectiveness of WIP screens for protecting early life stages of fish demonstrated that larger fish and lower approach velocities resulted in greater survival, and overall survival was relatively high (greater than 60%) for larvae and juveniles of the species

In the Draft Permit, EPA did not consider traveling screens, including the WIP screen, as an available technology for entrainment, because this technology is not considered effective for reducing entrainment.[27] Screens must consist of fine mesh to prevent entrainment of eggs and larvae, and fine mesh screens may lead to increased mortality of impinged eggs and larvae that would have otherwise been entrained. *See Technical Development Document for the § 316(b) Existing Facilities Rule* (TDD) at 6-23 and 6-45 to 48. WIP screens have been shown to be as effective or even more effective than modified traveling screens for reducing impingement mortality for many species. *See Id*. at 6-40 to 41. However, WIP screens to reduce entrainment at PNPS would likely have to be fitted with mesh sizes in the range of 0.5 to 1.0 mm. In addition, there are technical challenges to the installation of WIP screens that must be considered in an evaluation of this technology for PNPS.

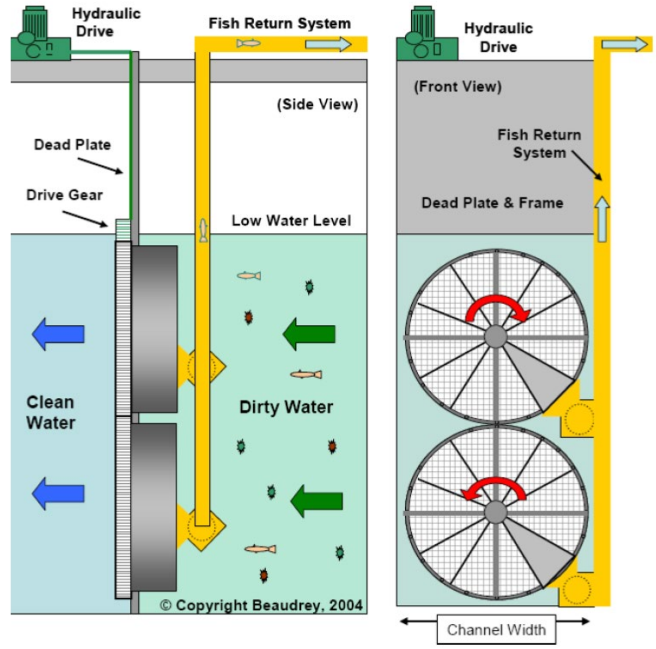

Figure 1. Schematic of a Beaudrey WIP Screen. (Source: Beaudrey).

According to the manufacturer, WIP screens can be installed in the existing traveling screen bays, which can make for easier and more cost-effective installation. However, because of the

tested. *See* AR-707. However, the study only observed early life stages of freshwater species: bigmouth buffalo, white sucker, bluegill, and common carp. The study notes that the results are believed to be indicative of performance with marine species of comparable hardiness, but species commonly entrained at PNPS are not likely to act similarly to the tested species. The study notes that entrainment at coastal power plants tends to be dominated by clupeids (American shad, blueback herring, Atlantic menhaden) and that these species are unlikely to be as hardy as the tested species. In addition, the mean larval length in the study was 26 mm; mean larval length of the most commonly entrained species at PNPS tends to be less than 10 mm. *See* AR-526. In addition, the study used 2 mm screens, but this mesh size is not likely to be effective for excluding Labrid (cunner-tautog-yellowtail) eggs, commonly entrained at PNPS, which are about 0.8 mm. While a WIP screen is not a proven technology for effectively reducing entrainment in a coastal system, this technology may be available to reduce impingement mortality at PNPS. Again, however, a study of impingement survival for species, or species similar to those, commonly entrained at PNPS is unavailable. The WIP study at North Omaha Station (AR-718) observed impingement survival of 90% or more for hardy, freshwater species (channel catfish, bluegill), as well as relatively high survival (75%) for emerald shiner and fathead minnow. The study demonstrates that this technology can effectively reduce impingement mortality for hardier species, but there is no evidence to support this technology as the BTA for impingement at PNPS, where impinged species are more fragile. The comment includes a reference to a study "as recent as 2016" but the reference was not provided in either the footnote or the references in the comments. EPA was unable to find a study of the WIP from 2016.

[27] Entergy evaluated traveling screens in its 2008 Engineering Response (AR-489 at 35) and concluded that upgrading the traveling screens, including to a WIP screen, would not measurably reduce impingement mortality because the majority of mortality at PNPS (89%) involves Atlantic menhaden and Atlantic silversides, which are not expected to survive screen impacts associated with impingement regardless of the screening technology employed.

design, the WIP screen has a smaller dimension than the conventional traveling screen (see Figure 1). If the same number of screen bays are replaced with the WIP screens, the through-screen velocity will increase because the flow rate will be withdrawn through a smaller screen area. If PNPS were to install WIP screens without increasing the existing through-screen velocity (or to achieve, as the comment suggests, through screen velocities of no greater than 0.5 fps), the existing intake structure would have to be expanded to accommodate additional screens. Similarly, because the screen mesh affects the velocity, decreasing the mesh size of WIP screens to exclude early life stages of marine fish (*e.g.*, less than 1 mm) would also necessitate additional screens to accommodate the required cooling water volume, which would require expansion of the existing intake structure. Expanding the intake structure would be more costly and would likely add a significant amount of time to the project as compared to simply installing new WIP screens in the existing bay. From a technical standpoint, while a WIP screen may be feasible for PNPS, it is not likely that it would meet the BTA requirements indicated in the comment without significant expansion of the CWIS. Moreover, the technology is not as effective as reducing impingement mortality and entrainment as the flow and intake velocity BTA requirements that can be achieved with the flow reductions associated with the shutdown.

The commenter also states that modified traveling screens are a proven technology for reducing impingement and that EPA overlooked these benefits in its analysis. The Final Rule's standard for impingement mortality is based on the performance of modified traveling screens, in part because this technology has demonstrated effectiveness and is widely available throughout industry. *See* 79 Fed. Reg. 48,328-9. The Final Rule requires that this technology be optimized to minimize impingement mortality of all *non-fragile* species. *Id*. Though modified traveling screens are available and may reduce impingement of non-fragile species at PNPS, more than 65% of total impingement is comprised of fragile species that are not expected to survive impingement even with modified traveling screens. *See* Fact Sheet Attachment D at 21, 91. In other words, implementing either a modified traveling screen or a WIP screen is unlikely to effectively minimize the majority of impingement mortality at PNPS, which is comprised of fragile species. Moreover, the effectiveness of either technology is surpassed by the effectiveness of the reduction in the actual intake velocity achieved following the shutdown of PNPS, which is a more biologically protective BTA standard for impingement mortality for all species, not just those classified as non-fragile.

After considering the points raised in the comment, EPA maintains that the BTA performance standards in the Final Permit, which require PNPS to achieve a flow reduction greater than 92% as a monthly average and achieve a through-screen velocity of 0.5 fps, represent the BTA for impingement and entrainment at PNPS. This site-specific determination was made under 40 C.F.R. § 125.98(g) in consideration of the relevant factors at § 125.98(f)(2) and (3) and the impingement mortality BTA standards at § 125.94(c). As such, this determination is consistent with CWA § 316(b). PNPS must meet the BTA standards in Part I.F. on the effective date of the Final Permit.

5.0 Comments on EPA's Fact Sheet

5.1 Anti-backsliding

We support cases where permit limits and conditions in the draft permit are more stringent than the existing 1991 permit. However, PNPS's permit has been weakened in several ways and Entergy's activities are less protective of Cape Cod Bay resources than in years past. For example:

- PATC oversight committee was disbanded in 2000: One of the cornerstones of PNPS's 1991 NPDES permit was the requirement for a scientific panel, the PATC, to oversee impacts and recommend technology improvements or mitigation as needed. The PATC was disbanded in early 2000, shortly after Entergy bought PNPS, because Entergy refused to participate. This is in violation of PNPS's current NPDES permit, which says Entergy must "carry out the monitoring program under the guidance of the Pilgrim Technical Advisory Committee." Before it disbanded, the PATC met several times per year, issued reports, and regularly expressed recommendations about PNPS's operations and monitoring. Since the PATC disbanded, there has been no regulatory oversight of PNPS's operations in the manner required by the current NPDES permit, and now the new draft permit omits the PATC altogether. The PATC should be reinstated, and strengthened, under the new permit.
- Entergy is no longer coordinating refueling and maintenance shut downs with times when there are high concentrations of winter flounder eggs and larvae in the water to avoid entrainment. There is no record that Energy has ever fully observed the PATC's recommendations to coordinate PNPS's planned refueling outages or to use "alternate cooling" during the last 2 weeks of April until the end of May to "coincide with the peak densities of winter flounder larvae in the water column."[42] While PNPS's scheduled refueling outages sometimes overlap with the months of April and May, the outages do not fully follow the PATC's recommendation (last 2 weeks of Apr. and throughout May). In years when refueling does not occur, Entergy does not use an alternate cooling system as recommended by PATC during this timeframe, despite the real and potential impacts to winter flounder and other migrating and threatened species like smelt and river herring. EPA should make this a restriction in the new draft permit.
- Entergy stopped funding mitigation projects. In the past, Boston Edison, and later Entergy, was required to fund mitigation projects in an effort to offset PNPS's destructive marine ecosystem impacts.[43] Soon after Entergy bought PNPS, most of the restoration funding ceased.
- Entergy ended marine monitoring of the "benthic" or sea floor habitat in front of PNPS.[44] The last benthic survey was done in 1999, the year Entergy bought PNPS.

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[42] Letter to EPA from Szal G.M. (PATC), Dec. 8, 1998. Re: Pilgrim Nuclear Power Plant.

[43] For example, rainbow smelt spawning habitat enhancement in the Jones River. See: Entergy, 1999. Final report on rainbow smelt (*Osmerus mordax*) restoration efforts in the Jones River, 1994-1999. PNPS Marine Environmental Monitoring Program, Report Series No. 8. (Mass. DMF, Lawton R. and J. Boardman)

[44] Oct. 5, 2012 Notice of Intent to Sue Letter, p. 12.

Response to Comment 5.1

According to the comment, the Draft Permit is weaker than the 1991 Permit because it omits requirements for an advisory committee to guide monitoring efforts; coordination of refueling with presence of winter flounder eggs and larvae; mitigation funding; and benthic surveys. The comment classifies these issues under the heading "Anti-backsliding," though it does not explain how such permit conditions are required under anti-backsliding or cite any statutory or regulatory language to otherwise support such a claim. In addition, while the comment quotes some language from Part I.8.d of the 1991 Permit in support of its claims regarding the advisory committee, it does not identify the other requirements in any particular provision(s) of the 1991 Permit.

The anti-backsliding provision of the Act, Section 402(o), generally provides that "a permit may not be renewed, reissued, or modified to contain effluent limitations [that] are less stringent than the comparable effluent limitations in the previous permit." Sections 402(o)(1) and (2) provide several exceptions to anti-backsliding, including, but not limited to, circumstances where material and substantial alterations or additions to the permitted facility occurred after permit issuance. CWA § 402(o)(2)(A); *see also id.* § 303(d). Section 402(o)(3) of the Act provides a catchall limitation, specifying that at no time shall a reissued, renewed, or modified permit contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time of issuance or if implementation of a less stringent limit would result in a violation of a water quality standard. An "effluent limitation" is defined as "any restriction established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters, the waters of the contiguous zone, or the ocean, including schedules of compliance." CWA § 502(11).[28] EPA regulations also address backsliding: "[W]hen a permit is renewed or reissued, interim effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit." 40 C.F.R. § 122.44(*l*)(1). The regulations similarly contain a number of exceptions, including where the circumstances on which the previous permit was based have materially and substantially changed. *Id.* As explained in the Introduction and elsewhere in this Response to Comments, PNPS permanently ceased operating on May 31, 2019, and, as a result, drastically reduced water withdrawals and discharges of heated effluent.

The commenter first asserts that the Final Permit should "reinstate[]" and "strengthen[]"[29] the Pilgrim Technical Advisory Committee (PTAC), apparently based on language in Part I.A.8.d of the 1991 Permit requiring the permittee to "carry out the monitoring program, under the guidance of the Pilgrim Technical Advisory Committee." This quoted phrase from the 1991 Permit, however, is only part of Part I.A.8.d and should be read together with two other provisions—all of which appear in the 1991 Permit under the heading "Biological Monitoring." Part I.A.8.b requires the Permittee to "conduct such studies and monitoring as are determined by

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[28] *See also* 40 C.F.R. § 122.2 (defining "effluent limitation" as "any restriction imposed by the Director on quantities, discharge rates, and concentrations of 'pollutants' which are 'discharged' from 'point sources' into 'waters of the United States,' the waters of the 'contiguous zone,' or the ocean").

[29] To the extent the commenter asserts that anti-backsliding requires the Agencies to issue a permit that is *more* stringent than the previous permit, we disagree. Nothing in the statutory or regulatory anti-backsliding provisions supports such an argument, and the comment provides no explanation for such a view.

the EPA and the State to be necessary to evaluate the effect of the operation of the Pilgrim Station, on the balanced, indigenous community of shellfish, fish, and wildlife in and on Cape Cod Bay." Part I.A.8.c provides that "[t]he 1990 Environmental Monitoring Programs and plans," previously submitted to the Agencies and approved, "become[] an integral element of this permit (Attachment A)." Finally, Part I.A.8.d—partially quoted in the comment—begins with the requirement that the Permittee submit to EPA and Massachusetts each year any revisions to the annual monitoring program for 1990 described in Part I.A.8.c. It also provides that such revised monitoring for the next year be incorporated into the permit and carried out "under the guidance of the Pilgrim Technical Advisory Committee."

The statutory anti-backsliding provision does not appear to be applicable to the biological monitoring requirements in the 1991 Permit (or any other condition referenced in the comment), because these requirements do not meet the definition of "effluent limitation." Nor does the comment explain how a provision regarding the advisory committee (or the others) is an "effluent limitation." Moreover, it is not clear from the comment why the regulatory anti-backsliding provision should apply, because the comment does not explain how the Draft Permit is any less stringent than the 1991 Permit.[30] In any event, even if one or both of the anti-backsliding provisions applied to the pre- or post-shutdown period (or both periods), the cessation of electricity generating operations and the concomitant drastic reduction in withdrawals and thermal discharges constitute material and substantial changes to the facility and the permitted activity since the 1991 Permit was issued that would justify permit conditions that are different. The Final Permit need not contain the provision regarding biological monitoring carried out under the guidance of the advisory committee, because the permittee has permanently shut down the facility, which resulted in a reduction of water withdrawals commensurate with the best performing technology and drastically reduced its heat load discharge to Cape Cod Bay. In other words, the exception for material and substantial changes applies.

The comment also asserts that the Final Permit should require the Permittee to coordinate refueling and maintenance shut downs with times when there are high concentrations of winter flounder eggs and larvae in the water to avoid entrainment. The comment does not identify such a requirement in a particular provision of the 1991 Permit, meaning that anti-backsliding is not implicated by the lack of such a condition in the Final Permit. In any event, there will no longer be refueling outages at PNPS because PNPS shut down and certified that the fuel was permanently removed from the reactor as of June 9, 2019. *See* AR-691. Therefore, any permit conditions related to refueling outages are no longer applicable consistent with the material and substantial alteration of the facility. The comment also asserts that the Final Permit must include

[30] The Draft Permit still required the permittee to conduct biological monitoring "determined by EPA and MassDEP to be necessary to evaluate the effect of the permittee's discharges on the balanced, indigenous population of shellfish, fish, and wildlife in and on Cape Cod Bay." *Compare* Draft Permit at Part I.G *with* 1991 Permit at Part I.A.8.b. The Draft Permit also required the permittee to submit to EPA and MassDEP each year "any revisions to the existing biological monitoring program (BMP) which may be warranted by the availability of new information." *Compare* Draft Permit at Part I.G *with* 1991 Permit at Part I.A.8.d; *see also id.* at Att. B. Lastly, the Draft Permit still provided that, upon approval by EPA and MassDEP, "the revised program submitted in accordance with this paragraph shall be incorporated as a part of this permit." *Compare* Draft Permit at I.G *with* 1991 Permit at Part I.A.8.c, d. In other words, the Draft Permit would still have required the permittee to conduct biological monitoring that the Agencies determined to be necessary and that the Agencies approved. The comment does not explain how or why "guidance" from an "advisory" committee would have provided for (and required) more stringent monitoring.

provisions for mitigation funding and benthic monitoring based on anti-backsliding, yet similarly points to no corresponding provisions in the 1991 Permit that could make anti-backsliding applicable. And even if applicable, the substantial reduction in withdrawals and heated discharges would justify re-issuing the permit without such permit conditions. *See* 40 C.F.R. § 122.44(*l*). Moreover, the comment does not assert that any of these conditions are required under any effluent guidelines or that their absence would result in a violation of a water quality standard.

Following its purchase of PNPS, Entergy continued to submit the following year's monitoring plan to EPA and MassDEP for approval and revisions pursuant to Part I.A.8.d of the 1991 Permit. The Agencies consulted with additional State Agencies, such as the Massachusetts Division of Marine Fisheries, when appropriate. The biological monitoring required by the 1991 permit, including the guidance of the advisory committee, was intended in part to evaluate the effect of operation of PNPS on the balanced, indigenous community. In 1999—when the heat load to Cape Cod Bay was substantially higher than under the Final Permit—the Massachusetts Division of Marine Fisheries (a member of the PTAC) stopped monitoring the effects of the thermal plume due to the lack of findings of significant impacts since the 1970s and shifted the monitoring focus to the impacts of impingement and entrainment. *See* Fact Sheet Att. C at 33. The cessation of thermal plume monitoring was authorized pursuant to Part I.A.8.d of the 1991 Permit and, thus, no further "guidance" under the PTAC was necessary for such monitoring. As previously explained, PNPS is no longer operating as of May 31, 2019, and the Final Permit, which reflects the substantially altered operation following shutdown requires monitoring to ensure compliance with the temperature, intake, and flow limitations but does not require continued biological compliance monitoring for entrainment. *See also* Responses to Comments I.5.5, I.6.1, III.8.1.

The Final Permit includes limitations and conditions reflecting a 98% reduction in the heat load to Cape Cod Bay and a 92% reduction in water withdrawals from Cape Cod Bay. These requirements are consistent with the best performing technologies to minimize the impacts from heat and cooling water intake structures in the industry. As such, the operation of PNPS has substantially reduced the potential impacts to the balanced, indigenous community by reducing the thermal discharge and the impacts from impingement and entrainment, which were the focus of the biological monitoring studies evaluated by the PTAC. As explained in Response to Comment I.3.4 and elsewhere, the temperature limits in the Final Permit are more stringent than the 1991 permit and will ensure the protection and propagation of the balanced, indigenous population. Re-initiating biological studies evaluating the impacts of thermal discharges is not warranted in this case.

5.2 Anti-Degradation

There are no new or increased discharges being proposed within this permit reissuance therefore EPA believes that MassDEP is not required to conduct an anti-degradation review. We disagree. There are new outfalls, and outfalls have been identified that were not covered under the last permit (012, 014, 013). Decommissioning could also create new sources of contamination entering Cape Cod Bay. As buildings are demolished and soils disturbed, new contaminants could end up in Cape Cod Bay. MassDEP should be required to conduct an anti-degradation review. As discussed above in section III.B, the CWA affords MassDEP the authority to protect the water resources, including the discharge of pollutants and water intake.

Response to Comment 5.2

The comment requests that MassDEP conduct an anti-degradation review on the new Outfalls 012, 014, and 013. In addition, JRWA comments that anti-degradation should also apply to the new sources of contamination that may arise during decommissioning. Although Outfalls 012 and 014 are newly designated in the Draft Permit, neither is considered a new or increased load of pollutants because each is a subset of Outfalls 003 and 011, respectively. In both cases, the newly designated outfalls do not represent new or increased discharges, but rather an alternative flow path and discharge location of an existing outfall from the current permit, which does not require an antidegradation review.

The Fact Sheet at 27 explains that Outfall 012, which discharges to the discharge canal, is used as an alternative to the discharge to the fish sluiceway at Outfall 003, which discharges to the intake embayment. This discharge option is used to prevent the re-impingement of seaweed, which could occur during storm events were these flows to be discharged to Outfall 003. In other words, the discharge from Outfall 012 would otherwise have been discharged from Outfall 003 and, as such, does not represent a new or increased discharge to Cape Cod Bay consistent with EPA's characterization in the Draft Permit.

As explained in the Fact Sheet (at 37), Outfall 014 discharges flow that would otherwise be discharged from Outfall 011 directly to the discharge canal. Flow from the waste neutralizing sump, which combines with other wastestreams and is discharged from Outfall 011 under the current permit, may be leaking into stormwater Outfall 005. The waste neutralizing sump was rerouted to avoid the possibility of leaking into Outfall 005, which ensures that this wastewater is monitored for the appropriate parameters and avoids improperly comingling and discharge from the stormwater outfall. In other words, similar to Outfalls 003 and 012, flows from Outfall 014 do not represent new or increased discharges even though the outfall is newly designated because these flows are currently permitted to be discharged through Outfall 011, which does not trigger an antidegradation review.

The Fact Sheet (at 29) explains that Outfall 013 is a newly identified stormwater outfall located between stormwater Outfalls 006 and 007. Stormwater in this storm drain is expected to infiltrate to sandy soil and not discharge directly to the intake embayment. Since identification of the storm drain, PNPS has added additional security fencing and a concrete wall, which makes the storm drain inaccessible for monitoring. This outfall was only expected to discharge to the intake embayment in the event of extreme weather conditions. The Draft Permit recognizes and authorizes discharge from this storm drain, but does not establish any monitoring requirements since the outfall is not expected to discharge directly to Cape Cod Bay except under extreme storm events, drains a relatively small area similar in character to the drainage area for Outfall 006, and is reportedly inaccessible.

Regarding decommissioning activities, it is not known at this time whether they will result in the new or increased discharge of pollutants. The Permittee must revise its SWPPP and associated

BMPs in response to any changes that result in a significant effect on the potential for the discharge of pollutants, including a change in design, construction, operation, or maintenance. Part I.D.2.e of the Final Permit requires the Permittee to revise the SWPPP to reflect changes made to stormwater controls at PNPS. However, the Final Permit (Part I.B) clarifies that discharges of pollutants in stormwater associated with construction activity, including demolition of buildings, is not authorized. Similarly, the Final Permit does not authorize the discharge of pollutants in effluent associated with the dismantlement and decontamination of plant systems and structures or demolition of buildings. The Permittee must seek a permit modification or alternative NPDES permit coverage (e.g., the Construction General Permit) for authorization to discharge pollutants associated with these wastestreams. *See also* Response to Comment IV.5.1.

5.3 Additional Permit Conditions

EPA states that the lack of discharge related mortality events and recent gas saturation data (as well as pending shutdown in 2019) shows that gas bubble disease is unlikely to occur, therefore PNPS's draft permit does not include permit conditions requiring a fish barrier net or a maximum average dissolved nitrogen saturation level. This is unacceptably less stringent than the previous permit – the fish barrier net should be required, a maximum average dissolved nitrogen saturation level should be included, and PNPS should be required to shut down during certain time of the year when migrating fish are more likely to be impacted by operations.

Response to Comment 5.3

The commenter requests that the Final Permit include requirements to maintain a fish barrier net at the end of the discharge canal, a maximum average dissolved nitrogen saturation level in the discharge canal, and mandatory shutdown during certain times of the year to protect migrating fish. The comment suggests these requirements are necessary to prevent discharge mortality events related to gas bubble disease that were last observed in the 1970s. The Fact Sheet explains that such discharge mortality events are associated with the high temperature of this discharge, which can also result in supersaturation of dissolved nitrogen, both of which can result in mortality. Fact Sheet at 45. As the Agencies noted in the Fact Sheet, and the comment does not dispute, "[u]se of the barrier net was discontinued in 1995 because there had been 'no evidence of any significant thermal discharge related incidents for the past several years such . . . .'" *Id.* The Agencies further noted that dissolved gas saturation measurements from 2003 to 2012 indicated that dissolved nitrogen had exceeded the critical threshold for adult menhaden once in June 2005 and once in September 2009, both during low tide when contact with the bottom limits the extent of the plume outside of the discharge canal. PNPS has not reported any discharge related mortality events in the period since the Draft Permit was on public notice. A fish barrier net or dissolved nitrogen limitation do not appear to be necessary. As explained in the Introduction to this Response to Comment, PNPS ceased generating electricity on May 31, 2019, and the heated discharge from the main condenser has been terminated. Compared to the current permit maximum daily and delta-T limits of 102°F and 32°F, respectively, the Final Permit will achieve a 98% reduction in heat load. See Response to Comment I.3.4. This substantial reduction in the temperature of the discharge justifies the discontinuation of these conditions in the 1991 permit. The Final Permit does not include permit conditions requiring a barrier net or a maximum average dissolved nitrogen saturation level.

5.4 Endangered Species

EPA discusses a consultation between NOAA Fisheries (NMFS) and NRC concerning an assessment of the potential effects of PNPS operations on listed species as part of PNPS's renewal process in 2012. NMFS specified that re-initiation would likely be necessary when EPA reissued a revised NPDES permit. We recommend that a re-initiation would be appropriate given that EPA is revising PNPSs NPDES permit, the newly established, expanded critical habitat area for North Atlantic right whales in Cape Cod Bay,[45] the fact that more endangered right whales (including at least 1 calf)[46] are being sighted in the western part of Cape Cod Bay with more frequency than when PNPS's current NPDES permit was issued and when PNPS was relicensed in 2012, the current special concern status of rainbow smelt, and on-going moratorium on the take of river herring.

EPA outlines listed species in vicinity of PNPS in section 11.1, however no birds are listed. Roseate terns spend extended periods of time in close proximity to PNPS (within 4 miles) and PNPS's operations impinge fish species that terns rely on for prey (e.g., blueback herring, Atlantic menhaden).[47] Roseate terns should be considered.

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[45] Right whale distribution and occurrence is keyed directly to the plankton resources and the health of the population depends on the quality and quantity of the food that the whales obtain in all of their few known critical feeding habitats areas of which one is Cape Cod Bay. See: Memo to Jones River Watershed Association, Kingston, MA from Charles "Stormy" Mayo, Ph.D., Senior Scientist, Director, Right Whale Habitat Studies, Senior Advisor, Whale Disentanglement Program, Center for Coastal Studies, Provincetown, MA. Apr. 12, 2012.

[46] See Ecolaw letter to NOAA Fisheries. June 28, 2012. Re: Pilgrim Nuclear Power Station: Request to Reinitiate Consultation for Entergy Nuclear Generating Corporation Operating License Renewal. <http://www.capecodbaywatch.org/wpcontent/uploads/2013/01/06.28.12-final-nmfs-req-reinitiate-1.pdf?d23684>; Declaration of Regina Asmutis-Silvia, Whale and Dolphin Conservation, regarding the Jan. 2013 sighting of Wart and calf in Cape Cod Bay. Mar. 21, 2013.

[47] Affidavit of Ian Christopher Thomas Nisbet, Ph.D., from: JRWA and Pilgrim Watch Request to Reopen, For a Hearing, and to File New Contentions and JRWA Motion to Intervene on Issues of: (1) Violation of State and Federal Clean Water Laws; (2) Lack of Valid State § 401 Water Quality Certification; (3) Violations of State Coastal Zone Management Policy; and (4) Violation of NEPA.

Response to Comment 5.4

The comment indicates that re-initiation of ESA consultation is appropriate under the NPDES permit because the permit is being revised, the designated critical habitat for North Atlantic right whale has been expanded since the 2012 NRC consultation was completed, there have been more frequent sightings of right whales in western Cape Cod Bay in recent years and given the special concern status of rainbow smelt and river herring. EPA assessed the effects of the proposed re-issuance of the NPDES Permit for PNPS on listed species and critical habitat, including the indirect effects on prey and habitat. *See* Fact Sheet at 61-65.

EPA proposed that the re-issuance of the NPDES Permit for PNPS is not likely to adversely affect listed species or critical habitat in the action area, which includes Cape Cod Bay. In addition, EPA proposed that because the Draft Permit limits are as stringent or more stringent that the permit in effect at the time of the 2012 consultation with NRC, in which NOAA Fisheries found that the impacts of the proposed relicensing were unlikely to adversely affect listed species or designated critical habitat (including the continued operation in compliance with the administratively continued permit), re-initiation of formal consultation is not necessary at this time. *See* AR-698, AR-465. *See also* Fact Sheet at 54-65. NOAA Fisheries concurred with EPA's finding that re-initiation of consultation is not necessary for the Final Permit. *See* AR-694. All effects of the proposed action on listed species and designated critical habitat have been previously considered in the 2012 consultation and the analysis remains valid. In particular, the 2012 consultation already considered the effects to designated critical habitat for the North Atlantic right whale in Cape Cod Bay. In other words, the analysis remains valid even as the area of critical habitat was expanded in 2016 because the 2012 consultation already considered the impacts to designated critical habitat.

The comment also requests that EPA consider additional species in the ESA assessment, including rainbow smelt and river herring. The Fact Sheet (at 54-56) explains that Section 7(a) of the ESA requires Federal agencies, in consultation with and with the assistance of the Secretary of Interior, to ensure that any action that the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Rainbow smelt and river herring were not included in the ESA assessment because neither species is listed as federally threatened or endangered species. In other words, Section 7(a) does not apply to these species. Having said that, EPA did consider the potential impacts of the CWIS and effluent discharges on both species for the Draft Permit and again in responding to comments on the Draft Permit. *See*, *e.g*., Fact Sheet Attachment D at 26-27 and Response to Comment III.2.1.6. If a new species is listed (including either river herring or rainbow smelt), or critical habitat is designated or revised, and the species or habitat may be affected by the action, EPA will re-initiate consultation with the Services.

Finally, the comment requests that EPA consider impacts to roseate terns. The roseate tern is a federally threatened species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). EPA notified USFWS of the public notice for the Draft Permit but did not receive any comments. In response to this comment, EPA corresponded with USFWS regarding the potential impacts of the permit reissuance on roseate tern (*Charadrius melodus*) and red knot (*Calidris canutus rufa*). *See* AR-699. USFWS concurred with EPA's assessment that renewal of the PNPS NPDES permit may affect, but is not likely to adversely affect, any listed species or critical habitat under USFWS' jurisdiction. *See* AR-700.

5.5 Attachment B: Biological Monitoring

We support the requirement to continue to require biological monitoring after shutdown in 2019 to ensure monitoring of impingement and entrainment. After shutdown, impingement and entrainment monitoring will occur periodically when cooling withdrawals and circulating water pumps are operating. As long as PNPS's spent fuel pool requires cooling, we understand that cooling water will be used from Cape Cod Bay – therefore, we expect impingement and entrainment monitoring to be required until PNPS's spent fuel pool is no longer used, and the intake system is shut down permanently.

Winter flounder studies will cease after shutdown. However, Energy should be required to continue these studies in order to monitor any improvement to the populations after PNPS ceases operating. Entergy should be required to study and mitigate the impacts it has had over the past

40+ years, including at least 10 years after shutdown and certainly until decommissioning is completed.

Due to the discontinuance of the PATC, Entergy no longer carries out rainbow smelt studies but PNPS continues to impinge and entrain them with impunity. One study estimates that more than 1,300,000 rainbow smelt are killed each year by Entergy's operation of PNPS.[48] Smelt populations in the Jones River are erratic, and this species continues to be listed as of "special concern" by NMFS. The smelt studies should be reestablished.

[48] Based on data from 1974-1999; Stratus Consulting. 2002. Habitat-based replacement costs. Report for the U.S. EPA, Region 1.

Response to Comment 5.5

The comment supports the continued biological monitoring required in the Draft Permit and explained in Attachment B of the Draft Permit. The Draft Permit required weekly impingement monitoring and weekly entrainment monitoring during the peak season (March through October) prior to shutdown. As discussed in the Introduction to this Responses to Comment and in response to other comments, PNPS ceased electrical generating operations on May 31, 2019. As such, the pre-shutdown conditions related to biological monitoring have been eliminated from the Final Permit. The issues raised with the pre-shutdown monitoring requirements will not be addressed, because the pre-shutdown monitoring requirements are not in the Final Permit and will not go into effect.

Parts I.A.1, I.A.2, and I.C of the Final Permit, which is consistent with operations following shutdown of PNPS, requires the Permittee to meet flow limits that will achieve a flow reduction of greater than 92% as compared to the current permit. This flow reduction is commensurate with operation of closed-cycle cooling had the Facility continued to operate. In addition, the Permittee must maintain an actual through-screen velocity of no greater than 0.5 fps except when operating one of the circulating water pumps. When operating a circulating pump, which occurs for a limited time on a monthly basis, the Permittee must also continuously rotate the existing traveling screens. The Draft Permit proposed a reduced biological monitoring frequency following shutdown, including impingement monitoring once per week only when PNPS operates one of the circulating water pumps, and entrainment monitoring twice per month.

In consideration of this and other comments on the proposed biological monitoring in the Draft Permit, the Agencies have re-examined the Draft Permit's biological monitoring requirements. Monitoring requirements for impingement mortality in compliance with the 2014 Final Rule are established at 40 C.F.R. §§ 125.94(c) and 125.96(a). Monitoring requirements for entrainment are determined on a site-specific basis to meet the requirements established for minimizing entrainment at 40 C.F.R. § 125.94(d). *See* 40 C.F.R. § 125.96(b). Additional monitoring requirements may be required under 40 C.F.R. § 125.96(c). To demonstrate compliance with the flow reduction requirements, the Permittee must monitor flow daily at each pump and report the average monthly and maximum daily flows for each monitoring period. *See* Final Permit Parts I.A.1 and I.A.2. The flow reductions reflected in the Final Permit compared to the 1991 permit are similar to closed-cycle cooling, and entrainment performance commensurate with a closed-cycle recirculating system can be determined by reducing a baseline level of entrainment (E_B) by the percentage of flow reduced through the use of a closed-cycle cooling system. 79 Fed. Reg. at 48,378. To demonstrate compliance with the actual through-screen velocity, the Permittee must monitor the through-screen velocity at the intake screens daily. In lieu of monitoring, the Permittee may calculate the maximum through-screen velocity using water flow, depth, and open screen area. *See* Parts I.A.2 and I.C.2 of the Final Permit. *See also* 40 C.F.R. § 125.94(c)(3). Facilities complying with an actual through-screen velocity of 0.5 fps in compliance with the BTA standard for impingement mortality under 40 C.F.R. § 125.94(c)(3) are not subject to biological compliance monitoring unless otherwise specified by the permitting authority. *See* 79 Fed. Reg. 48373. *See also* 2014 Final Rule Response to Comments at 271 ("biological compliance monitoring is no longer required for pre-approved and other approvable technologies in 40 CFR 125.94(c)(1) through (5) of today's rule beyond that required for the permit application, and monitoring may be greatly reduced for facilities choosing other compliance alternatives"), 277.

The Agencies have determined that part of the BTA to minimize impingement mortality (in addition to meeting a through-screen velocity no greater than 0.5 fps when operating only the SSW pumps) includes limiting operation of one of the circulating water pumps to no more than 48 hours in a calendar month and continuously rotating the screens when a circulating water pump is in operation. The Final Permit requires impingement monitoring of the traveling screens once per month when operating a circulating pump. *See* Part I.C.6 and Attachment B of the Final Permit. After considering Entergy's comments and the expected operation of a circulating pump, the Agencies have determined that monthly monitoring is a sufficient frequency. Given the uncertainty in how PNPS will operate the pumps over the calendar month, the Final Permit requires one 8-hour collection per month *to the extent practicable* and requires the Permittee to provide an explanation in the Annual Biological Monitoring Report when impingement sampling was fewer than 8 hours in a single month. In other words, the Agencies do not intend for the Permittee to operate a circulating water pump solely to meet the 8-hour monitoring period requirement if it does not otherwise need to operate a pump for that long to meet its operational needs. In addition, EPA typically recommends that impingement monitoring captures three time periods: morning, afternoon, and night and in fact, the Draft Permit did require monitoring over three time periods. The Final Permit requires that, to the extent practicable, impingement monitoring be conducted such that a morning, afternoon, and night sample are collected over three consecutive months. The Permittee must provide an explanation in the Annual Biological Monitoring Report when collection over three time periods in three months is not practicable, however. The Final Permit also includes a new requirement that the traveling screens be visually inspected daily and retains the Draft Permit's conditions for continuous operation of the traveling screens and reporting in the event of an unusual impingement event. *See* Part I.A.20 of the Final Permit. Finally, the Final Permit allows the Permittee to request elimination or a reduction in frequency of impingement monitoring after a minimum of two years. *See also* Response to Comment I.5.1 (regarding anti-backsliding provisions as they relate to biological monitoring requirements).

The effective BTA requirements upon issuance of the Final Permit include limiting flow from the cooling water intake structure commensurate with a 92% reduction as compared to pre-shutdown volumes (for entrainment) and, for the majority of time, maintaining an actual through-screen velocity at the existing traveling screens of 0.5 fps or less (for impingement mortality). PNPS must monitor flow continuously and report the average monthly and maximum daily flows at Outfalls 001 and 010, which will ensure compliance with the requirement to achieve a 92% reduction in flow. The Permittee must perform limited, monthly impingement monitoring when a circulating water pump is operating (i.e., when the actual intake velocity is greater than 0.5 fps). *See* Response to Comment III.8.1. Finally, there is an extensive record of entrainment at PNPS's CWIS dating back to 1980 and the baseline entrainment density under the pre-shutdown flow regime is well documented. As a result of shutting down, PNPS has reduced its flow commensurate with closed-cycle cooling. The benefits of this flow reduction can be calculated using the existing record of entrainment and the actual flow at PNPS without additional monitoring. For this reason, the Final Permit does not require biological monitoring for entrainment. *See* Responses to Comments I.4.1 and III.8.1.

6.0 Comments: NPDES Standard Conditions, Part II.A, General Requirements

6.1 Violations of Permit Standards and Requirements

Part I, Duty to Comply, reads, "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." However, Entergy has been in noncompliance with the current permit in a variety of ways discussed in our comments above (e.g., not carrying out required storm drain testing for nearly a decade, disbanding the required PATC that watched over marine impacts, exceeding effluent limits for a variety of pollutants).

These violations should be "grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application." It is clear that enforcement of NPDES requirements have been woefully inadequate in the past. EPA and MassDEP should hold Entergy accountable for past violations and ensure this pattern does not continue with the new permit. It is imperative that EPA and MassDEP hold Entergy accountable to NPDES limits and requirements in order to effectively reduce impacts to Cape Cod Bay.

Response to Comment 6.1

EPA's Environmental Compliance Assurance Division (ECAD) tracks permit violations and determines the appropriate enforcement action based on the frequency, magnitude, and severity of violations. *See* Response to Comment I.3.5

The requirement to convene and utilize a Pilgrim Technical Advisory Committee (PTAC) for this site was not a permit condition, as the PTAC was convened prior to when operations at Pilgrim were initiated. Therefore, the disbanding of the PTAC would not be considered a permit violation. As noted earlier, even though the PTAC is no longer active, EPA, MassDEP, and fisheries agencies that formerly comprised the PTAC have coordinated on the reviews of past biological monitoring conducted at Pilgrim Station. *Also see* Response to Comment I.5.1.

II. COMMENTS SUBMITTED BY ASSOCIATION TO PRESERVE CAPE COD (APCC)[31]

1.0 Comments on the Draft Permit

In March of 2014 APCC completed a study of the environmental impacts of Pilgrim on Cape Cod Bay and Cape Cod (copy attached and included in comments).[[32]] APCC identified a number of problems and concerns. Since the release of that report, APCC has become increasingly concerned about Pilgrim's risk to the environment and Entergy's declining performance, particularly related to safety and the environment. It is APCC's view that the draft NPDES permit in its present form violates federal and state law and cannot be issued as a final permit. The draft permit merely protects the status quo and does nothing to work toward the elimination of pollutants or implementation of the best technology available. The draft permit condones decades of regulatory neglect and allows the polluter to shift the cost of pollution to the taxpayers.

In 1972, with the passage of comprehensive amendments to the Federal Water Pollution Control Act, this country embarked on a mission to eliminate water pollution. Indeed, the goal was to eliminate all pollution discharges into the navigable waters of the United States by 1985. The goal to eliminate fisheries-related water pollution that impaired the propagation of fish and/or shellfish was to be no later than 1983, 33 U.S.C. § 1251. The principal purpose of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). Unfortunately, the purpose of the National Pollutant Discharge Elimination System (NPDES)—to eliminate pollutant discharges and reach the state goal of the law—was overlooked in drafting the permit currently under review.

NPDES permits in theory are short term permits (five years) that allow regulators and polluters to review developing technologies and implement/require the best available technology economically achievable (BAT) so that discharges and environmental harm can be minimized and ultimately eliminated. For Pilgrim there were at least four permit renewal cycles completely lost to bureaucratic inefficiency—1996, 2001, 2006, and 2011. By delaying issuance of an updated NPDES permit for Pilgrim Nuclear Power Station, the Environmental Protection Agency (EPA) ignored the basic tenets of the CWA and allowed the polluter, Entergy, to avoid and delay implementation of BTA. Now, with the plant in its twilight, EPA has again refused to require implementation of BTA and erred in not requiring implementation of long-proven technologies to eliminate thermal and radioactive pollution discharges and protect fish and shellfish propagation. In determining what is economically achievable at Pilgrim, the economic analysis should be based on at least 23 years (1996-2019) of return on investment and not on what appears to be the remaining three years of the plant's possible operation. Closed cycle

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[31] On July 14, 2016, EPA received a series of emails expressing support for, but not adding to or modifying, the comments from the Association to Preserve Cape Cod (APCC) from the following individuals: C. Staff, R. Summersgill, M. Sabin, A. Rosenkranz, L. Roscoe, E. Ridge, B. Nevin, D. Langeland, P. Gadsby, B. Forgione, C. Fischer, J. Coyle, R. Smith Coté, M. Burgess, S.V. Walker, C. Wolcott, T. and L.A. Zicko, and R. Brown. Our responses to APCC's comments, therefore, also respond to these emails.

[32] Statements from the referenced APCC document are reproduced in Comment II.2.0 below.

technology is economically achievable in less than 20 years. Brayton Point is an excellent local example of the economics of closed cycle technology. While EPA identified operational differences between fossil fuel and nuclear generating facilities, EPA relied primarily on an outdated biased report completed at the behest of Entergy. The literature indicates that the concern for implementation of closed cycle BTA is purely economic and not operational.

Based upon the EPA's own press releases (e.g. Settlement Will Spur Major Environmental Improvements at Brayton Point Power Plant, Release Date: 12/17/2007), closed cycle technology to reduce thermal pollution by as much as 95 percent has been well-accepted and would curb Pilgrim's thermal discharge into Cape Cod Bay. Indeed, when Entergy purchased Pilgrim in 1999 it did so knowing that Pilgrim's NPDES permit was expired and that closed cycle technology was the best technology available (BTA) for limiting thermal pollution discharges and minimizing fisheries harm. Entergy also knew that the EPA was struggling to perfect a regulatory framework for economic achievability of BTA. (See, Entergy Corp. v. Riverkeeper, Inc., 129 S. Ct. 1498 (2009). By 2001, EPA required closed cycle technology for all new power plants; Entergy should have known that BTA would be required for all power plants unless the owner could demonstrate that it was not economically feasible.

Further, according to these same EPA press documents, implementation of a closed cycle cooling system takes less than three years. At a minimum, the Pilgrim permit should require a three-year implementation deadline for closed cycle technology. There is no guarantee the plant will close by 2019 other than Entergy's stated intention. The permit should put the plant on the definite track to implement BTA or closure by 2019. The plant's nuclear license expires in 2032 so there is potential for more than a decade of operation without BTA. According to EPA estimates this would mean loss of another 15 billion fish from Cape Cod Bay. This requirement is essential, especially if Entergy should change its mind or find a buyer interested in continued operation of the plant. The plant should not be allowed to operate beyond 2019 without a BTA cooling system.

In addition to reducing thermal pollution, closed cycle cooling systems reduce large-scale impingement and entrainment of fish and shellfish. Justice Scalia noted in the cited Entergy decision that "closed-cycle cooling systems could reduce impingement and entrainment mortality by up to 98 percent." Entergy's own 2007 Environmental Impact Statement (EIS) for relicensing Pilgrim identified 91 different species of marine and diadromous fish entrained or impinged in the Pilgrim existing cooling system. This is more species than EPA identified. In the 2007 EIS, Entergy concluded that the existing cooling system was having "moderate" impacts on winter flounder, an important bottom-dwelling commercial and recreational species. While the nation spends more than a billion dollars of taxpayers' money on fisheries management and protection, the EPA allows Entergy to operate a fisheries Cuisinart essentially for free on the shores of Cape Cod Bay, one of the most important fisheries grounds in the country.

The history of Pilgrim's chronic discharge of radioactive substances into the environment and towards Cape Cod Bay is well documented in the EIS and Entergy's own monitoring reports. For example, in some cases discharges of tritium exceeded federal drinking water standards, and tritium flow pathways were towards Cape Cod Bay. The fact sheet attached to the draft NPDES permit does not properly address discharges of radioactive substances such as tritium as a pollutant, nor does it address the duration of the leakage. Moreover, the fact sheet does not indicate that anyone other than Entergy has determined that the leakage has been fully addressed. Tritium discharges must either be expressly permitted or treated as a violation of the CWA. The EPA has for too long ignored the reported violation of the CWA. Radioactive discharges from Pilgrim pose a regional threat to environmental quality, human health and the health of Cape Cod Bay's ecosystems. Additional monitoring and operating conditions must be added to the permit specifically for tritium, but also for other radioactive discharges. The monitoring must include the determination of any health impacts on shellfish and fish in Cape Cod Bay. This monitoring must begin immediately and continue well beyond cessation of operations at the plant.

According to the EPA, "stormwater runoff is generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. The runoff picks up pollutants like trash, chemicals, oils, and dirt/sediment that can harm our rivers, streams, lakes, and coastal waters. To protect these resources, communities, construction companies, industries, and others, use stormwater controls, known as best management practices (BMPs). These BMPs filter out pollutants and/or prevent pollution by controlling it at its source." In its recently enacted Massachusetts municipal separate storm sewer system (MS4) general permit, the EPA articulated a comprehensive and modern approach to stormwater management. The Pilgrim draft permit overlooks and ignores all of the technological improvements in stormwater management. Foremost, the draft permit fails to require reduction or even the monitoring of pollutants being discharged directly into Cape Cod Bay via the various permitted and existing stormwater discharges. Secondly, there is no requirement to identify and correct illicit discharges from Pilgrim. Lastly, there is no requirement for employee education and training related to stormwater management.

The draft permit does not contain a site-specific variance from the national performance standards. Any variance from the regulatory requirements, including avoidance of BTA, requires a site specific analysis of both environmental impacts and the economics of remediation/ correction. The harms at Pilgrim include thermal pollution of Cape Cod Bay, tritium leakage, and fisheries impingement and entrainment. (See APCC report attached.) Ultimately, a variance does not appear warranted in the totality of the facts and history surrounding Pilgrim.

Entergy is also well aware of the Commonwealth of Massachusetts regulations regarding cooling water intake structures (CWIS). See, Entergy Nuclear Generation Co. v. Dept. of Environmental Protection, 459 Mass. 319 (2011). As noted in the decision affirming the state's right to regulate thermal pollution, the state must consider adding appropriate conditions, including mandating BTA cooling systems to the subject discharge permit. The state has not added appropriate conditions to the permit as required by the Massachusetts Clean Waters Act and the decision in the Entergy DEP case. As drafted, the permit violates the Massachusetts Clean Waters Act.

Cape Cod Bay is a unique and precious resource. Key natural resources include shellfish beds, commercial and recreational fisheries, wildlife that includes rare species, robust fish habitat and miles of adjacent coastal habitat including beach, bays and salt marsh. The draft permit does nothing to protect these important CWA resources and actually promotes additional degradation. Considering more than 20 years of EPA effort went into crafting this permit, to say that APCC is disappointed is the understatement of the year. In essence the permit turns the technology clock back to 1970 and allows Entergy to proceed at full speed ahead with business as usual. Without a requirement to phase in BTA, the draft permit violates the CWA. Without appropriate stormwater management conditions, the draft permit violates the CWA. Without appropriate monitoring conditions, the draft permit violates the CWA. For these reasons as well as express CWIS violations, the permit also violates the Massachusetts Clean Waters Act.

Response to Comment 1.0

APCC comments that the Draft Permit violates both the CWA and the Massachusetts Clean Water Act because it does not include a requirement to phase in best technology available (BTA), appropriate stormwater management conditions, or appropriate monitoring conditions. The Agencies address each of these points below and, where appropriate, refer to responses to similar issues raised in the comments submitted by JRWA et al. and addressed in Section I of this Responses to Comments.

In addition, the comment identifies issues with effluent limitations and conditions from the Draft Permit that apply prior to the cessation of power generation at PNPS. The Agencies have reviewed and considered comments on limits and conditions that apply both prior to and after shutdown. However, as explained in the Introduction to this Responses to Comments, PNPS ceased generating electricity on May 31, 2019. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the electric generation facility, which would have been effective prior to the shutdown date, are no longer applicable. For this reason, the Agencies have not included the pre-shutdown effluent limitations and conditions in the Final Permit.

Turning to the requirements for the CWIS, the comment argues that the Draft Permit does not require the Permittee to implement the BTA to minimize impingement and entrainment. In some ways, the comment appears to reflect a misunderstanding of section 316(b)'s requirement that cooling water intake structures "reflect the best technology available for minimizing adverse environmental impact"—often referred to as BTA and decided in a process referred to as a BTA determination. While closed-cycle cooling is generally considered the best *performing* technology for minimizing entrainment and impingement, it is not necessarily the best technology *available* (i.e., BTA) for every facility. Under the Final Rule—and similar to EPA's historic practice—a permitting authority undertakes a site-specific inquiry to determine the BTA at a particular facility, considering a number of relevant factors, such as numbers and types of organisms entrained, impact of pollutants associated with entrainment technologies, land availability, remaining useful plant life, and social benefits and costs. 40 C.F.R. § 125.98(f). While the comment suggests that the only relevant factor is economic feasibility and that otherwise a facility should be required to install closed-cycle cooling, this view is not supported by the regulatory framework set out in the Final Rule.[33] *Id.* Attachment D of the Fact Sheet

[33] The comment also asserts that an "economic analysis" of closed-cycle cooling should be "based on at least 23 years (1996-2019) of return on investment and not on what appears to be the remaining three years of the plant's possible operation." The Agencies did not, however, reject closed-cycle cooling based on economic considerations. Nor would anything in the Act or the Final Rule require the backward-looking analysis sought by the commenter.

explains the basis for the site-specific BTA determination in this permit proceeding, including the consideration of factors in 40 C.F.R. § 125.98(f).

In any event, the Final Permit requires the Permittee to meet flow limits that are comparable to those that could be achieved with operation of closed-cycle cooling at PNPS. The post-shutdown flow limits in the Final Permit for Outfall 010, which is the primary intake and discharge during shutdown, result in a 96% reduction in cooling water flow as compared to the current permit limits. The Final Permit also authorizes the operation of one of the circulating water pumps to support shutdown operations for no more than 48 hours over a single calendar month. Together, the total flow at the cooling water intake structure on an average monthly basis represent a 92% reduction in flow as compared to the current permit, which equates roughly to a 92% reduction in entrainment. The expected net reduction in flow if PNPS had installed closed-cycle cooling would have been 91%. *See* Fact Sheet, Att. D at 45. In other words, the Final Permit requires the Permittee to meet flow limits comparable to the operation of closed-cycle cooling at PNPS. That PNPS did not install closed-cycle cooling to meet the flow reductions, as a result of the shutdown, does not diminish the environmental benefits gained by reducing impingement mortality and entrainment under the new flow limits.[34] EPA maintains that the BTA performance standards in the Final Permit, which require PNPS to achieve a flow reduction greater than 92% as a monthly average and achieve a through-screen velocity of 0.5 fps (except when operating a circulating water pump up to 48 hours per month), satisfy the BTA for impingement and entrainment at PNPS. This site-specific determination was made under 40 C.F.R. § 125.98(g) in consideration of the relevant factors at § 125.98(f)(2) and (3) and the impingement mortality BTA standards at § 125.94(c). As such, this determination is consistent with CWA § 316(b). *See also* Response to Comment I.4.2.

The Final Permit's flow limits, which reflect operations following shutdown, also result in a substantial reduction in the heat load to Cape Cod Bay. Under the current permit, which reflects operating conditions for generating electricity at PNPS, the total heat load to Cape Cod Bay from

[34] APCC comments that closed-cycle cooling could have been implemented at PNPS in less than three years, citing an EPA press release related to the NPDES Permit for the Brayton Point Power Station. A key factor in the Agencies' decision not to require closed-cycle cooling was that PNPS was scheduled to close in 2019, roughly three years from the issuance of the Draft Permit, and that the technology, even if construction began soon thereafter, would not be operational before the scheduled closure. *See* Fact Sheet, Att. D at 75-77. This decision is consistent with the Final Rule, which requires consideration of the useful life of the plant when establishing entrainment controls. *See* 40 C.F.R. § 125.98(f)(2)(iv); *see also* 79 Fed. Reg. at 48,342, 48,366. Moreover, the cited press release does not support the commenter's claim. The press release regarding the Brayton Point Station reports a schedule for that facility of three years, commencing only after the facility obtained "all of the required construction and operating permits and approvals," which the press release suggests could take at least an additional year-and-a-half. Based on the available information, EPA concluded that cooling towers at PNPS "are likely to take a minimum of 4 years to construct." Fact Sheet, Att. D at 76. Thus, the cited press release does not support the commenter's claim that "implementation of a closed cycle cooling system takes less than three years" and is not inconsistent with EPA's conclusion about timing at PNPS. Moreover, the commenter essentially asserts, without any explanation, that the Agencies should have required PNPS to begin construction on a closed-cycle cooling system on the basis of a Draft Permit. Note that the NPDES Permit for Brayton Point Station requiring the technology was issued in 2003 and that construction did not begin until 2009, fully 6 years after the Final Permit was issued. Even had PNPS begun construction in 2016 based on issuance of the Draft Permit, the cooling towers would only have been operable for, at most, a few months before the Facility shut down. Entergy did shut PNPS down on May 31, 2019, and the Facility is now achieving flow reductions commensurate with operation of closed-cycle cooling.

the circulating water pumps was about 14,304 mm BTU/day. The Final Permit limits (maximum daily flow of 19.4 MGD and delta-T of 10°F) result in a 98.6% decrease in the heat load to Cape Cod Bay. This reduction in heat load will ensure protection and propagation of a balanced, indigenous population in Cape Cod Bay and is consistent with the reduction in heat load that would be achieved through operation of closed-cycle cooling. Temperature monitoring at the monitoring point for Outfall 001 will confirm the extent to which the effluent from Outfall 010 is mixed prior to discharge. *See also* Response to Comment I.3.4.

APCC requests that the Final Permit include additional monitoring and operating conditions for tritium and other radioactive discharges. According to the comment, discharges of tritium at PNPS have exceeded federal drinking water standards and the fact sheet does not properly address discharges of radioactive substances such as tritium as a pollutant. APCC requests that the Final Permit expressly authorize the discharge of tritium and include appropriate permit conditions and monitoring requirements, or these discharges should be treated as a violation of the CWA. These comments reflect an additional misunderstanding about the Clean Water Act—in particular, its role in the regulation of discharges of radioactive materials. While the CWA defines "pollutant" to include "radioactive materials," that definition does not include radioactive materials regulated by the NRC under the Atomic Energy Act. *See also* 40 C.F.R. § 122.2 (defining "pollutant" to include "radioactive materials," "*except* those regulated under the Atomic Energy Act of 1954 (AEA), as amended (42 U.S.C. 2011 et seq.).)" (emphasis added). In *Train v. Colorado Public Interest Research Group*, 426 U.S. 1 (1976) (hereinafter, "*Train*"), the Supreme Court upheld this view, interpreting the term "pollutant" at CWA § 502(6) consistent with EPA's regulatory definition at 40 C.F.R. § 122.2. The Court held that "special nuclear materials," "by-product," and "source materials" are not encompassed within the CWA's definition of "pollutant." In other words, the Court agreed with EPA that these materials are not "pollutants" within the meaning of the CWA and, thus, not within EPA's authority to regulate; at the same time, the Court did not contest EPA's general authority under CWA to regulate discharges of pollutants. EPA does not regulate discharges of tritium under the CWA because it is a byproduct material as defined in Section 11e(1) of the Atomic Energy Act and is regulated by the NRC under 10 C.F.R. Part 30. *See also* 10 C.F.R. § 20.1003. Entergy began routine monitoring of groundwater wells for tritium in 2007. Under the current program, well and surface water samples collected by Entergy are sent to an independent analytical lab and duplicate samples are provided to Massachusetts Department of Public Health (MassDPH) for analysis at the Massachusetts Environmental Radiation Lab. MassDPH provides quarterly updates on groundwater and surface water results.[35] Neither Entergy nor MassDPH has indicated that the groundwater monitoring program at PNPS will be discontinued now that PNPS has shut down. Finally, although NRC oversees and regulates the decommissioning of nuclear power plants, the NRC and the EPA have signed a memorandum of understanding on the consultation and finality on decommissioning and decontamination of contaminated sites that may be relevant to the comment, even if outside the scope of the NPDES permit. *See* AR-695. Under the MOU, if, during the license termination process NRC determines that there is radioactive groundwater contamination above certain limits, NRC will consult with EPA, consistent with its authority

[35] Monitoring data are available to the public at https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station.

under CERCLA, on the appropriate approach in responding to the circumstances at sites with groundwater contamination.

Other than tritium, the comment does not establish which additional radioactive discharges should be addressed with additional monitoring and conditions. Consistent with *Train*, the Final Permit does not regulate special nuclear materials, by-product, or source materials, since these are not "pollutants" under the CWA. *See* Draft Permit, Part I.D.15. *Train* and the years of NPDES permitting of nuclear power plants across the country support the view that Congress intended that effect be given to both the CWA and the AEA, where possible, and that nuclear power plants would be regulated under the CWA insofar as they use cooling water intake structures and discharge pollutants within the meaning of CWA. To the extent that APCC is including radioactive discharges that are regulated under the Atomic Energy Act, these constituents are not included in the NPDES permit because they are not regulated as pollutants under the CWA. At the same time, under the AEA and Reorganization Plan No. 3 of 1970, EPA is responsible for establishing standards for radiation releases and doses to the public from normal operation of nuclear power plants and other uranium fuel cycle facilities. *See also* 35 FR 15623, 15624 (Oct. 6, 1970). The NRC is responsible for implementing and enforcing these standards, including to ensure that radiological releases from PNPS are protective of public health. *See* 40 C.F.R. Part 190. *See also* 42 Fed. Reg. 2860 (Jan. 13, 1977). EPA's role in establishing such standards does not derive from the Clean Water Act, and therefore is not implemented via a NPDES permit. EPA has responded to similar comments regarding EPA's oversight of radioactive materials in Responses to Comments I.2.6 and III.7.0. MassDPH oversees a monitoring program for nuclear power station emergency planning zones, including at PNPS. The Massachusetts Bureau of Environmental Health monitors radiation at a series of stationary monitors surrounding PNPS. These data are transmitted to MassDPH, which ensures real-time environmental monitoring of radiation from PNPS. The Radiation Control Program also monitors radiation levels in surface water, sediment and biota, and fish and shellfish around PNPS. *See* AR-701.

Further, Part I.A.23 of the permit states "The discharge of radioactive materials shall be in accordance with and regulated by the Nuclear Regulatory Commission (NRC) requirements (10 C.F.R. Part 20 and Technical Specifications set forth in facility operating license, DPR-35)." To allow MassDEP to review information generated by the Permittee regarding these NRC requirements, and to ensure that MassDEP is aware of potential impacts to Massachusetts waters and aquatic life, MassDEP has added Parts I.H.4 and 5 to the Final Permit and Conditions 2 and 3 to its Water Quality Certificate.

APCC comments that the Draft Permit fails to require reduction or monitoring of pollutants being discharged directly into Cape Cod Bay via stormwater discharges. Permit limits and conditions for stormwater discharges at PNPS were included in Parts I.C.1, I.C.2, I.C.3 and I.H of the Draft Permit and are included in Parts I.A.5, I.A.6, I.A.7, and I.D of the Final Permit. Stormwater discharged from Outfalls 004, 005, 006, and 007 is subject to limits on total suspended solids, oil and grease, and pH. *See* Fact Sheet at 29-31. A subset of the electrical vaults which discharge stormwater to the authorized stormwater outfalls must be monitored for a suite of parameters including total suspended solids, copper, iron, lead, and pH, among others. In addition, the Draft Permit requires sampling from all 25 electrical vaults at least once during the permit term. *Id*. The Draft Permit also requires the Permittee to implement BMPs and document its actions in a Stormwater Pollution Prevention Plan (SWPPP), which must include a site description of stormwater activities (including stormwater flows, monitoring locations, control measures, conveyances, and exposures), a summary of pollutant sources, and a description of stormwater controls. *See* Fact Sheet at 53-54. APCC does not explain which of these stormwater limits and requirements are inadequate nor does it request any specific changes to the stormwater requirements in the Draft Permit or why such changes are required under state or federal law.

APCC also comments that the Draft Permit does not include a requirement to identify and correct illicit discharges or a requirement for employee education and training related to stormwater management. Part I.D.1 of the Final Permit requires preventative maintenance and spill prevention measures to avoid releases of pollutants into stormwater and employee training to ensure personnel understand the stormwater requirements. Part I.D.2.c requires the Permittee to conduct regular inspections of all areas with industrial materials or activities exposed to stormwater and report leaks or spills and tracking or blowing of materials to exposed areas. Part I.B of the Permit requires the Permittee to report any discharges of wastewater from any other point sources not authorized by this permit within 24 hours. Furthermore, Part II of the Final Permit incorporates the NPDES Standard Conditions, including the Duty to Mitigate, which requires the permittee to "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. *See* 40 C.F.R. § 122.41(d).

APCC comments that the Draft Permit does not address technological improvements in stormwater management. While APCC does not elaborate on specific improvements that the Draft Permit lacks, it does reference generic stormwater controls, or best management practices (BMPs), and the approach to stormwater management in the Massachusetts municipal separate storm sewer system (MS4) general permit. The non-numeric BMPs and SWPPP requirements in the Draft Permit are consistent with EPA's 2015 Multi-Sector General Permit (MSGP) for stormwater associated with industrial activity.[36] This General Permit is the more appropriate reference for controlling discharges of stormwater associated with industrial activity, such as at PNPS. The Final Permit retains the effluent limitations, monitoring requirements, and non-numeric, technology-based limits from the Draft Permit.

Partially in response to this comment, EPA has revised how the non-numeric, technology-based limits are presented in the Final Permit to improve consistency with the 2015 MSGP. Part I.D of the Final Permit (Special Conditions) includes two separate sections: best management practices (BMPs) and stormwater pollution prevention plan (SWPPP). The first section describes the BMPs that must be implemented, consistent with the 2015 MSGP, to minimize pollutant discharges from stormwater associated with industrial activity. The Final Permit includes a brief description of each of the BMPs and refers the Permittee to Part 2.1.2 of the 2015 MSGP, which includes a more detailed discussion of potential control measures to address each of the BMPs. These include minimizing exposure of stormwater to processes and material storage areas, good housekeeping measures, preventative maintenance programs, spill prevention and response, erosion and sediment controls, runoff management practices, proper handling, and minimizing dust. The Final Permit also requires the Permittee to implement employee training to ensure

[36] The 2015 MSGP is available at https://www.epa.gov/npdes/stormwater-discharges-industrial-activities.

personnel understand the stormwater related requirements of the permit, including staff responsible for stormwater controls, staff responsible for storage and handling of materials that may be exposed to stormwater, and staff responsible for inspections. The BMPs from the MSGP were developed using best professional judgement to result in the reduction or elimination of pollutants from stormwater discharges associated with industrial activity and generally correspond to the six minimum control measures in the Massachusetts municipal separate storm sewer system (MS4) general permit.[37] The second section describes the required elements of the SWPPP that will document how the BMPs in the first section are implemented. Together, the numeric limits, monitoring requirements, and non-numeric limits in the Draft Permit will ensure that pollutants being discharged directly into Cape Cod Bay via stormwater discharges are minimized.

APCC comments that the Draft Permit "does not contain a site-specific variance from the national performance standards" and maintains that "[a]ny variance from the regulatory requirements, including avoidance of BTA, requires a site specific analysis of both environmental impacts and the economics of remediation/correction." The comment suggests that the type of impacts to be analyzed at PNPS include "thermal pollution of Cape Cod Bay, tritium leakage, and fisheries impingement and entrainment," citing a Position Statement APCC attached to its comments. *See* Comment II.2.0. The comment is muddled and conclusory. It fails to explain what APCC considers a variance or provide a statutory or regulatory citation specifying any particular variance. Nor does it identify, or explain the basis for, a specific approach that the Agencies should have taken. As explained in Section 6.0 of the Fact Sheet, the technology-based and water quality-based effluent limitations are consistent with regulations for establishing limitations, standards, and other permit conditions at 40 C.F.R. § 122.44. The BTA requirements for the CWIS in the Final Permit are based on a site-specific analysis and are consistent with national performance standards under the 2014 Final Rule. *See* 40 C.F.R. §§ 125.94(c), 125.98(f), 125.98(g); *see also* Response to Comment I.4.2. The Final Permit's temperature limits at Outfall 010 result in a 98% reduction in the heat load to Cape Cod Bay. The Agencies determined that the pre-shutdown temperature limits in the Draft Permit, which were based on a variance from water quality and technology-based limits, would assure the protection and propagation of the balanced, indigenous population (BIP) of shellfish, fish, and wildlife in and on Cape Cod Bay consistent with the criteria for determining alternative effluent limitations under CWA § 316(a). *See* 40 C.F.R. part 125, subpart H; Fact Sheet at 45-50 and Attachments B and C. The criteria and standards for determination of thermal limits under § 316(a) are provided in 40 C.F.R. § 125.73 and do not require an economic analysis. Because the Final Permit thermal limits are more stringent and will result in a substantial reduction in the heat load to Cape Cod Bay, the Agencies have determined that these limits will assure the protection and propagation of BIP. *See also* Responses to Comment I.3.1, I.3.4. The Agencies have already addressed APCC's comments on tritium leakage above.

APCC states that MassDEP must establish "appropriate conditions" in the Final Permit for the cooling water intake structure, including mandating closed-cycle cooling, which the commenter views as being required by the Massachusetts Clean Waters Act (MCWA) and the Supreme Judicial Court of Massachusetts ("SJC") decision in *Entergy Nuclear Generation Co. v.*

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[37] Stormwater Management: Summary of the Six Minimum Control Measures for the Small MS4. https://www3.epa.gov/region1/npdes/stormwater/ma/six-minimum-control-measures.pdf

Massachusetts Department of Environmental Protection, 944 N.E.2d 1027 (Mass. 2011) (hereinafter, *Entergy v. MassDEP*). According to APCC, without such conditions, the Draft Permit violates the MCWA. The comment fails, however, to explain or support this position in any meaningful way. We agree that the SJC held in *Entergy v. MassDEP* that MassDEP is authorized to regulate cooling water intake structures under the MCWA, but the comment points to nothing in the opinion that dictates a particular BTA determination or prohibits the determination the Agencies made in this permit proceeding. Similarly, the comment fails to cite to any provision of the MCWA or its implementing regulations mandating a determination that closed-cycle cooling is the BTA at PNPS. EPA and MassDEP work cooperatively to develop and issue NPDES permits. The effluent limitations and permit conditions, including those applicable to the CWIS, were established pursuant to the CWA and the MCWA.

EPA and MassDEP agree that Cape Cod Bay is a unique and precious resource that provides excellent habitat for shellfish, fish, including commercially and recreationally important fisheries, and wildlife, swimming and boating opportunities, and excellent aesthetic value. The effluent limitations, monitoring requirements, and permit conditions in the Final Permit, including limits that require the Permittee to maintain substantial reductions in flow (and thus impingement and entrainment) and heat load, will ensure compliance with applicable water quality requirements.

2.0 Summary Comments from APCC Attachment[38]

Regarding Pilgrim, many organizations, agencies and officials have identified threats to human health and safety. Potential threats to the Cape's environment and resources have received less attention. Human health and environmental quality are linked. Our statement therefore focuses on the potential threats posed by Pilgrim to the Cape's environment as summarized below:

Summary Statement 1: Safety issues at Pilgrim include power outages, a power-down in July 2013 due to seawater being too warm to cool the reactor, a fire that could have damaged the reactor, storage of spent nuclear fuel in overcrowded spent-fuel-pools, partial blockage of an emergency cooling system by mussels, and vulnerability to natural hazards and terrorism. In January 2014 the NRC downgraded Pilgrim's performance to "degraded"; only seven other nuclear power facilities in the nation are in this performance category. These issues point to aging infrastructure, outdated systems, failure to account for climate change, and inadequate maintenance, oversight and regulation. Safety issues increase the risk of a serious accident occurring that could damage the Cape's environment.

> <u>Safety Issues at Pilgrim</u>: Safety issues at Pilgrim point to aging infrastructure, outdated systems of cooling and operation, failure to take account of changes in ocean temperature affecting cooling, inadequate maintenance, oversight, and regulation. Safety issues are of great concern because they indicate below-par performance that raises the risk of harm to

[38] To its comment letter on the Draft Permit, APCC attached a "Position Statement on Pilgrim Nuclear Power Station" dated March 17, 2014. In the interest of brevity, the Agencies have reproduced verbatim summaries of APCC's statements from the document's executive summary as well as the individual "Statements" and the "Conclusion" from the main document. The Agencies have considered the content of the entire document and included it in the administrative record.

humans and the environment from ongoing operations or a nuclear accident. APCC believes that Pilgrim's inability to meet existing safety and performance requirements calls for termination of their permits.

Summary Statement 2: Pilgrim is causing environmental impacts nearby and in Cape Cod Bay, namely: release of radioactive materials, including releases of tritium into groundwater that exceed drinking water standards; impingement and entrainment of 90+ species of fish and shellfish which is affecting some species at the population level; discharge of heated seawater into Cape Cod Bay resulting in a thermal plume, erosion, barren and stunted areas, warm-water algal growth, and increased thermal burden on marine ecosystems that are already experiencing warming; potential impacts on rare species, fish and wildlife; and cumulative impacts of all of the above. Such impacts are unacceptable. Furthermore, regulatory agencies have allowed these impacts to continue, increasing the chances that a larger area such as Cape Cod will eventually be affected.

<u>Release of Radioactive Materials</u>: Radioactive discharges from Pilgrim pose a regional threat to environmental quality, human health and the health of Cape Cod Bay's ecosystems. Discharges of radioactive tritium into groundwater pose a threat to Plymouth's sole-source aquifer and to Cape Cod Bay's water quality and ecosystems. APCC believes that Pilgrim's discharge of radioactive materials should cease and that permits allowing for discharge should be terminated.

<u>Seawater intake system impacts commercially and recreationally important fisheries in Cape Cod Bay</u>: Pilgrim's once-through seawater intake system adversely impacts commercially and recreationally important species of fish that are experiencing declines. Many local, state and federal agencies, organizations (including APCC) and citizens have expended time, effort and millions of dollars to protect and restore fisheries and their habitat. Allowing these impacts to continue counteracts protection and restoration efforts and represents a failure by regulators to protect fisheries. APCC believes that these impacts are unacceptable and should be ended.

<u>Cumulative impacts of thermal plume and warming sea temperatures</u>: Pilgrim's discharge of heated seawater is environmentally detrimental and adds to the thermal burden on fish, wildlife and marine ecosystems that are already experiencing warming to climate change. These cumulative impacts could result in a tipping point for some marine species. Also, as ocean temperature continues to rise, it is uncertain whether Pilgrim can safely continue operations. APCC believes that discharge of heated seawater poses unacceptable risks for marine ecosystems and that Pilgrim's discharge permit should be terminated.

<u>Changes in rare species, fish and wildlife populations were not considered</u>: The environmental impact analyses for relicensing Pilgrim did not account for changes in the distribution of rare species, fish and wildlife populations that occurred after the permit was issued. This raises the risk that Pilgrim will cause impacts because permit conditions based on old information are not protective enough.

Cumulative impacts of fish impingement/entrainment, radioactive releases, thermal discharges and climate change were not adequately evaluated or regulated: Cumulative impacts of fish impingement and entrainment, radioactive releases, thermal discharges and climate change were not adequately evaluated or regulated. Given Pilgrim's inability to avoid causing impacts, APCC believes that Pilgrim represents a serious threat to Cape Cod's resources and its permits should be revoked.

Summary Statement 3: The Fukushima nuclear disaster provided important lessons: a) improbable accidents occur, and b) if an accident results in major radioactive contamination, there can be serious and widespread impacts on water resources, fish, wildlife, food webs, crops, the economy, human populations and society.

Lessons learned from Fukushima and other Nuclear accidents. Nuclear accidents can release radioactive materials into the environment that can enter the food web. The scale of impacts on humans and living organisms can range from individuals to populations and ecosystems. Most impact studies have focused on human health risks rather than effects of radiation on other living organisms or ecosystems. Despite the relative lack of studies on ecological effects, APCC believes that decision makers should proactively take steps to protect our resources from the effects of a nuclear accident.

All of Cape Cod lies within a 50-mile radius from the Pilgrim Nuclear Power Station [(17)]. If a nuclear accident were to occur at Pilgrim, impacts on Cape Cod would depend on many factors: the type and extent of the accident, amount and type of radiation released, human responses, prevailing weather and ocean currents, environmental conditions, and the types of resources impacted. However, if a radioactive plume or fallout were to reach Cape Cod, we are concerned that the following impacts could occur:

- Contamination of shellfish beds, aquaculture, and fishing areas;
- Contamination of water bodies (both freshwater and marine) affecting aquatic ecosystems and public uses;
- Contamination of drinking water supplies;
- Contamination of land, soil and sediments;
- Impacts on life, including plankton, invertebrates, fish, shellfish, wildlife, plants, their habitats, food webs, and ecosystem processes;
- Closure of swimming beaches;
- Impacts on local agriculture;
- Economic impacts resulting from the above; and last but not least,
- Impacts on Cape Cod's residents and communities due to health risks, dislocation, economic impacts and social disruption.

A nuclear accident at Pilgrim has the potential to significantly damage the Cape's environment, natural resources and economy. Given Pilgrim's safety record and history of causing impacts, we believe that it is unlikely that Pilgrim will be able to upgrade its facilities to ensure full safety and avoid impacts.

Therefore, APCC calls for Pilgrim's permits to be terminated and for the facility to be decommissioned. We also call on public officials and regulatory agencies to:

- Provide full regulatory oversight of the decommissioning process, including implementation of safeguards to protect public health and the environment before, during and after the decommissioning process, as outlined in NRC's process for decommissioning (35);
- Require storage of all spent fuel rods in dry cask storage, which represents the safest storage system in the absence of a national repository (36);
- Implement a radiation monitoring system on Cape Cod that includes monitoring of air, water, fish and shellfish, with reports to the public on a regular basis;
- Expand emergency planning throughout the 50-mile-radius zone to protect Cape Cod's residents and natural resources;
- Find safer and less polluting alternative energy sources for Pilgrim's customers. Replacing nuclear energy with greenhouse-gas-producing energy sources such as natural gas or other fossil fuels is not a satisfactory long-term solution, as climate change is also impacting the environment (19);
- Support scientific research on the effects of radiation on ecosystems; and
- Form an independent commission to oversee decommissioning of Pilgrim, to review progress and to identify problems to be addressed to help ensure safe and effective decommissioning.

Response to Comment 2.0:

In Comment II.1.0, APCC raised issues related to the facility's cooling water intake structure as well as issues related to its discharge of heated effluent and stormwater. The comment also raised issues related to the discharge of radioactive materials regulated by the NRC (including tritium) that are not "pollutants" under the CWA. *See* Response to Comment II.1.0. As referenced in, and in apparent support of, Comment II.1.0, APCC submitted a "Position Statement on Pilgrim Nuclear Power Station" (hereinafter referred to as the "Position Statement") that APCC apparently approved in March 2014, over two years before the Agencies issued the Draft Permit and roughly a year and a half before Entergy announced its plans to shut the plant down. As a result, the Position Statement does not take PNPS' shutdown into account or comment on the limits and conditions in the Draft Permit. The Position Statement includes general statements about APCC's view of the facility's then on-going impacts to the environment. Below, the Agencies provide general responses. *See In re Town of Concord*, 16 E.A.D. 514, 539-40 (EAB 2014). Furthermore, many of our responses and explanations in Response to Comment II.1.0 apply to concerns reiterated by APCC in the Position Statement. In addition, because the Position Statement was apparently prepared in 2014, prior to issuance of the Draft Permit, it is unclear if APCC statements therein calling for termination of "Pilgrim's permits" are intended to refer to the NPDES permit or the NRC licenses.

The Position Statement provides APCC's position on the impacts of PNPS on the environment of Cape Cod Bay, including impacts arising from "safety issues," which the Position Statement states "are of great concern because they indicate below-par performance that raises the risk of harm to humans and the environment from ongoing operations or a nuclear accident." We first reiterate that safety issues and performance of the plant, including with respect to "nuclear accidents," are overseen by the Nuclear Regulatory Commission (NRC); EPA and MassDEP, through the NPDES permit, regulate the intake of seawater and discharges of pollutants to Cape Cod Bay. EPA also works separately with the NRC to set air emissions and drinking water standards for radioisotopes, however, NRC is ultimately responsible for the enforcement of those standards as to certain radioactive materials, including tritium. *See* 10 C.F.R. Part 20; 40 C.F.R § 122.2 (defining "pollutant"). *See also* Responses to Comments I.2.2, I.2.5, IV.3.5. With respect to the concern about safety issues raising the risk of harm from "ongoing operations," PNPS ceased generating electricity on May 31, 2019. APCC does not explain how safety issues purportedly affecting electricity generating operations are still applicable to the NPDES permit. In addition, neither in Comment II.1.0 nor in the Position Statement, does APCC explain the impact such safety issues must have on the limits and conditions in the permit applicable to the post-shutdown period, other than to state that "Pilgrim's permits" should be "terminated" and the facility decommissioned. As has already been discussed, PNPS has shut down and is entering a decommissioning phase of its own accord. Termination is not necessarily appropriate for all facilities as soon as they cease operating. For instance, PNPS will continue to discharge pollutants in stormwater exposed to industrial equipment and activities at the site. *See also* Response to Comment I.2.2, I.3.5. The comment also does not explain why permit termination is required by law.

The Position Statement also discusses APCC's position on the environmental impacts related to the release of radioactive materials; impacts from the permitted withdrawals and discharges, including impingement and entrainment; impacts from the discharge of heated seawater; potential impacts on rare species, fish and wildlife; and cumulative impacts of all of the above, particularly in conjunction with climate change. We have already addressed many of these issues in Response to Comment II.1.0, above. For instance, the NRC is responsible for enforcing regulations concerning discharges of radioactive materials regulated pursuant to the Atomic Energy Act. Impacts from impingement and entrainment associated with the facility's cooling water intake structure are expected to decrease significantly because the Final Permit establishes flow limits that are significantly lower than those in the previous permit and similar to flows associated with closed-cycle cooling. With respect to impacts from the plant's thermal discharge, the Final Permit's flow limits also result in a 98% reduction in the heat load to Cape Cod Bay. *See also* Responses to Comments I.2.2, I.3.4.

In preparing the Draft and Final Permit, EPA also considered potential impacts to federally endangered and threatened species using the most recent information of these species' distributions. *See* Fact Sheet at 54-65. In response to comments received on the Draft Permit, EPA consulted with the United States Fish and Wildlife Service. *See* Response to Comment I.5.5. APCC's comments do not provide any information on changes in the distribution of particular species that EPA should have considered in this permit proceeding. As explained above, the Agencies conclude that the 92% reduction in flow combined with the 98% reduction in heat load and the other water quality and technology-based effluent limits and conditions in the Final Permit will ensure the protection of the aquatic community in Cape Cod Bay, including rare species. See also Responses to Comments in Sections I.3, I.4., and I.5.

The APCC Position Statement also raises impacts to human health and the environment from the 2011 nuclear accident at the Fukushima Daiichi Nuclear Power Plant in Japan and other nuclear accidents. APCC's comments do not include any specific recommendations for the PNPS NPDES Permit related to such accidents, however, stating in the Position Statement only that "decision makers should proactively take steps to protect our resources from the effects of a nuclear accident." EPA is committed to ensuring public safety and protecting the environment. Under the Final Rule, if the owner or operator of a nuclear facility demonstrates to the permitting authority, upon the permitting authority's consultation with the NRC, that compliance with the Final Rule "would result in a conflict with a safety requirement established by" the NRC, the permitting authority must establish site-specific BTA requirements that would not result in a conflict with the safety requirement. 40 C.F.R. § 125.94(f); *see also* Response to Comment III.3.1. The permittee has not made any such demonstration with respect to PNPS. The Position Statement also includes a list of recommendations for "public officials and regulatory agencies." APCC does not explain how any of these recommendations should be incorporated into the permit or are even within the scope of a NPDES Permit. While the decommissioning process is overseen and regulated by the NRC, licensees are required to comply with the CWA for any discharges of pollutants (as defined under the CWA) to waters of the U.S. during that process. In Response to Comment IV.5.1, the Agencies clarify that the Final Permit authorizes only those discharges that the permittee disclosed to the Agencies and adequately characterized; several specific discharges are not authorized under the Final Permit. The conditions and limits in the Draft Permit were not intended to cover, for instance, discharges associated with construction activity which, in this case, would include discharges related to the dismantlement of plant structures, systems, and buildings, as well as dust suppression water. Any request for a permit modification to authorize coverage for construction-related stormwater discharges must be accompanied by a sufficiently detailed characterization of the types of activities, effluent, and outfalls that the request for authorization covers. The Agencies will evaluate such requests in accordance with the CWA and MCWA. In addition, the investigation and clean-up of contamination from non-radiological, hazardous materials at the site may also be addressed by EPA and/or MassDEP under the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 et seq., or other state environmental laws. *See also* Response to Comment IV.5.1.

III. COMMENTS SUBMITTED BY ENTERGY

1.0 Introduction

Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc. (collectively, "Entergy"), respectively the owner and operator of Pilgrim Nuclear Power Station ("Pilgrim" or "PNPS"), are the applicants for a renewed, jointly issued National Pollutant Discharge Elimination System ("NPDES") and Massachusetts Clean Waters Act ("MCWA") permit, NPDES Permit No. MA0003557. On May 18, 2016, United States Environmental Protection Agency, Region 1 ("EPA") and the Massachusetts Department of Environmental Protection ("DEP") issued: (1) the Draft Authorization to Discharge Under the National Pollutant Discharge Elimination System, including Attachments A through C (collectively, the "Draft Permit"), as well as (2) the Fact Sheet, including Attachments A through E thereto (collectively, the "Fact Sheet"; on a consolidated basis, the "Draft Permit package").[1]

Entergy respectfully submits the following comments ("Comments") on the Draft Permit, which reflect terms and conditions that Entergy supports, subject to the corrections and clarifications provided in the Comments below. These Comments also include, as a separate attachment, exemplary revisions to the factual aspects of the proposed Fact Sheet, provided to ensure that EPA and DEP's stated rationale is both correct and supports issuance of the final permit (the "final Permit").[2]

It is worth underscoring that Entergy appreciates the efforts of EPA and DEP with respect to the Draft Permit package. Entergy specifically appreciates EPA and DEP's acknowledgement of the United States Nuclear Regulatory Commission's ("NRC") exclusive jurisdiction over nuclear operations and activities, including with respect to radioisotope discharges. In our experience, the express acknowledgement of NRC's jurisdiction helps to clarify for the public the impropriety of comments to EPA and DEP related to nuclear operations and activities, including with respect to radioisotope discharges and decommissioning, all in a manner that reduces extraneous comments. Entergy further appreciates the incorporation into the Draft Permit of conditions relating to Pilgrim's planned cessation of electricity generation ("shutdown") in 2019. The inclusion of pre-shutdown and post-shutdown conditions allows the public to better understand Pilgrim's NPDES activities over the next five years, particularly during a period of transition.

These Comments are organized as follows. The first Section below, titled "Environmental Context," summarizes the extensive, robust and consistent scientific record demonstrating that Pilgrim's cooling water intake structure ("CWIS") operations have had no more than a *de minimis* adverse environmental impact on the aquatic community of Cape Cod Bay, and that Pilgrim's operations continue to ensure the protection and propagation of the balanced indigenous population (or community)[3] of fish, shellfish and wildlife. With that context in mind, Entergy's specific comments on the Draft Permit and Fact Sheet, contained in the "Discussion of Draft Permit Language" Section below, proceeds in nine (9) Subsections. Subsection I addresses the impropriety, as a matter of law or fact, of what on the face of the Draft Permit appears to be a condition that requires PNPS to shutdown no later than June 1, 2019 and immediately thereafter enter into decommissioning, both actions within the sole control of Entergy and NRC. Subsection II addresses the volumetric flow limitations proposed by the Draft Permit after shutdown, in particular for service water, which represents the primary continuing (albeit, greatly reduced) discharge during that period. Subsection III addresses the Draft Permit's proposed thermal discharge and backwashing limitations. Subsection IV addresses the Draft Permit's chlorine and boron limitations. Subsection V requests clarification of the Draft Permit's definition of "toxic pollutant" to make clear that it does not include radionuclides. Subsection VI addresses post-shutdown biological monitoring. Subsection VII focuses on Fact Sheet statements concerning listed species and essential fish habitat. Subsection VIII addresses electrical vaults limitations. Finally, Subsection IX addresses the use of PNPS's sea foam suppression system.

Entergy submits these Comments subject to the following understandings and reservations of rights:

We understand that, as reflected in the Draft Permit,[4] EPA and DEP plan to issue a final Permit that will function as both a NPDES and an MCWA discharge permit, each pursuant to EPA's and DEP's respective laws and procedures. However, the Draft Permit is not clear as to the source of authority for particular sections. Accordingly, Entergy directs these Comments to both EPA and DEP, and specifically requests that each agency clarify which aspects of the final Permit has been issued pursuant to the CWA, as distinct from the MCWA.

Under EPA's and DEP's respective permitting procedures, each agency is required to respond, in writing, to comments on the Draft Permit, including these Comments.[5] Accordingly, Entergy respectfully requests either separate responses to these Comments from both agencies, or some designation within a combined response that identifies the responding agency, e.g., "Response [by DEP]."

Under EPA's and DEP's respective permitting procedures, each agency also is required to prepare and issue a fact sheet or statement of basis for draft surface water discharge permits, including the Draft Permit.[6] The Fact Sheet also is not clear as to the source of authority for the various determinations relevant to the Draft Permit, and how those determinations relate to the federal CWA, the MCWA or both.[7] Accordingly, Entergy directs its Comments on the Fact Sheet to both EPA and DEP, and respectfully requests that each agency clarify those aspects of the Fact Sheet that are pursuant to the federal CWA, as distinct from the MCWA.
Entergy also reserves its right to supplement these Comments as appropriate, including for the purpose of responding to comments submitted by other members of the public or responses to comments by EPA and DEP.[8]

Finally, and consistent with Entergy's longstanding commitment to environmental stewardship and collaboration with regulators, Entergy stands ready to respond to requests for additional information that may be needed by EPA or DEP to issue an informed and factually supported final Permit and fact sheet.

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[1] *See* Joint Public Notice of a Draft National Pollutant Discharge Elimination System ("NPDES") Permit to Discharge into the Waters of the United States Under Section 301, 316(a), and 402 of the Clean Water Act , as Amended, and Request for State Certification under Section 401 of the Act, NPDES Permit No. MA0003557, Public Notice No. MA-010-16 (May 18, 2016) ("Public Notice"). The Public Notice originally set a comment period from May 18, 2016 to July 18, 2016. EPA and DEP subsequently extended the public comment period to July 25, 2016, scheduling a public hearing for July 21, 2016. *See, e.g.*, Joint Extension of Public Comment Period and Public Notice of a Public Hearing Pertaining to the Issuance of a Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge into the Waters of the United States Under Sections 301, 316(a), and 402 of the Clean Water Act ("CWA" or the "Act"), as Amended, and Under Sections 27 and 43 of the Massachusetts Clean Waters Act, as Amended, NPDES Permit No. MA0003557, Public Notice No. MA-012-16 ("Public Notice Extension").
[2] With respect to the Fact Sheet, Entergy suggests a meeting with EPA and DEP to best ensure that the facts required to support the final Permit are accurate and complete.
[3] EPA's regulations implementing Section 316(a), 33 USC § 1326(a), use the perm population and community interchangeably, as do these Comments. *See, e.g.,* 40 C.F.R. § 125.71(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… .").
[4] *See* Draft Permit, Part I.I, at 41.

5 *See* 40 C.F.R. § 124.17; 314 Code Mass. Regs. § 2.09.
6 *See, e.g.*, 40 C.F.R. § 124.8; 314 Code Mass. Regs. § 2.05(1).
7 *See* Fact Sheet at 32, 36, 45, 50, 70.
8 *See* 40 C.F.R. § 124.19; 314 Code Mass. Regs. § 2.08(2)-(3); 310 Code Mass. Regs. § 1.0 *et seq*.

Response to Comment 1.0:

In its comment Entergy provides a framework for its written comments on the Draft Permit and submits its understanding of the responsibilities of EPA and of MassDEP in jointly issuing the NPDES permit for PNPS. EPA and MassDEP acknowledge the permittee's support for the Draft Permit generally, including as it applies to the bifurcation of permit limits and conditions applicable before and after the anticipated cessation of power generation at PNPS which was completed on schedule on June 1, 2019. The Agencies have reproduced Entergy's written comments verbatim and respond to Entergy's more detailed comments in sections of this document that follow Entergy's introductory comment.[39] The Agencies also recognize and have reviewed Entergy's revisions to the 2016 Fact Sheet, which has been included in the Administrative Record for this permit proceeding. *See* AR-719. A Fact Sheet is prepared for a Draft Permit and is typically not reissued based on comments submitted on the Draft Permit. *See* 40 C.F.R. §§ 124.8, 124.56. The Agencies will not reissue the Fact Sheet that accompanied this Draft Permit or individually address each revision made by the permittee; however, we have included specific examples of language from those revisions where such examples are significant or otherwise aid or clarify the position of either the Agencies or the permittee in responding to the written comments below.

In response to the permittee's comment that jurisdiction over radioisotope discharges lies exclusively with the United States Nuclear Regulatory Commission's (NRC), EPA reiterates that the definition of "pollutant" at 40 C.F.R. § 122.4 encompasses radioactive materials but expressly excludes "those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)." As the Fact Sheet (at 37) explains:

> EPA and the NRC, in the past, have signed a Memorandum of Understanding (MOU) which specifies that EPA will be responsible for the water quality aspects of the discharge in concert with the State, and the NRC will be responsible for the levels of radioactivity in the discharge. Thus, the draft permit addresses only the chemical aspects of water quality and does not regulate radioactive materials encompasses within the Atomic Energy Act's definitions of source, byproduct, or special nuclear materials. *See Train v. Colorado Public Interest Research Group*, 426 U.S. 1, 25 (1976) (holding that "the 'pollutants' subject to regulation under the [CWA] do not include source, byproduct, and special nuclear material.") All NRC radioactive discharge requirements will continue to be in effect, as required, in 10 C.F.R. Part 20 and plant technical specifications.

Having said that, the permittee's characterization of NRC's "exclusive jurisdiction over nuclear

[39] For instance, we do not agree with Entergy's general comment above that PNPS' cooling water intake structure "operations have had no more than a *de minimis* adverse environmental impact on the aquatic community of Cape Cod Bay," as explained in Responses to Comments III.2.0 and III.2.1.

operations and activities" more broadly could potentially encompass the intake and discharges regulated under the NPDES program. To the extent that the permittee means to differentiate the regulation of radioactive materials regulated under the Atomic Energy Act of 1954 and the act of decommissioning, EPA generally agrees that these activities are under the jurisdiction of NRC. *See also* Response to Comment III.7. The Final Permit continues to authorize and regulate the intake and discharges subject to the NPDES program. *See* CWA § 402(a); 40 C.F.R. §§ 122, 124, 125, 126.

Finally, Entergy notes its understanding of the duality of the permit as issued jointly by EPA and the Commonwealth of Massachusetts. As noted on Page 41 of the Draft Permit, this authorization to discharge includes two separate and independent permit authorizations: (i) a federal National Pollutant Discharge Elimination System permit issued by the U.S. Environmental Protection Agency (EPA) pursuant to the Federal Clean Water Act, 33 U.S.C. §§1251 et seq.; and (ii) an identical state surface water discharge permit issued by the Commissioner of the Massachusetts Department of Environmental Protection (MassDEP) pursuant to the Massachusetts Clean Waters Act, M.G.L. c. 21, §§26-53, and 314 CMR 3.00.

This response document has been prepared jointly by EPA and MassDEP to address significant comments on the Draft Permit. Likewise, the Final Permit was developed jointly by EPA and MassDEP. The permit authorization also incorporates the state water quality certification issued by MassDEP under § 401 of the Federal Clean Water Act, 40 C.F.R. 124.53, M.G.L. c. 21, §27 and 314 CMR 3.07. All of the requirements (if any) contained in MassDEP's water quality certification for the permit are incorporated by reference into this state surface water discharge permit as special conditions pursuant to 314 CMR 3.11(11)(a).

2.0 Environmental Context

Before turning to a discussion of the Draft Permit, the focus of which is on Section 316, 33 U.S.C. § 1326, Entergy respectfully submits this summary of the extensive, robust and continuous review, as compiled and analyzed by leading national biologists and statisticians,[9] of Pilgrim's potential impacts on the aquatic ecosystem in Cape Cod Bay over the last nearly half century. As summarized below, this scientific record demonstrates that Pilgrim's historic operations have had no more than a *de minimis* adverse environmental impact to the aquatic ecosystem, including as a result of impingement and entrainment ("I&E") mortality.[10] This scientific record further demonstrates that PNPS's continued operations have in the past and will continue to ensure the protection and propagation of the balanced, indigenous aquatic population (community) of fish, shellfish and wildlife.

For nearly a half century, PNPS's leading national experts have performed a robust suite of integrated environmental monitoring programs that collected and analyzed a wide range of I&E, as well as source of waterbody, aquatic population and aquatic community, data.[11] The plans for these studies, and the studies themselves, were conducted under the direction, oversight and review of EPA, DEP and, for a subset of those years, a specially constituted technical advisory committee (the "PATC").[12] Thus, and to date, for example, Pilgrim's experts have issued 87 semi-annual biological monitoring reports, each charting the health of the aquatic ecosystem and the absence of Pilgrim's impacts.[13]

In addition to this continuous dataset of biological monitoring reports, PNPS's owners and operators over the years have commissioned object-specific studies. Major areas of focus for these studies have included the potential impacts of Pilgrim's operations on: (1) phytoplankton and zooplankton; (2) intertidal and subtidal benthic communities in western Cape Cod Bay; (3) larval, juvenile and adult fish of species of particular concern, including winter flounder, rainbow smelt, cunner, and American lobster; and (4) long-term I&E.[14]

Of particular importance to the Draft Permit, in 2008, Entergy's leading national biological and statistical experts issued an "*Adverse Environmental Impact Assessment for Pilgrim Nuclear Power Station*" ("AEI Report") demonstrating that "operation of the [PNPS] CWIS has not adversely affected populations of any of the species . . . representative of the impinged and entrained organisms at [PNPS] and therefore of [PNPS's] potential I&E effects."[15] The AEI Report findings – which were updated with new I&E data covering the 2008-2013 period in what is hereinafter called the "2014 Update,"[16] and through 2014 in the most recent annual biological monitoring report (the "2015 Biological Report")[17] – represent the best available scientific evidence.[18] As detailed below, these twin reports underscore the absence of discernible adverse environmental impact, as contemplated by Section 316(b); impairment of the balanced indigenous community, as contemplated by Section 316(a); or impairment of Commonwealth water quality standards ("MWQS"). Indeed, in the 2014 Update, these leading national experts concluded, *inter alia*, that the "long-term trend in annual dominance diversity values over the 1980 through 2013 time-series … indicat[es] a stable [aquatic] community…."[19]

Likewise of importance to the Draft Permit are the various thermal studies. The first reports were published contemporaneous with Pilgrim's commencing operations in 1974 and 1976,[20] and supplemented in 1995.[21] Additional focused assessments of the potential effect of PNPS's thermal discharges on Cape Cod's aquatic ecosystem were published in two separate Section 316(a) demonstrations, the first performed in 1975 by Stone and Webster Engineering Corporation ("Stone and Webster"), and the second in 2000 by ENSR Corporation ("ENSR"). ENSR concluded, based on the then-thirty-year record of study, that PNPS's thermal discharges to Cape Cod Bay had caused no prior appreciable harm to representative important species ("RIS"), and by extension to the aquatic community, and would not do so in the future.[22]

In view of this uniquely robust, continuous and verified record, it is unsurprising that, in the Fact Sheet for the Draft Permit, EPA and DEP conclude not only that this record is sufficient, but also that PNPS's continued operations "will assure the protection and propagation of the balanced, indigenous population."[23]

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[9] With exception of Dr. Barnthouse who is traveling internationally, affidavits from these respective experts, attaching their respective curriculum vitae ("CVs"), were provided to EPA and DEP in 2008, and are herein provided to reflect updated CVs and current validation of historic documents. Dr. Barnthouse's affidavit will be provided upon his return to the United States.

[10] *See* 40 C.F.R. § 125.94(c)(11).

[11] *See, e.g.*, AKRF, Inc., LWB Environmental Services, Inc. and Normandeau Associates, Inc., *Adverse Environmental Impact Assessment for Pilgrim Nuclear Power Station* (June 2008), at 7-11; Entergy Nuclear Operations, Inc., *Proposal for Information Collection to Address Compliance with Clean Water Act §316(b) Phase II Regulations: Pilgrim Nuclear Power Station* (Oct. 6, 2006) ("PIC").

[12] While it functioned, the PATC consisted of representatives from the federal and Commonwealth water and fisheries resource agencies, as well as technical experts from regional public institutions and the Station. Entergy

has continued to provide, on an annual basis, copies of its annual Marine Ecology Reports to those individuals who sat on the PATC when it stopped meeting, and has responded to occasional questions received from former PATC members as they have arisen. *See, e.g.*, Letter from Elise N. Zoli, on behalf of Entergy, to Tom Chapman, U.S. Fish & Wildlife Service (July 13, 2012), Appendix A, at A-2, *available at* http://adams.nrc.gov/wba (Accession No. ML12207A583).

13 *See* PNPS's annual biological monitoring reports (also called ecological studies), which have previously been provided to EPA. These reports followed pre-operational environmental monitoring that began in 1969, and continued until operation began, thus ensuring robust comparison of pre- and post-operational conditions. *See* PIC at 1. In addition, many ecological studies (1969-1982) were summarized in a peer-reviewed scientific publication titled "*Observations of the Ecology and Biology and Western Cape Cod Bay, Massachusetts*," edited by J.D. Davis and D. Merriman (1984).

14 *See* PIC at 9-14. These studies include: (1) R.C. Toner, *Phytoplankton of Western Cape Cod Bay* (1984); (2) R.C. Toner, *Zooplankton of Western Cape Cod Bay* (1984); (3) J.D. Davis and R.A. McGrath, *Some Aspects of Nearshore Benthic Macrofauna in Western Cape Cod Bay* (1984); (4) SAIC, *The Ichthyoplankton of Cape Cod Bay* (1992); (5) G. Matthiessen, *The Seasonal Occurrence and Distribution of Larval Lobsters in Cape Cod Bay* (1984); (6) R.P. Lawton, *et al.*, *Fishes of Western Inshore Cape Cod Bay: Studies in the Vicinity of the Rocky Point Shoreline* (1984); (7) R. Lawton, *et al.*, *Final Report on Bottom Trawl Survey (1970-1982) and Impact Assessment of the Thermal Discharge from Pilgrim Station on Groundfish* (1995); (8) B. Kelly, *et al.*, *Final Report on Haul Seine Survey and Impact Assessment of Pilgrim Station on Shore-Zone Fishes, 1981-1991* (1992); (9) M.D. Scherer, *The Ichthyoplankton of Cape Cod Bay* (1984); (10) R.D. Anderson, *Impingement of Organisms at Pilgrim Nuclear Power Station* (1999); and (11) T. Horst, *et al.*, *Seasonal Abundance and Occurrence of Some Planktonic and Ichthyofaunal Communities in Cape Cod Bay: Evidence for Biogeographical Transition* (1984). Many of these studies may be found in volume 11 of Davis and Merriman (1984), *see supra* note 11.

15 AEI Report at 34.

16 The AEI Report was updated in August 2014, as Attachment 4 to the report entitled "*Engineering Response Supplement to United States Environmental Protection Agency CWA §308 Letter: Pilgrim Nuclear Power Station, Plymouth, Massachusetts*"(hereinafter "2014 Engineering Response Supplement"), prepared on a lead consultant basis by Enercon Services, Inc. ("Enercon") and submitted on behalf of Entergy in response to a May 14, 2014 informational request by EPA to Entergy pursuant to Section 308 of the Clean Water Act. *See* 2014 Engineering Response Supplement, Attach. 4, Normandeau Associates, Inc. Biological Input.

17 The 2015 Biological Report, *Marine Ecology Studies Pilgrim Nuclear Power Station, Report No. 85, January 2014 – December 2014*, April 30 2015, includes three reports prepared by Normandeau Associates, Inc.: *Winter Flounder Area Swept Estimate Western Cape Cod Bay 2014* ("Normandeau 2015a"); *Ichthyoplankton Entrainment Monitoring At Pilgrim Nuclear Power Station, January – December 2014* ("Normandeau 2015b"); and *Impingement of Organisms on the Intake Screens at Pilgrim Nuclear Power Station, January – December 2014* ("Normandeau 2015c").

18 2014 Engineering Response Supplement, Attach. 4, Normandeau Biological Input, at 2-6 (providing updated information); AEI Report at 15; *see, e.g.*, *San Luis & Delta-Mendota Water Auth. v. Jewell*, 747 F.3d 581, 602 (9th Cir. 2014) (noting that under "best available scientific information" standard, agencies "cannot ignore available biological information" or "disregard available scientific evidence that is in some way better than the evidence it relies on" (quoting *Kern County Farm Bur. v. Allen*, 450 F.3d 1072, 1080-81 (9th Cir. 2006)).

19 2014 Engineering Response Supplement, Attach. 4, Normandeau Biological Input, at 4; *see also* AEI Report at 16-34.

20 *See, e.g.,* Pagenkopf, *et al.*, *Circulation and Dispersion Studies at the Pilgrim Nuclear Power Station, Rocky Point, MA* (1976), *in Marine Ecology Studies Related to the Operation of Pilgrim Station*, Semi-annual Report No. 7; Pagenkopf, *et al.*, *Oceanographic Studies at Pilgrim Nuclear Power Station to Determine Characteristics of Condenser Water Discharge* (1974).

21 *See* EG&G, *Pilgrim Nuclear Power Station Cooling Water Discharge Bottom Temperature Study, August, 1994* (1995).

22 *See* ENSR, *§316 Demonstration Report-Pilgrim Nuclear Power Station*, Document Number 0970-021-200, prepared for Entergy Nuclear Generation Company (2000) (hereinafter "ENSR (2000)"); Stone and Webster, *§316 Demonstration: Pilgrim Nuclear Power Station – Units 1 and 2* (1975).

23 Fact Sheet at 70.

Response to Comment 2.0:

In the comment, Entergy quantifies the biological studies completed on behalf of PNPS and concludes that, on the basis of these studies, the operations at PNPS have not caused and will not cause either adverse environmental impact as contemplated by § 316(b), impairment of a balanced, indigenous population of shellfish, fish and wildlife as contemplated by § 316(a), or impairment of water quality standards.

Turning first to the effluent limitations for the discharge of heat established under § 316(a), EPA and MassDEP agree that, on the basis of the demonstration and the thermal studies conducted at PNPS, the pre-shutdown temperature limits in the Draft Permit, which are consistent with those in the 1991 Permit, have not resulted in appreciable harm and assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife on and in Cape Cod Bay. *See* Fact Sheet at 70 and Attachments B and C. Having said that, PNPS ceased operating as of May 31, 2019 and, at that time, terminated the discharge of condenser cooling water, which comprised the majority of heated effluent in the discharge. The post-shutdown thermal limits at the remaining cooling discharge, Outfall 010, which are based on the anticipated needs of the Facility during shutdown, are substantially more stringent than the pre-shutdown. The resulting heat load represents a 98% reduction as compared to the pre-shutdown conditions.

In its discussion of § 316(b), the commenter argues that the operations at PNPS have had no more than a de minimis adverse environmental impact to the aquatic ecosystem, including as a result of impingement and entrainment mortality. The comment also states that the biological studies conducted at PNPS "underscore the absence of discernable adverse environmental impacts as contemplated by Section 316(b)." EPA disagrees both with the comment that PNPS has not had any adverse environmental impact on Cape Cod Bay and that the impacts have been de minimis. The Fact Sheet (Attachment D at 23) clearly explains that the loss of billions of eggs and larvae and thousands of adult and juvenile fish each year as a result of entrainment and impingement at PNPS is an adverse impact. EPA continues:

> …the preamble to the Final 316(b) Rule for Existing Facilities generally refers to impingement and entrainment mortality associated with the withdrawal of cooling water through a CWIS as an adverse environmental impact. *See, e.g.*, 79 Fed. Reg. at 48,318-21 and 48,328 ("EPA interprets section 316(b) to require the Agency to establish a standard that will best minimize impingement and entrainment—the main adverse effects of cooling water intake structures . . . ."). Thus, 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 constitutes adverse environmental impact under CWA § 316(b). EPA Region 1 has established, in the discussion above, that PNPS is responsible for the loss of billions of eggs and larvae, and millions of fish and other aquatic organisms annually as a result of the operation of its CWIS. Consistent with the Final Rule, these losses represent an adverse environmental impact to Cape Cod Bay.

Fact Sheet Attachment D at 24. EPA considered the biological data referenced in the comment during development of the Draft Permit, including the 2008 AEI Report (AR-105). Entergy does not provide any explanation or evidence to dispute the determination of adverse impact in the

Fact Sheet, nor does the comment raise any new arguments or evidence which would alter EPA's determination since the issuance of the Draft Permit. On the contrary, the Fact Sheet demonstrates and these responses to comments confirm, that entrainment and impingement at PNPS's CWIS is an adverse environmental impact to the waterbody. See Response to Entergy's Comment 2.1 (below). EPA considers the loss of billions of organisms taken from Cape Cod Bay ecosystem and killed by PNPS's CWIS as an adverse impact that needs to be addressed under CWA § 316(b) and that these losses are not de minimis.

2.1 The AEI Report, The 2014 Update, And The 2015 Biological Report Demonstrate That PNPS's CWIS Has Had And Is Expected To Have Only A *De Minimis* Adverse Environmental Impact

The Fact Sheet states that "on average, PNPS entrains about 2.8 billion eggs and 354 million larvae annually, and impinges about 42,800 fish annually."[24] Entergy agrees that these values are sufficient to trigger searching review under Section 316(b).

However, the best scientific evidence is that, despite their apparent magnitude, these levels represent a de minimis adverse environmental impact. The reasons are several. First, levels of I&E must be examined in the proper ecological context, i.e., whether I&E levels are large enough to have a significant impact on the relevant fish populations. Second, levels of I&E must account for the actual quotient of mortality attributable to Pilgrim, e.g., whether the vast majority (typically more than 99.9%) of eggs, if fertilized, die of natural causes (e.g., non-fertilization, starvation and predation) before those fish could contribute to future populations.[25] To account for high early life stage mortality, it is widely accepted practice among scientists and EPA to convert the number of eggs and larvae lost into an equivalent number of adults, because doing so puts early life stage I&E losses into their proper ecological context.[26] Indeed, in its August 15, 2014 Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities ("Final 316(b) Phase II Rule" or "Rule"), EPA expressly approves the use of adult-equivalent losses (i.e., "the number of individual organisms of different ages impinged and entrained by facility intakes, standardized to equivalent numbers of [adult] fish") to evaluate impacts under Section 316(b), stating "EPA finds it appropriate to use the [adult equivalent] measure because information in the record indicates that an overwhelming majority of eggs, larvae and juveniles do not survive into adulthood and the [adult equivalent] calculations adjust for differences in survivorship based on species and age-specific mortality rates."[27]

The 2008 AEI Report focused on four fish RIS, *i.e.*, winter flounder, cunner, Atlantic menhaden, and Atlantic mackerel, and one commercially important crustacean RIS, *i.e.,* American Lobster.[28] As explained in that Report, the RIS satisfy EPA's selection criteria, both for potential I&E mortality and thermal impacts.[29] Further, selection of these RIS, which dominate I&E at PNPS,[30] precipitated no objection or criticism from EPA, DEP or the PATC.[31]

The data evaluated in the AEI Report, the 2014 Update and the 2015 Biological Report come from three sources, collected annually: (1) I&E data collected at PNPS; (2) near-field fisheries monitoring studies; and (3) regional and coastal fisheries data available from state and federal resource management agencies.[32] These data are valid and verified by the consultants, have been directed and reviewed, and in some instances were performed, by governmental agencies, or are the product of independent governmental authorities with specialized fisheries-management knowledge, *e.g.*, the Atlantic States Marine Fisheries Commission ("ASMFC") and the National Marine Fisheries Service ("NMFS").[33] Therefore, the data represent the "most authoritative available information concerning abundance, recruitment, and other characteristics useful in interpreting the potential impacts of I&E at PNPS on harvested fish populations," *i.e.*, the best available information to determine whether PNPS's operation has had any adverse environmental impact on Cape Cod Bay species.[34]

The AEI Report and the 2014 Update establish that populations and communities, not individuals, are the proper focus for evaluating the potential adverse impacts of Pilgrim's operations on Cape Cod Bay.[35] In brief, the AEI Report, the 2014 Update, and the data in the 2015 Biological Report together demonstrate that PNPS has had no discernible adverse impact to the aquatic community. In general, equivalent adult losses of RIS are trivial, particularly compared to conservative (*i.e.*, understated), independent estimates of the abundance of local and regional populations and approved fisheries management practices (and yields). Additional lines of evidence, including standard fisheries management models, also indicate that I&E losses from operation of PNPS's CWIS are not sufficient to affect the ability of representative populations to persist and fulfil their normal functions, including propagation.[36] Therefore, the best available scientific information would not reasonably support a finding of adverse environmental impact for PNPS.[37] The data and analyses presented in the AEI Report, the 2014 Update, and the 2015 Biological Report for individual RIS are summarized in the following sections.

Before addressing the RIS individually, Entergy respectfully submits that the equivalent adult entrainment loss estimates provided in the Fact Sheet for winter flounder, cunner, Atlantic menhaden, Atlantic Herring, Atlantic cod and Atlantic Mackerel, although attributed to the 2015 Biological Report, do not reflect that document correctly. The table below presents a comparison of the equivalent adult entrainment loss estimates (without accounting for entrainment survival) for these species as given in the Fact Sheet and the same metric calculated from the data in the 2015 Biological Assessment.[38]

	Equivalent Adult Entrainment Losses	
Species	Fact Sheet	2015 Biological Report
Winter flounder	17,047	12,474
Cunner	785,219	680,116
Atlantic menhaden	2,508	2,653
Atlantic herring	12,837	13,249
Atlantic cod	1,816	950
Atlantic mackerel	1,437	1,524

Entergy respectfully requests that the correct 2015 Biological Report numbers be employed in the final Fact Sheet.

Additionally, EPA's presentation of adult equivalent entrainment losses fails to account for the fact that survival of entrainment has been demonstrated for some of the species.[39] When demonstrated survival is accounted for, as noted below, estimated adult losses are substantially lower than the losses summarized in the table above or reported in the Fact Sheet for most species.

24 *Id.* at 68; *id.*, Attach. D, at 15.
25 *See*, *e.g.*, EPRI, *Extrapolating Impingement and Entrainment Losses to Equivalent Adults and Production Foregone*, July 2004.
26 *Id*. at 1-1; *see also infra* note 26.
27 79 Fed. Reg. 48300, 48,403 (Aug. 15, 2014). EPA specifically approves the use of age-1 equivalents, *i.e.*, equivalent numbers of 1-year-old fish, to represent adult fish. However, certain species mature at older ages (*e.g.*, after two or three years), and for those species age-2 or other equivalents should be used to represent adult equivalents. In other words, adult equivalent ages below vary with species.
28 *See* AEI Report at 1. American lobster was included as a result of perceived commercial and recreational overharvesting of lobsters in Massachusetts waters, not because of perceived Pilgrim impacts. *Id.*
29 *See id.* at 1, 7-8; *see also* EPA, *Draft Interagency 316(a) Technical Guidance Manual and Guide for Thermal Effects Sections of Nuclear Facilities: Environmental Impact Statements*, § 3.5.2.1, at 36-39 (May 1, 1977) (discussing selection criteria and noting that five is a "high" number of RIS for study).
30 ENSR (2000) at 5-5 to 5-9.
31 AEI Report at 1, 7-9. Because it arises later in these Comments, it is worth emphasizing that *alosines* alewife, Atlantic silverside and rainbow smelt are represented by RIS Atlantic menhaden. *Id.* at 9.
32 AEI Report at 12-15.
33 *Id.*
34 *Id.* at 15; *San Luis & Delta-Mendota Water Auth.*, 747 F.3d at 602; *Kern County Farm Bur.*, 450 F.3d at 1080-81.
35 *See* AEI Report at 2; *see also, e.g.*, John A. Veil, *et al.*, *A Holistic Look at Minimizing Adverse Environmental Impact Under Section 316(b) of the Clean Water Act*, Scientific World Journal (Apr. 2002), at 48 ("Impingement and entrainment, when they result in death or harm to an organism, create an adverse impact to that organism. However, they do not necessarily create an adverse impact on the population or ecosystem at large."); David A. Mayhew, *et al.*, *Adverse Environmental Impact: 30-Year Search for a Definition*, Scientific World Journal (Mar. 2002), at 28 ("Over the last 30 years, the scientific community has attempted to define AEI on a scientific basis, *i.e.*, based on impacts at the population level. This is consistent with the clear intent of Section 316(b) to minimize *environmental* impact.").
36 *See, e.g.*, AEI Report at 11, 18, 22, 31.
37 AEI Report at 15, 34; *see also* 2014 Engineering Response Supplement, Attach. 4, Normandeau Biological Input, at 4 (concluding that more recent data confirm conclusion that Cape Cod Bay aquatic community has been stable since 1980, notwithstanding PNPS's operations); *San Luis & Delta-Mendota Water Auth*, 747 F.3d at 602; *Kern County Farm Bur.*, 450 F.3d at 1080-81.
38 *See* Fact Sheet at 68 and Attach. D at 17; *see also* Normandeau 2015b, Tables 5, 9, 13, 15, 18, 20. In Normandeau 2015b, averages over the period 1980-2014 omit the years 1984 and 1987 due to unusually low numbers resulting from plant outages in those years. *Id*.
39 *See*, Normandeau 2015b.

2.1.1 Atlantic Menhaden

The Atlantic menhaden is a migratory, pelagic fish that is abundant from Florida to Nova Scotia and believed to consist of a single spawning population with no evidence of local or regional subpopulations.[40] The AEI Report relied on two lines of evidence to determine whether historic or continued operation of Pilgrim's CWIS has caused an adverse impact on Atlantic menhaden: (1) comparison of I&E at the PNPS CWIS, expressed as age-1 equivalents, to estimates of age-1 abundance of Atlantic menhaden available from ASMFC; and (2) the use of fisheries assessment models to calculate the impact of PNPS on Atlantic menhaden recruitment and spawning stock biomass.

Comparison Of Age-1 Equivalent I&E To Age-1 Population

An average of 24,364 Atlantic menhaden per year were impinged at the PNPS from 1980 through 2007, based on normal operational flows of 461.28 MGD, making this species the most abundant fish impinged at PNPS's CWIS during the period assessed in the AEI Report.[41] This number of fish converts to 15,369 adult (age-1) equivalents, most impinged during seasonal transitions (and cold shock events) or predation.[42] An estimated 66,969,349 eggs and larvae were entrained over the 28-year period, which converts to 1,956 age-1 equivalents.[43] ASMFC estimated that age-1 abundance of Atlantic menhaden varied between 1.57 billion and 10.4 billion over the period from 1980-2005, with an average abundance of 4.78 billion fish.[44] Thus, the AEI Report demonstrated that I&E at PNPS is a miniscule fraction—0.0004% to 0.0005%, depending on the method of calculation—of the average age-1 population of Atlantic menhaden.[45]

The data in the 2014 Update confirm that from 2008-2013, I&E remained a small fraction of the Atlantic menhaden population. From 2008-2013, an average of 25.6 million eggs and larvae were entrained and 3,198 fish were impinged, which together convert to just 406 adult equivalent fish per year.[46] According to the ASMFC's 2014 stock assessment, the average age-1 abundance of Atlantic menhaden from 2008 to 2013 ranged from 2.8 billion to 8.8 billion, with an average of 4.88 billion fish.[47] Thus, from 2008-2013, I&E at PNPS was an even smaller fraction—0.00001%—of the average age-1 Atlantic menhaden population than that reported in the AEI report.

As provided in the 2015 Biological Report, over the entire 1980-2014 period an average of 63.54 million Atlantic menhaden eggs and larvae per year were entrained and impinged, which converts to an average of 8,950 adult (age-2) equivalents per year.[48] However, these long-term average I&E figures do not account for the fact that a portion of Atlantic menhaden eggs and larvae have been shown to survive entrainment, [49] despite being identified by EPA as fragile under the Final 316(b) Phase II Rule.[50] When entrainment survival is taken into account, annual adult equivalent I&E losses over the entire 1980-2014 period average just 7,587 per year.[51]

Fisheries Assessment Models

The AEI Report presents the results of a model used to calculate year-specific conditional mortality rates ("CMRs") from year-specific estimates of population structure and total egg production available from stock assessment reports.[52] The CMR is a measure of the mortality imposed on a year class of a population by a stressor such as a cooling water intake structure.[53] Information required to implement the model includes: (1) age-specific natural mortality rates for all 1-year-old and older fish; (2) age-specific fecundities and sex ratios for mature fish; (3) the number of eggs spawned during each year included in the calculation (calculated from estimates of the total abundance and age structure of the spawning stock); (4) the number of these eggs that survive to become one-year-old fish; and (5) the number of fish lost due to entrainment during each year.[54] The model's output consists of the total rate of mortality for age 0 fish and the rate of mortality due to I&E, expressed as a CMR. In essence, the CMR identifies the contribution of I&E to total age 0 mortality, as determined from empirical stock assessment data.[55] Over the years 1985-2004 modeled, the combined impingement and entrainment CMRs for the PNPS CWIS averaged only 0.00078%, equivalent to a 0.00078% reduction in recruitment of age-1

Atlantic menhaden.[56] As noted in the AEI Report, from a cumulative impact perspective, more than 12,000 power plants, each imposing a CMR of 0.00078%, would be required to raise the cumulative entrainment and impingement CMR for Atlantic menhaden to 1%.

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40 AEI Report at 16.
41 *Id*.
42 *Id*. at 16-17, 48. *See also, e.g.*, EPRI, *The Role of Temperature and Nutritional Status in Impingement of Clupeid Fish Species* (Mar. 2008), at 2-10.
43 AEI Report at 16-17, 48.
44 *Id*. at 17, 50.
45 *Id*.
46 *See* 2014 Update, Appendix B, Tables 9-12. Data through 2013 are presented because the data for numbers of eggs and larvae entrained in 2014 in the 2015 Biological Report are converted to age-2 equivalents and therefore are not directly comparable to age-1 equivalents provided in the 2014 ASMFC stock assessment.
47 *See* Southeast Data, Assessment and Review, *SEDAR 40 Stock Assessment Report: Atlantic Menhaden, Section II:*
Addendum to the 2014 Atlantic Menhaden Benchmark Stock Assessment, January 2015, Table 3.
48 *See* Normandeau 2015b, at Tables 15, 17.
49 *See id.* at 75.
50 *See* 40 C.F.R. § 125.92(m).
51 Normandeau 2015b, at Tables 16, 17.
52 AEI Report at 18.
53 *Id*.
54 *Id*.
55 *Id*.
56 *Id*.

2.1.2 Winter Flounder

The winter flounder is a benthic right-eyed flatfish important to both the commercial and recreational fisheries in Cape Cod Bay and in the Gulf of Maine.[57] Winter flounder larvae and eggs are distributed throughout Cape Cod Bay with higher densities of eggs and larvae associated with Barnstable, Wellfleet, and Plymouth Harbor estuaries, although tidal fluxes and currents disperse the ichthyoplankton throughout the bay.[58]

As discussed in the AEI Report, based on normal operational flows, the estimated total number of winter flounder eggs and larvae entrained at PNPS annually from 1980 through 2007 averaged 25.4 million, while the number winter flounder impinged averaged 985 fish.[59] These numbers of fish convert to a total of 15,766 age-3 (adult) equivalents.[60] When this number is adjusted for demonstrated, site-specific survival, the annual total number of age-3 equivalents is reduced to just 8,029 age-3 winter flounder.[61]

Three lines of evidence were used in the AEI Report to determine whether the operation of the PNPS CWIS has caused an adverse impact on winter flounder: (1) the percent of the larval flux past PNPS that is entrained, as determined by larval transport studies; (2) comparison of equivalent adult losses to spawning population estimates for Gulf of Maine stock, and to the adult population present in Cape Cod Bay; and (3) the use of fisheries assessment models to calculate the impact of the PNPS CWIS on winter flounder recruitment, spawning stock biomass, and fishery yield.

Larval Transport

PNPS conducted a study of the flux of winter flounder larvae passing the PNPS CWIS, for the purpose of estimating the percent of larvae in the vicinity of PNPS that may be entrained.[62] These data provide a direct estimate of the potential impact of entrainment on susceptible winter flounder populations.[63] Sampling was conducted during three years—2000, 2002, and 2004—and during each, field sampling of four stages of winter flounder larvae was conducted at five or more transects along the Plymouth (western) coast of Cape Cod Bay.[64] Concurrently, water velocity measurements were performed at each transect and winter flounder entrainment samples were collected at the PNPS CWIS.[65] The percent entrainment over all three years ranged from 0.45% to 2.03%, and averaged 1.23%. Thus, only a very small fraction of the winter flounder transported past PNPS's CWIS are entrained.

Equivalent Adult Losses

The estimated number of age-3 winter flounder entrained from 1980 through 2007 (summarized above) was compared to NMFS's estimate of the number of age-3 winter flounder in the Gulf of Maine stock for the years 1982-2005. Over the years 1980-2002 (a period that accounts for the three-years needed to reach age-3) an average of 8,452 equivalent age-3 winter flounder were entrained or impinged per year.[66] This represents an average of only 0.25% of the Gulf of Maine stock of age-3 winter flounder over that same period, which was estimated to be more than 3.4 million.[67] I&E of winter flounder also was compared to the abundance of adult winter flounder present in Cape Cod Bay, as estimated from PNPS's Area Swept Trawl Survey that at the time had been conducted annually from mid-April to mid-May from 2000 through 2006.[68] Over the period 1997-2003 an average of approximately 16,800 age-3 equivalents per year were entrained or impinged at PNPS. Over the period 2000-2006, when these fish would have been 3 years old, an average of 286,000 adult winter flounder were present in the PNPS study area and, assuming that the study area represents 1/6 the area of Cape Cod Bay, 1.714 million age-3 winter flounder would have been present in all of Cape Cod Bay. Based on these estimates, I&E of winter flounder at the PNPS CWIS over the 1995 through 2006 period was equivalent to 1% of the adult population present in Cape Cod Bay.[69] Even this small percentage may be an overestimate, as some of the larval winter flounder entrained likely originated from outside Cape Cod Bay.[70]

Fisheries Assessment Models

The AEI Report employed a Spawning Stock Biomass Per Recruit ("SSBPR") model, which calculates the expected lifetime reproduction of a typical female recruit, measured in terms of the expected future egg production or biomass, to evaluate the potential impact of entrainment on the ability of susceptible winter flounder populations to sustain themselves and support future commercial and recreational fisheries.[71] The SSBPR model, requires estimates of age-specific mortality rates (available from NMFS) and weights of one-year-old and older fish, and an estimate of mortality by PNPS entrainment, expressed as a CMR.[72] The SSBPR model was used to model the increase in spawning potential ratio ("SPR," a measure of the impact fishing has on the ability of each recruit to contribute to spawning) that could have occurred: (1) if PNPS had not been operating; and (2) if ten power plants with the same impact as the PNPS (assuming that such plants existed and had been operating at full capacity) had not been operating.[73] According to the model, had PNPS not been operating, winter flounder SPR would have increased by less than 1%.[74] Hypothetically, had there been ten plants with the same impact as the PNPS withdrawing water from the Gulf of Maine, and if impacts of all ten of these plants were removed from the SPR calculations, winter flounder SPR would have been raised only to 30%.[75] Each of these values is far below the 50% overfishing threshold level specified in the ASMFC Fisheries Management Plant for winter flounder, indicating that PNPS is only a minor contributor to overall human influences on this stock and does not threaten the sustainability of the susceptible winter flounder populations.[76]

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57 *Id*. at 19.
58 *Id*. at 19.
59 *Id*. at 19, 52.
60 *Id*.
61 *Id*. *See also* K.A. Rose, *et al.*, *Simulating winter flounder population dynamics using coupled individual-based young-of-the-year and age-structured adult models.* Can. J. Fish. Aquat. Sci. 53:1071-1091 (1996). In addition, as shown in the 2015 Biological Report, for the years 2008-2014, an average of 19,484,840 eggs and larvae were entrained, and another 752 fish were impinged, converting to a total of 12,556 age-3 equivalents. Normandeau, 2015b, Tables 5, 7. Accounting for survival, combined egg and larval losses averaged 18,004,020 per year, which converts to average age-3 equivalent losses of just 9,473. *Id*. at Tables 6, 8. This is particularly low for a species for which Pilgrim has run an effective hatchery. *See* Normandeau Associates, Inc., *Hatchery Production Study Report: Young-of-the-Year Winter Flounder Post-Release Collections 2010* (Apr. 2011).
62 AEI Report at 20.
63 *Id*.
64 *Id*.
65 *Id*.
66 *Id*. at 21.
67 *Id*.
68 *Id*.
69 *Id*.
70 *Id*.
71 *Id.* at 22.
72 *Id.*
73 *Id*. at 22-23.
74 *Id*. at 23.
75 *Id*. at 23-24.
76 *Id*. at 24. Attachment D of the Fact Sheet raises a potential concern about I&E of winter flounder, based on that species' high level of site fidelity to natal spawning grounds. *See* Fact Sheet, Attach. D, at 25-26. The 2014 Update, however, reports an annual average I&E mortality of just 744 age-1 equivalent winter flounder from 2008-2013, as compared to an average annual adult (age-3) population in western Cape Cod bay of 200,160 over the same period. *See* 2014 Update, Appendix B, Tables 9-12; Normandeau (2015), Winter Flounder Area Swept Estimate, Western Cape Cod Bay 2014 (April 30, 2015) at 5-6. Thus, Pilgrim's I&E represents just 0.4% of the annual estimated adult population in western Cape Cod Bay.

2.1.3 Cunner

The cunner is a temperate reef fish that is abundant in rocky areas of the Atlantic coast from the Middle Atlantic States to Newfoundland and is typically associated with rocky subtidal habitats such as those found in the vicinity of PNPS in Western Cape Cod Bay.[77] Since cunner larvae are planktonic, they can be transported for large distances before they settle and occupy a home range.[78] The PNPS breakwaters promote the settlement of cunner, resulting in an artificially localized high density.[79] On average, 2.27 billion cunner eggs and larvae were entrained annually between 1980 and 2007, and just 286 impinged.[80] These numbers convert to an annual average of 829,482 age-1 (adult) equivalents.[81] The 2015 Biological Report shows that, from 2008 through 2014, cunner I&E was somewhat lower, with an average of 2.12 billion cunner eggs and larvae entrained, and fish 381 impinged, which converts to an average of 657,132 age-1 equivalents.[82] However, cunner eggs and larvae have been shown to exhibit substantial entrainment survival, and older cunner life stages often survive impingement.[83] When this survival is taken into account, the average number of eggs and larvae lost to I&E from 1980 to 2014 is reduced to approximately 221.2 million per year, which converts to an average of just 149,820 age-1 equivalents per year.[84]

Because cunner are considered to have no commercial or recreational value, stock estimates are not readily available.[85] As explained in the 2015 Biological Report, a rough estimate of the population in the PNPS area can be determined by using representative fecundity values to calculate the number of adult cunner that would be necessary to produce the number of eggs found there.[86] For 2014, an estimated 6.9 trillion eggs were produced by an estimated 364 million adult fish.[87] The number of adult equivalent cunner lost due to PNPS I&E in 2014—817,967— represents just 0.2% of the estimated spawning stock.[88] If cunner survival is accounted for, the estimated number of adults lost in 2014,—179,278—is just 0.05% of the estimated spawning stock.[89]

Four additional lines of evidence were used in the AEI Report to determine whether the operation of PNPS's CWIS has caused an adverse impact on cunner: (1) estimation of the size and location of the region from which entrained cunner eggs are withdrawn; (2) analysis of recruitment of cunner larvae to rocky habitats in the vicinity of PNPS; (3) comparison of entrainment losses at the PNPS CWIS to potential cunner production within a 9 km radius surrounding the PNPS site; and (4) comparison of impingement losses to mark and recapture population estimates of the local cunner population inhabiting the artificial habitat created by the breakwater protecting the PNPS CWIS.

Withdrawal Region Size and Location

According to a hydrodynamic study performed by MIT, 90% of eggs entrained at PNPS (which account for 97% of all life stages entrained) would have been spawned within a local subregion extending from approximately 5.5 miles north of PNPS to about 1 mile south.[90] This nearfield area, which is the dominant contributor of eggs entrained at the PNPS CWIS, is only a small fraction of the total habitat available to cunner in Cape Cod Bay. Further, while 90% of entrained eggs are derived from a relatively small subregion of Cape Cod Bay, this does not imply that entrainment is depleting the cunner population in this subregion, as detailed below.[91]

Recruitment of Cunner to Rocky Habitats Near PNPS

As reported in the AEI Report, Nitschke (1998) studied recruitment of cunner juveniles to rocky habitats in the vicinity of PNPS to determine whether entrainment could be reducing the abundance of cunner in the nearfield area.[92] He measured the abundance of settling juveniles as a function of distance from PNPS, and also the relationship between the abundance of settling juveniles and the number of juveniles surviving to the end of the recruitment period. Nitschke reasoned that if entrainment at PNPS were significantly reducing cunner abundance in the vicinity of the plant, then the density of settling cunner larvae should be lower near PNPS than at two sites farther away.[93] However, contrary to this prediction, the density of settling cunner was higher near PNPS than at the other two sites.[94] Nitschke also found that the post-settlement survival of juvenile cunner was inversely related to initial density. Although the initial density of settling cunner in July was highest at the discharge site, by the time sampling ended in November, there was no difference in cunner density between sites.[95] This result is consistent with the hypothesis that settlement success of juvenile cunner is density dependent, which would act to reduce the potential impact of PNPS' CWIS on the abundance of cunner larvae available for settlement.

Comparison of Entrainment Losses at PNPS to Potential Cunner Production within a 9 km Radius

The AEI Report discusses the 1975 sampling of cunner eggs within a 9 km radius surrounding the PNPS site.[96] Correcting for sampling efficiency and for the development time of cunner eggs, approximately 7 trillion cunner eggs were present in this region during 1975.[97] The average annual entrainment of cunner eggs at PNPS is 0.04% of this value.[98] The annual average number of equivalent adult cunner entrained at the PNPS, including both eggs and larvae, over the 1980 through 2006 period was 0.16% of the estimated total population value within this radius.

Comparison of Impingement Losses to Mark and Recapture Population Estimates

As reported in the AEI Report, Lawton et al. (2000) performed mark and recapture sampling in 1992, 1994 and 1995 to estimate the population of cunner in the vicinity of PNPS.[99] This sampling estimated that, in those three years, 4,976, 7,408 and 9,300 adult cunner were present off the outer breakwater at PNPS.[100] In the same three years, 28, 77, and 346 equivalent adult cunner were impinged at PNPS, respectively.[101] Hence, impingement of cunner at PNPS is equivalent to 4% or less of the adult cunner then present in the vicinity of the PNPS breakwater.[102] Since the breakwater is an artificial habitat that did not exist prior to the construction of the PNPS, even accounting for impingement mortality, the cunner inhabiting the breakwater represents a net increase in the abundance of cunner in western Cape Cod Bay, compared to the population that would have been present without PNPS.

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77 AEI Report at 25.
78 *Id*.
79 *Id*.
80 *Id*. at 25, 57.
81 *Id*.
82 Normandeau 2015b, Tables 9, 11.
83 *Id*. at 69. *See also* EPRI, *Review of entrainment survival studies: 1970 – 2000, Final Report*, EPRI Report 1000757 (2000) ("EPRI (2000)"); MRI, *Assessment of finfish survival at Pilgrim Nuclear Power Station final report, 1980-1983* (2004) ("MRI (2004)").
84 Normandeau 2015b, Tables 10, 12.
85 *Id*. at 70.
86 *Id*.

87 *Id*.
88 *Id*.
89 *Id*.
90 *Id*. at 26.
91 *Id*.
92 *Id*.
93 *Id*.
94 *Id*.
95 *Id*.
96 *Id*. at 27.
97 *Id.*
98 *Id.*
99 *Id.*
100 *Id.*
101 *Id.*
102 *Id.*

2.1.4 American Lobster

The American lobster, a crustacean representative of the mobile megabenthic macroinvertebrate community of the sublittoral zone, comprises the most important fishery within Massachusetts territorial waters.[103] Three lines of evidence were used to determine whether the operation of the PNPS CWIS has caused an adverse impact on American lobster: (1) comparison of equivalent adult losses to adult population estimates for Massachusetts portion of the Gulf of Maine stock, and to the entire Gulf of Maine stock; (2) comparison of the reduction in adult abundance due to I&E to the reduction caused by harvesting; and (3) the use of fisheries assessment models to calculate the impact of the PNPS CWIS on American lobster fishery yield.

Comparison of Equivalent Adult Losses to Adult Population Estimates

The AEI Report compares American lobster I&E at PNPS for the years 1998-2007 to stock abundance estimates for the years 1982-2007 obtained from ASMFC for the Massachusetts portion of the Gulf of Maine stock and the larger Gulf of Maine. It demonstrates that I&E combined represent 0.01% of the stock abundance in Massachusetts waters every year analyzed (with the exception of 2005 when they represent 0.02% of the stock abundance) and 0.001% or less of the entire Gulf of Maine stock.[104]

Comparison of Exploitation Rates Due to Commercial Harvest vs. I&E Losses

Estimates of the annual exploitation rate, *i.e.*, the proportion, ranging from 0 to 1, of the exploitable (legal size) American lobster population that is actually harvested by the commercial fishery in a given year, in both the entire Gulf of Maine stock and Massachusetts waters, were obtained from the ASMFC.[105] Exploitation rates due to the commercial harvest range from 0.33 to 0.61 (33% to 61%) for the entire GOM stock, and from 0.54 to 0.90 (54% to 90%) in Massachusetts waters, over the period of 1982-2003.[106] Adult equivalent lobster losses due to I&E were expressed in terms of annual exploitation rates by dividing the annual adult equivalent I&E totals by ASMFC's annual stock abundance estimates.[107] Adult equivalent exploitation rates due to entrainment at PNPS are less than 0.00004% for the entire Gulf of Maine stock and less than 0.001% in Massachusetts waters.[108] Adult equivalent exploitation rates due to impingement at PNPS are less than 0.001% for the entire Gulf of Maine stock and less than 0.02% in Massachusetts waters every year from 1998-2003.

Fisheries Assessment Models

The AEI Report presents the results of a simple yield per recruit model of the type that has played a central role in the development of lobster management policy in both Canada and the United States.[109] A comparison of natural and fishing mortality rates for age 1-4 and age 5 (adult) lobster demonstrates that for every lobster recruit entering the fishery in a given year, about 0.18 kg (0.4 lbs.) was obtained from the fishery.[110] Multiplying the adult equivalent numbers lost to I&E, combined with 0.18 kg, results in a range of 17-200 kg (37- 441 lbs.) potentially lost to the fishery per year between 1998 and 2007, or approximately 0.0001 % to 0.0007% of the average annual GOM landings from 2000-2003.[111] By comparison, the average pounds per trap fished in Massachusetts waters of the Gulf of Maine is roughly 24 lbs.[112] Yield lost to I&E therefore conservatively represents less than 2 to 18 traps fished for a year.[113] Thus, fisheries management models demonstrate that I&E at PNPS have a negligible impact on the American lobster population.

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103 *Id*. at 28.
104 *Id*. at 27, 59.
105 *Id*. at 30.
106 *Id*.
107 *Id*. at 30, 59.
108 *Id*.
109 *Id*. at 31, 60.
110 *Id*.
111 *Id*.
112 *Id*.
113 *Id*.

2.1.5 Atlantic Mackerel

The Atlantic mackerel is a migratory, pelagic fish that is abundant from North Carolina to the Gulf of St. Lawrence.[114] One component of the stock spawns along the southern New England corridor and a second spawns in the Gulf of St. Lawrence; only eggs and larvae spawned in the southern New England region are susceptible to entrainment at PNPS.[115] An estimated 799.8 million Atlantic mackerel eggs and larvae were entrained at PNPS annually from 1980 through 2007 while an average of only 6 fish per year were impinged during that same interval.[116] These convert to a total of 5,097 age-1 (adult) equivalent mackerel. Two lines of evidence were used in the AEI Report to determine whether the operation of the PNPS CWIS has caused an adverse impact on Atlantic mackerel: (1) estimation of the size and location of the region from which entrained Atlantic mackerel eggs are withdrawn; and (2) comparison of entrainment losses from the PNPS CWIS, expressed as age 1 equivalents, to estimates of age 1 abundance of Atlantic mackerel available from NMFS.

Size And Location Of The Region From Which Eggs Are Withdrawn

Eggs account for more than 95% of Atlantic mackerel entrainment at the PNPS, and Atlantic mackerel eggs usually hatch within 4 days at water temperatures typical of the late spring/summer period in western Cape Cod Bay.[117] Based on the results of the MIT hydrodynamic modeling study, entrained Atlantic mackerel eggs would have been spawned no more than about 10 miles north or 2 miles south of the CWIS under typical conditions.[118] Because Atlantic mackerel spawn throughout southern New England, only a negligible fraction of Atlantic mackerel eggs spawned in this region are susceptible to entrainment by PNPS. *Id.*

Comparison Of Age-1 Equivalent Entrainment Losses To NMFS Estimates Of Age-1 Abundance

Over the period 1980-2004, estimates of Atlantic mackerel entrainment, expressed as age-1 equivalent fish, ranged from 82 to 19,125 per year, with an annual average of 4,606.[119] The most recent stock assessment available from NMFS, by comparison, reported that the estimated coastwide abundance of age-1 equivalent Atlantic mackerel during the period 1961-2004 ranged from 100 million to 5.1 billion, with an average abundance of 1.1 billion age-1 equivalent fish.[120] Based on these estimates, average annual entrainment at PNPS during the 1980-2004 period is equivalent to only 0.004 percent of the average abundance of age-1 equivalents for this species.[121] If one were to conservatively assume that only 10% of the coastwide Atlantic mackerel stock spawns in southern New England, then entrainment at PNPS still would be equivalent to only 0.04 percent of the annual average recruitment for this species.[122] From a cumulative impact perspective, it would take 25 comparably sized power plants along the southern New England corridor, each imposing a CMR of 0.04 percent on the New England component of the Atlantic mackerel population, for the cumulative CMR to equal 1%, confirming that even viewed cumulatively, the I&E of this species represented by PNPS has at most a negligible impact.[123]

The 2008-2014 I&E data provided in the 2015 Biological Report confirm that I&E of Atlantic mackerel at PNPS is trivial considering the overall abundance of the population, in that the average annual I&E of this species at IPEC over these later years has declined to just 469 age-1 equivalent fish per year.[124]

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114 *Id*. at 31.
115 *Id*.
116 *Id*. at 31, 61.
117 *See id.* at 32; *accord* 2014 Update, Appendix B, Table 9 (eggs account for more than 97% of Atlantic mackerel entrainment for the 2008-2013 period).
118 *See* AEI Report at 32.
119 *Id.* at 32-33.
120 *Id.* at 33.
121 *Id.*
122 *Id.*
123 *Id.*
124 *See* 2014 Update, Appendix B, Table 11.

2.1.6 Additional Species of Interest

While these Comments appropriately focus on the RIS, Attachment D to the Fact Sheet also discusses coastwide population declines in rainbow smelt, river herring (which includes alewife) and Atlantic cod, none of which is attributed to or reasonably could be attributable to PNPS.[125]

With respect to river herring, the Jones River population—nearest to Pilgrim and therefore most likely to be impacted—is not even in decline. Rather, as the Fact Sheet indicates, the Jones River population has fluctuated from year to year, with an overall increasing trend (positive slope from 2005-2014 with a p value of 0.03).[126]

With respect to rainbow smelt, the 2014 Update indicates that from 2008-2013, an average of just 63,952 larvae were entrained at Pilgrim annually, with another 496 smelt impinged.[127] Together, these figures equate to a mortality of just 859 adult (age-1) equivalent fish, which cannot reasonably be interpreted as having an adverse impact on the smelt population.[128] For Atlantic cod, the 2014 Update reported an average of 5,444,856 eggs and larvae entrained from 2008-2013, and 74 fish impinged, which together correspond to mortality of just 1,439 adult (age-1) equivalent fish.[129] Although the coastwide population of Atlantic cod has been in recent decline due to overfishing, NMFS has estimated that the average age-1 recruitment for the Gulf of Maine stock ranged from 6.73 million to 8.35 million (depending on the model used) over the years 2008 to 2013, and even in the lowest years, 2013 and 2014, age-1 recruitment ranged from 2.55 to 3 million.[130] Thus, since the AEI Report, I&E mortality of Atlantic cod has remained a small fraction of adult recruitment in the Gulf of Maine, totaling just 0.02% of the 2008-2013 average age-1 stock and 0.05 to 0.06% in the two most recent years of data, 2012 and 2013. Indeed, Attachment D to the Fact Sheet acknowledges the average annual losses attributed to PNPS over the last two decades—about 3,700 pounds of cod per year— are trivial, compared to the annual commercial and recreational losses (as landings) along the Massachusetts coast, *i.e.*, respectively 2.2 million and 471,000 pounds.[131]

Thus, there is no reasonable, scientifically grounded concern that Pilgrim has a measurable impact on Rainbow smelt, river herring or Atlantic cod.

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125 *See* Fact Sheet, Attach. D, at 27; AEI Report at 9-10; *see also* Affidavit of Michael D. Scherer, Ph.D., in Support of Entergy's Answer Opposing Jones River Watershed Association's and Pilgrim Watch's Motion to Reopen and Hearing Request, *In re Entergy Nuclear Generation Co. & Entergy Nuclear Operations, Inc. (Pilgrim Nuclear Power Station)*, Docket No. 50-293-LR, ASLBP No. 06-848-02-LR (NRC Mar. 19, 2012) ("Scherer ASLB Aff."), ¶¶ 5, 71-73 (concluding PNPS's operations likely have no effect on river herring populations, which are subject only to "infrequent[] entrain[ment]" and "minimal" impingement at PNPS).
126 *See* Fact Sheet, Attach. D, at 26-27 (Table 3).
127 *See* 2014 Update, Appendix B, Tables 9-12.
128 *Id*.
129 *Id*.
130 *See* NMFS, Gulf of Maine Atlantic Cod 2014 Assessment Update Report (August 22, 2014), Table 1 at 5.
131 *Id.* at 27-29.

Response to Comment 2.1 (including subparts 2.1.1 through 2.1.6):

Entergy agrees that the impingement and entrainment of billions of organisms each year at PNPS's CWIS "are sufficient to trigger searching review under Section 316(b)" but comments that the levels nonetheless represent a *de minimis* adverse environmental impact. To Entergy's first point, EPA clarifies that the "trigger" for a BTA analysis pursuant to Section 316(b) is not any particular amount of impingement and entrainment, but simply that the NPDES permittee operates a CWIS. Section 316(b) of the CWA 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). 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"). Thus, to the extent the comment suggests that review under § 316(b) is only appropriate where a permitted facility impinges and entrains billions of organisms, it is incorrect. Further, for an existing facility like PNPS, the requirements of the August 15, 2014, *Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities* ("Final Rule"),[40] apply if the facility is a point source, uses or proposes to use one or more cooling structures with a cumulative design intake flow (DIF) greater than 2 MGD to withdraw from waters of the U.S., and 25 percent or more of the water withdrawn on an actual intake flow basis is used exclusively for cooling purposes. 40 C.F.R. § 125.91(a). The criteria for the applicability of § 316(b) is 1) a point source and 2) the operation of a CWIS. Section 125.90(b) is clear that, where cooling water intake structures are not subject to requirements under Subparts J (for existing facilities that do not meet the criteria stated above), I (for new facilities), or N (for new offshore oil and gas extraction facilities), they "must meet requirements under section 316(b) of the CWA established by the Director on a case-by-case, best professional judgment (BPJ) basis." There is no question that CWISs are subject to § 316(b) regardless of the actual number of organisms impinged. What remains is the determination of what represents the BTA for an individual facility that operates a CWIS.

Second, EPA disagrees that the entrainment of 2.8 billion eggs and 354 million larvae annually, and impingement of about 42,800 fish annually represents a *de minimis* environmental impact. Stated differently, EPA maintains, as it established in the Fact Sheet, that impingement and entrainment at this level represents an adverse environmental impact. The comment claims 1) that levels of impingement and entrainment must be examined in the "proper ecological context, *i.e.*, whether I&E levels are large enough to have a significant impact on the relevant fish populations" and 2) that levels of impingement and entrainment must account for the "actual quotient of mortality attributable to Pilgrim." EPA addresses each of these points below.

According to Entergy, the data evaluated in the AEI Report, the 2014 Update and the 2015 Biological Report represent the "most authoritative available information concerning abundance, recruitment, and other characteristics useful in interpreting the potential impacts of I&E at PNPS on harvested fish populations, *i.e.*, the best available information to determine whether PNPS's operation has had any adverse environmental impact on Cape Cod Bay species." EPA does not dispute the validity of the data evaluated in the referenced documents. Rather, EPA disagrees with the fundamental premise of the comment that an environmental impact can only be

[40] In its comments, Entergy refers to the 2014 Final Rule for CWIS requirements at existing facilities (79 Fed. Reg. 48300) as the "Final 316(b) Phase II Rule." The Phase II Rule refers specifically to a final rule implementing § 316(b) at certain existing power producing facilities (69 Fed. Reg. 41575, July 9, 2004), which EPA withdrew in 2008 pending further rulemaking (72 Fed. Reg. 37107, July 9, 2007). The 2004 Phase II Rule was replaced with the 2014 Final Rule. To avoid confusion, EPA refers to the final rule implementing § 316(b) at certain existing facilities promulgated on August 15, 2014 as the "Final Rule" in this Response to Comments.

considered "adverse" if it has a negative, population-level effect; this interpretation is incorrect and finds no support in the statute, EPA's 2014 Final Rule, or past interpretations from § 316(b)'s rulemaking history. Moreover, this interpretation of adverse environmental impact as a population-level impact has been rejected by the courts.

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. Attachment D of the Fact Sheet (at 23-30) clearly explains the term "adverse environmental impact" (AEI) and the basis for its interpretation. Neither statute nor regulation expressly limits the extent of adverse environmental impact that may be considered. Stated differently, neither statute nor regulation specifies an impact threshold above which a CWIS's effects must rise before the BTA requirement is triggered.[41]

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. 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 applied here—one that considers the numbers of organisms impinged and entrained. 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

[41] As mentioned above, the legislative history behind CWA § 316(b) is sparse, but in the House Consideration of the Report of the Conference Committee for the final 1972 CWA Amendments, Representative Clausen stated that "Section 316(b) requires the location, design, construction and capacity of cooling water intake structures of steam-electric generating plants to reflect the best technology available for minimizing *any* adverse environmental impact" (emphasis added). 1972 Legislative History at 264. At the same time, EPA has interpreted "minimize" to mean "reduce to the smallest amount, extent, or degree reasonably possible" in the context of § 316(b). 40 C.F.R. § 125.92(r). The majority opinion in *Entergy Corp. v. Riverkeeper, Inc.* discusses the term "minimize" in the context of considering whether EPA has discretion to consider a comparison of the costs and benefits of alternative technologies. 556 U.S. 208, 218-20. Both interpretations include an implicit limitation of reasonableness. The Final Rule, at 40 C.F.R. § 125.98(f)(2) and (3), sets out a list of factors that the permitting authority must or may consider in establishing site-specific entrainment controls, which essentially provides a framework for determining whether a particular level of reduction is reasonable. *See also* Determination Document at 232-3.

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) ("*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.

Id. at 123. 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).[42] 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).

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 Entergy 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 adverse environmental impact 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

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[42] *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). The comment seems to conflate (without explanation or citation) the different standards of § 316(a) and (b).

Fed. Reg. 41,612 (July 9, 2004); 71 Fed. Reg. 35,019 (June 16, 2006); 76 Fed. Reg. 22,196 (April 20, 2011).

For impingement, EPA concluded in the 2014 Final Rule that the BTA for minimizing mortality was "modified traveling screens," as defined in the rule. 79 Fed. Reg. at 48,329; *see* 40 C.F.R. §§ 125.92(s), 125.94(c)(5). In addition to the option to employ modified traveling screens to comply with the standard, the rule includes six alternatives whose performance is equivalent to, or better than, modified traveling screens. 40 C.F.R. § 125.94(c). Consequently, the Final Rule provides that "[t]he owner or operator of an existing facility must comply with one of the alternatives in paragraphs (c)(1) through (7) of this section, except as provided in paragraphs (c)(11) or (c)(12) of this section, when approved by the" permitting authority. *Id.* The comment asserts that annual impingement of 42,800 fish is *de minimis*; however, the actual *de minimis* impingement provision in the regulations—paragraph (c)(11)— provides in relevant part:

> In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified. The Director, based on review of site-specific data submitted under 40 CFR 122.21(r), may conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted.

40 C.F.R. § 125.94(c)(11). Several themes are evident from a review of paragraph (c)(11) and are further explained in the record for the rulemaking. First, there is no express language supporting the commenter's claim that anything less than a population-level impact is *de minimis*. Second, the *de minimis* impingement provision will only be available "[i]n limited circumstances." Thus, a decision by a permitting authority that no additional impingement controls are warranted at a facility based on *de minimis* impingement will be an infrequent occurrence. Indeed, in the record accompanying the Final Rule, EPA explained that it expects the *de minimis* impingement provision to be "rarely used." Final Rule RTC at 25 n.4; *see also id.* at 118 ("[T]he Agency intends for the *de minimis* provision to be infrequently used."), 212 (noting that only in "the most rare cases" will *de minimis* impingement be demonstrated under § 125.94(c)(11)); TDD at 12-3 ("EPA intends that this provision would not be utilized often"). Third, the rate of impingement must actually be quite low, not just low enough that broader-scale harm to populations of individual species or particular communities of organisms have not been observed. In responding to comments on the Final Rule, EPA described the provision as potentially applicable only where rates of impingement are "exceptionally low." Final Rule RTC at 42 ("The final rule provides flexibility for the Director to decide not to require impingement controls where rates of impingement are *exceptionally low* as to be de minimis.") (emphasis added), 118 ("In seeking to avail themselves of the de minimis provision, facilities are required to submit data to the Director indicating that they experience *exceptionally low* impingement rates; the Director will then determine what measures are appropriate.") (emphasis added); *see also* TDD at 12-3 ("EPA has included a provision in the final rule that permits the Director to conclude that a site-specific determination of BTA for impingement mortality is warranted at sites *with exceptionally low rates of impingement*.") (emphasis added). EPA explained the relationship between the two concepts, noting that EPA had not established "metrics for what qualifies as 'exceptionally low' impingement rates, as the Agency intends for the *de minimis* provision to be infrequently used," and citing as an example an impingement rate of "several fish

per month." Final Rule RTC at 118. By comparison, annual impingement of 42,800 fish amounts to several *thousand* fish per month. Furthermore, in disagreeing with a comment opposing an annual *de minimis* threshold on the basis that it could mask significant short-term impingement, EPA noted that "the absolute number of fish impinged is likely to be sufficiently low" such that masking would not be numerically possible and that such a facility "likely would not qualify for the de minimis provision." *Id.* at 109, 118. Fourth, the *de minimis* provision is within a permitting authority's *discretion* to invoke in a particular instance and is not automatically applied in any case. 40 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); Final Rule RTC at 264 ("[T]he Director has the discretion to conclude that the documented rate of impingement at the cooling water intake is so low that no additional controls are warranted."). Reviewing the information presented in the comments in light of the *de minimis* provision in the Final Rule, the Region does not agree that impingement of tens of thousands of adult fish represents a *de minimis* adverse environmental impact.

Turning to entrainment, the requirements of the Final Rule informed the determination of the BTA for PNPS even as the permit is considered an on-going permit proceeding under 40 C.F.R. § 125.98(g). *See* Fact Sheet Attachment D at 9-10, 74-75. The comment overlooks that, when establishing site-specific requirements for entrainment consistent with 40 C.F.R. § 125.94(d), EPA *must* consider the "*[n]umbers* and types of organisms entrained," 40 C.F.R. § 125.98(f)(2)(i) (emphasis added), and *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, but has no such requirement to consider population-level impacts. While the comment asserts that any entrainment impact less than a population-level impact must be *de minimis*, it fails to explain how this view squares with the regulatory framework.[43] EPA's consideration of the adverse environmental impacts caused by PNPS's CWIS in the context of its BTA determination for this permit have been both reasonable and consistent with applicable law and relevant Agency policy. To be clear, EPA is not saying that it cannot consider other effects in determining the maximum reduction in entrainment warranted (*e.g.*, the magnitude of the impact associated with the relative costs and benefits of available technologies). EPA is simply saying that, contrary to the comment, population-level effects are not required for "a finding of adverse environmental impact."

The comment's second argument is that levels of impingement and entrainment must account for the "actual quotient of mortality" attributable to Pilgrim. According to the commenter, EPA must recognize that the vast majority of eggs, if fertilized, will die of natural causes before those fish could contribute to future populations. Entergy comments that high early life stage mortality can be accounted for by converting the number of eggs and larvae lost to the CWIS into an equivalent number of adults, because doing so puts early life stage losses into their "proper ecological context." To support its comment, Entergy claims that EPA approves the use of adult-

[43] Further, the comment does not identify specific permit condition(s) that should be changed or in what way, even if population-level impacts from entrainment were a prerequisite for finding adverse environmental impact (which they are not). Moreover, in the Fact Sheet to the Draft Permit, the Agencies concluded that no additional entrainment controls were warranted, based on Entergy's representations about PNPS' remaining useful life and post-shutdown CWIS operation. *See, e.g.*, Fact Sheet, Att. D at 86. Thus, it is not clear from the comment what effect the assertion that population-level impacts are required to support a finding of adverse environmental impact, even if true (which, again, it is not), would have on the permit.

equivalent losses to evaluate impacts under Section 316(b) in the Final Rule. Adult equivalents can be a useful metric when establishing national standards under § 316(b), or when comparing the performance of available technologies on a site-specific basis, or when standardizing impingement and entrainment counts from multiple facilities. The reference to the preamble to the Final Rule in footnote 27 of the comment explains how EPA used adult equivalents as one of the standard fishery modeling techniques to standardize sampling counts for impingement and entrainment across facilities in calculating the benefits of different options considered in the rulemaking. *See* 79 Fed. Reg. 48,404.

As the comment points out, the Final Rule states "EPA finds it appropriate to use the [adult equivalent] measure because information in the record indicates that an overwhelming majority of eggs, larvae and juveniles do not survive into adulthood and the [adult equivalent] calculations adjust for differences in survivorship based on species and age-specific mortality rates." 79 Fed. Reg. 48,403. Entergy uses this quotation to mean that EPA finds it appropriate to use the measure for evaluating impacts under § 316(b). EPA does not believe this is the case. This statement describes EPA's approach to estimating the *national* environmental benefits of the Final Rule and other options considered by EPA, in particular, how EPA used models (including A1E) to standardize facility-derived impingement mortality and entrainment counts collected on a site-specific basis under a range of conditions and protocols. The Final Rule does not prohibit consideration of A1E in evaluating the site-specific entrainment controls; however, to suggest that the Final Rule uses adult equivalent fish in the context of assessing adverse environmental impact is incorrect and inconsistent with the Final Rule itself, which requires the permitting authority to consider the numbers of organisms entrained. *See* 40 C.F.R. §125.98(f)(2)(i); *see also*, *e.g.*, 79 Fed. Reg. at 48,303 ("Aquatic organisms drawn into CWIS are either impinged (I) on components of the intake structure or entrained (E) in the cooling system itself. In CWA section 316(b) and in this rulemaking, these impacts are referred to as *adverse environmental impact* (AEI).").

In addition, 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.[44] *See* AR-720. Indeed, in the same paragraph as the quotation above, the preamble to the Final Rule continues "using A1Es [age-one equivalents] 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. 48,403. 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. Still, the CWIS at PNPS presents an additional source of mortality not accounted for by the natural mortality rates and life histories of marine fish. That an individual egg or larva killed by entrainment would likely not have survived to adulthood naturally does not excuse a facility from killing billions of organisms each year, and it does not establish a lack of adverse environmental impact. 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 adverse environmental impact to the aquatic environment of Cape Cod Bay. Even considering

[44] For example, 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.

the natural mortality of early life stages, the loss of hundreds of thousands of adult fish each year is an adverse impact.

According to the comment, the estimated entrainment losses provided in the Fact Sheet and in Attachment D (at 17-18) for winter flounder, cunner, Atlantic menhaden, Atlantic herring, Atlantic cod, and Atlantic mackerel do not reflect the 2015 Biological Report correctly. Entergy provides a table of the equivalent adult entrainment loss estimates (without accounting for entrainment survival) for these species from the data in the 2015 Biological Assessment. EPA reviewed the 2015 Report and the tables referenced in the footnote (Tables 5, 9, 13, 15, 18, 20,) but was unable to replicate these values. Having said that, EPA does not reissue Fact Sheets and, as such, the Fact Sheet to the Draft Permit will not be revised. In addition, the differences between the two (the Fact Sheet and the 2015 Report) are relatively small and do not alter the decision that the annual loss of hundreds of thousands of adult equivalent fish from entrainment represents an adverse impact on the aquatic community in Cape Cod Bay. At this writing, the Marine Ecology Report for January-December 2017 is available. Rather than revise the values in the Fact Sheet, the 2018 Report (summarizing results of monitoring from 1980 to 2017) is used in responding to comments on the Draft Permit.

Finally, in comments 2.2.1 through 2.1.6, Entergy maintains that its CWIS has had no adverse environmental impact on a species-specific basis when one converts the entrainment and impingement losses to adult equivalents and considers the magnitude of such losses in the context of populations of these species in the Gulf of Maine. First, as we have already explained, impingement and entrainment that do not have population-level effects may still constitute adverse environmental impact. Thus, while EPA has not replicated Entergy's calculations of spawning stock populations and has no reason to believe them to be inaccurate, losses from impingement and entrainment at PNPS as a percentage of the overall stock in the Gulf of Maine or regionally are not required for EPA to conclude that the mortality of aquatic organisms at PNPS from the CWIS is an adverse impact.

Second, Entergy converts the raw numbers of life stages lost at PNPS to adult equivalent fish. Again, EPA has not reviewed Entergy's adult equivalent models or the underlying data used to calculate adult equivalents, but has no reason to believe them to be inaccurate. Converting raw losses, especially for early life stages that exhibit high natural mortality, to adult equivalent fish is common and has been used by EPA to evaluate the potential benefits of various options during rulemaking under § 316(b). EPA has responded above to comments about how this value has been considered in the context of § 316(b). Again, EPA plainly considers impingement and entrainment to be an adverse environmental impact that must be addressed by ensuring that the CWIS is operated using the BTA to minimize the impacts of impingement and entrainment, and does not specify that EPA only consider the loss of age-1 or adult fish. In making the determination of what entrainment controls may be necessary to minimize this impact, EPA may choose to consider the possible benefits of various available technologies, including, as one possible means of standardizing the comparisons, the number of age-1 fish saved. Considering age-1 fish when determining if and what additional technologies may be required to minimize adverse impacts is not the same as establishing that there is an adverse impact. Regardless, Entergy's comments at 2.1.1 through 2.1.6 indicate that past operation of the CWIS has resulted in the impingement and entrainment of more than 862,000 age-1 cunner and nearly 33,000 other adult equivalent fish annually. Even after adjusting for the possible survival, this equates to the death of more than 173,000 adult fish per year. While EPA is not required to assess adverse impact on the basis of loss of adult equivalent fish, the loss of hundreds of thousands of fish per year at PNPS's CWIS is an adverse impact that must be addressed by the BTA.

The BTA requirements are included as Part I.C of the Final Permit. In this case, PNPS ceased operations as of June 1, 2019 and no longer withdraws cooling water for the condensers, resulting in an overall flow reduction of more than 92%. Therefore, EPA determined that no additional controls are warranted to minimize entrainment at PNPS after consideration of the relevant factors. *See* 40 C.F.R. § 125.98(f). The near elimination of withdrawals via the circulating water pumps also allows PNPS to achieve an actual through-screen velocity of less than 0.5 fps much of the time, which is consistent with the available impingement mortality BTA options at 40 C.F.R § 124.94(c)(3). During the limited period when PNPS must operate one of the circulating water pumps, which the Final Permit limits to 48 hours within a calendar month, the through-screen velocity will exceed 0.5 fps. Consequently, the existing traveling screens must be rotated continuously to limit the impingement duration and increase the likelihood that impinged fish survive and are transported to the receiving water.

2.2 As The Fact Sheet Recognizes, PNPS's Thermal Discharges And Thermal Backwashes Have Not Compromised The Aquatic Community Of Cape Cod Bay

The Fact Sheet concluded, on the basis of species-specific analysis presented in Attachment C to the Fact Sheet, that PNPS's thermal discharges to Cape Cod Bay and occasional thermal backwashing have resulted in no prior appreciable harm to Cape Cod Bay RIS, and therefore that the thermal limits contained in PNPS's current permit are "more stringent than necessary to assure the protection and propagation of the balanced indigenous population [or community] of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made," *viz.* Cape Cod Bay.[132] Specifically, Attachment C concludes that: PNPS's thermal discharges "are not a cause for appreciable harm to fish populations in the environs of the PNPS";[133] there has been no evidence of thermally related fish kills occurring at PNPS since the 1970s;[134] any thermal impact to river herring, rainbow smelt, tautog, cunner, Atlantic silverside, blue fish, striped bass, winter flounder, and American lobster is only "*de minimis*";[135] and historical impingement of Atlantic menhaden in connection with thermal cycling has not occurred since the 1970s.[136]

Some commenters, however, have asserted the 2000 Demonstration is outdated. As a matter of law, this objection is without merit. As EPA precedent and technical guidance concerning 316(a) demonstrations recognize, determinations under Section 316(a) are to be made "on the basis of the best information reasonably attainable," which is satisfied by the periodic thermal assessments discussed at the beginning of the "Environmental Context" Section, *supra*, particularly assessments that were contemporaneous with (*i.e.*, 1995), and postdate (*i.e.*, 2000) Pilgrim's NPDES application.[137] Indeed, EPA's Section 316(a) regulations likewise recognize the principle that prior studies of thermal impacts do not lose their relevance by mere passage of time, and expressly allow applicants for renewal of a thermal variance to rely on prior submissions, absent requests from EPA for additional information: "[a]ny application for the renewal of a section 316(a) variance shall include only such information … as the Director requests within 60 days after receipt of the permit application."[138]

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[132] *See* 33 U.S.C. § 1326(a); 40 C.F.R. § 125.71(c) (again, equating statutory term "balanced, indigenous population" with "balanced, indigenous community" and defining both 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").

[133] Fact Sheet, Attach. C, at 33.

[134] *Id.*

[135] *Id.* at 19-22, 24-30.

[136] *See id.* at 22-24.

[137] *See In re Pub. Serv. Co. of N.H. (Seabrook Station, Units 1 and 2)*, NPDES Appeal No. 76-7, Decision of Administrator, 1977 WL 22370, at *12 (E.A.B. June 10, 1977) ("*Seabrook I*") (stating that EPA must make decisions "on the basis of the best information reasonably attainable." (quoting 1974 EPA Draft §316(a) Guidance)). Courts also recognize that "EPA cannot reject the 'best available' evidence simply because of the possibility of contradiction in the future by evidence unavailable at the time of action – a possibility that will *always* be present." *Chlorine Chem. Council v. EPA*, 206 F.3d 1286, 1291-92 (D.C. Cir. 2001); *accord Bldg. Indus. Ass'n v. Norton*, 247 F.3d 1241, 1246 (D.C. Cir. 2001) (best scientific data "available" does not mean "the best scientific data possible").

[138] 40 C.F.R. § 125.72(c).

Response to Comment 2.2:

In its comment Entergy reiterates the conclusion from the Fact Sheet and supporting analysis that the thermal discharges from PNPS are protective of the BIP. EPA and MassDEP determined that the Draft Permit limits, which were based on a variance from technology- and water quality-based thermal limits under § 316(a) of the CWA, will be protective of the balanced indigenous population (or "BIP"). EPA maintains that the Draft Permit's pre-shutdown, variance-based temperature limits are protective of the BIP. Since PNPS ceased operations as of May 31, 2019, all pre-shutdown limits, including the maximum daily temperature limit of 102°F and delta-T of 32°F, which applied at Outfall 001, have been eliminated from the Final Permit. The Final Permit at Part I.A.3 includes a maximum daily temperature limit of 90°F, average monthly limit of 80°F, and delta-T of 10°F temperature limits, which apply at Outfall 010. These limits are based on the anticipated post-shutdown cooling needs and are more stringent than the variance-based pre-shutdown limits, will also ensure the protection of the BIP. The post-shutdown temperature limits, which will become effective on the effective date of the Final Permit, represent a 98.6% reduction in the heat load to Cape Cod Bay. *See* Responses to Comments I.3.1, I.3.4, and III.5.2.

In its comment, Entergy states the thermal limits contained in PNPS's current permit are "more stringent than necessary to assure the protection and propagation of the balanced indigenous population [or community] of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made" and references 33 U.S.C. § 1326(a) and 40 C.F.R. § 125.71(c). As a point of clarification, the current permit limits, which were based on a variance under § 316(a) and continued as pre-shutdown temperature limits in the Draft Permit, will assure the protection and propagation of the balanced indigenous population. The current permit limits are not *more* stringent than necessary. CWA § 316(a) states:

> any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than

> necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or, if appropriate, State) may impose an effluent limitation under such section for such plant, with respect to the thermal component of such discharge (taking int account the interaction of such thermal component with other pollutants), that will assure the projection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water.

33 U.S.C. § 1326(a). *See also* 40 C.F.R. § 125.70. In other words, where a technology-based and/or water quality-based temperature limit would be more stringent than necessary to ensure protection of the BIP, the permitting authority may impose an alternative effluent limitation that will ensure the protection of the BIP. For PNPS, MassDEP and EPA agreed that the technology- and water quality-based temperature limits would be more stringent than necessary, but that the Draft Permit pre-shutdown limits (which are consistent with the current permit's temperature limits) were sufficiently stringent to ensure protection of the BIP. *See also* 40 C.F.R. § 125.73(a) ("[t]hermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in and on the body of water into which the discharge is made.")

2.3 Summary

In sum, PNPS's historic operations have had a *de minimis* impact on the aquatic ecosystem of Cape Cod Bay, which has remained stable since 1980, as demonstrated by the AEI Report and 2014 Update.[139] The absence of such impacts underpins the Draft Permit, because a demonstrable "adverse environmental impact" is the prerequisite to technology forcing under Section 316(b)[140] or to a finding of any alteration of the "excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions" for which MWQS provide.[141]

There also is no reasonable question that U.S. nuclear power stations, including PNPS, have played an essential role in the reduction of greenhouse gas ("GHG") emissions and thus in mitigating devastating effects of climate change.[142] Setting aside the profound confusion among some commenters at the July 21, 2016 public hearing on this question, the only evidence is that closure of PNPS will result in more GHGs and exacerbated climate change conditions, the long term impacts of which will affect Cape Cod Bay, with results that may well be catastrophic.[143]

With this background on the aquatic community, which underscores Pilgrim's lack of adverse environmental impact, impairment of the balanced indigenous aquatic community or impairment of MWQS, Entergy respectfully submits the following corrections and clarifications to the Draft Permit.

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[139] AEI Report; 2014 Engineering Response Supplement, Attach. 4: Normandeau Biological Input, at 4; *see also* 40 C.F.R. § 125.94(c)(11).
[140] 33 U.S.C. § 1326(b).

[141] 314 Code Mass. Regs. § 4.05(4)(a), (4)(a)(2)(d).
[142] *See, e.g.*, Pushker A. Kharecha & James E. Hansen, *Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power*, 47 Environ. Sci. & Tech. 4889 (2013) (concluding, based on analysis of historical production data, that global nuclear power use has prevented an average of 64 gigatonnes of CO_2-equivalent GHG emissions that otherwise would have resulted from fossil-fueled generation); NERA, *Economic Assessment of Fish-Protection Alternatives at Pilgrim Nuclear Power Station* (June 26, 2008) ("Economics Report"), at 71-79 (reporting that reductions in generation of electricity at PNPS will "requir[e] that other sources of generation be used more intensively, or that new generating units be built," with the result that there would be significant increases in CO_2 emissions, among other criteria air pollutants).
[143] *See* Kharecha & Hansen, *supra* note 142, at 4893 (noting continued potential for "devastating climate impacts").

Response to Comment 2.3:

In Response to Comment III.2.1, EPA explained that Section 316(b) of the CWA, 33 U.S.C. § 1326(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). 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"). In other words, Section 316(b) applies to the operation of a cooling water intake structure and is *not* triggered by a threshold level of organisms impinged or entrained. For an existing facility like PNPS, the requirements of the Final Rule applies if the facility is a point source, uses or proposes to use one or more cooling structures with a cumulative design flow (DIF) greater than 2 MGD to withdraw from waters of the U.S., and 25 percent or more of the water withdrawn on an actual intake flow basis is used exclusively for cooling purposes. *See* 40 C.F.R. § 125.91(a). The criteria for the applicability of § 316(b) is 1) a point source and 2) the operation of a CWIS. Entergy appears to agree that § 316(b) applies to PNPS, stating in Comment III.2.1 that the estimated losses or impingement and entrainment "are sufficient to trigger searching review under Section 316(b)."

According to Entergy, demonstration of "adverse environmental impact" is the prerequisite to technology forcing under Section 316(b) or to a finding of any alteration of the "excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions" for which Massachusetts surface water quality standards provide. The statute at 33 U.S.C. § 1326(b), above, requires that cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. The adverse environmental impact is not at issue, rather, the location, design, construction, and capacity of the cooling water intake structure must reflect BTA. What remains is for the permitting authority to determine what the BTA is to minimize the impact, which, as the Final Rule makes clear, may be no additional entrainment controls. *See* 40 C.F.R. § 125.98(g).

Finally, EPA acknowledges that closure of PNPS may increase overall GHG emissions if electricity that was generated at PNPS is replaced primarily by electricity generation that results in greater GHG emissions. The comment does not request any change to the permit based on this assertion nor does it explain how the change in greenhouse gases would affect any condition of the Draft or Final Permits. As such, EPA has not addressed this comment further.

3.0 The Final Permit Should Not Include What May Be Misconstrued As A Mandatory-Shutdown Condition Or Continuous Rotation Of The Traveling Screens

The Draft Permit states that, as of June 1, 2019, "PNPS *will terminate* cooling water withdrawals for the main condenser and will be authorized to continue withdrawing cooling water only as necessary to support decommissioning activities and to cool the spent fuel rods for a limited period of time following the shutdown of PNPS."[144] The Draft Permit further provides that, "[u]pon termination of generation of electricity *or no later than June 1, 2019*, the permittee shall," *inter alia*, "[c]ease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD."[145] The Draft Permit also states that "[t]he permittee has informed EPA and MassDEP that it will terminate operations at PNPS *and enter a decommissioning phase no later than June 1, 2019*."[146] Thus, Draft Permit provisions do more than memorialize Entergy's planned shutdown. Rather, the language suggests, and (if intentional)[147] could be interpreted as imposing, a shutdown mandate no later than June 1, 2019, followed by immediate decommissioning.

This mandatory shutdown and decommissioning condition is legally inappropriate, and the immediate shutdown condition is factually inappropriate. Both, therefore, should be removed from the final Permit. As Section I.A below explains, a mandatory closure condition is not within EPA's authority and is otherwise contrary to law. Further, while shutdown is expected to occur no later than June 1, 2019, decommissioning cannot commence immediately. Indeed, as a matter of law, decommissioning cannot commence until at least 90 days after Entergy submits its Post-Shutdown Decommissioning Activities Report ("PSDAR") to NRC, which is not due to NRC until two years following the shutdown.[148] Further, as a matter of industry practice, SAFESTOR is routinely employed by stations and is a viable option at PNPS, in which case decommissioning activities may not commence for many years.[149] Thus, Entergy respectfully submits that a statement that decommissioning activities will proceed "immediate[ly]" is not correct.

Section I.B below discusses the proposed new condition that PNPS be required to continuously rotate the traveling screens, and to monitor through-screen velocity, during post-shutdown dilution water usage. As detailed there, these proposed conditions are factually unsupported and lack any environmental rationale, and should therefore be deleted from the final Permit.
As a result, Part I.F of the Draft Permit, including the preamble thereto, must be clarified when the final Permit is issued. Proposed revisions are provided below in Section I.C.

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144 Draft Permit, Part I.F, at 32 (emphasis added).
145 *Id.* at 33 (emphasis added).
146 *Id.* at 32 (emphasis added).
147 Based on language appearing in Attachment D of the Fact Sheet, it remains unclear whether EPA or DEP actually intend to impose such a condition. For example, EPA states that, "*[s]hould the plant operate beyond June 2019*, EPA would have to *reconsider*" the "cost-benefit comparison" and "potential availability" of other BTA alternatives that "have been *eliminated from [its BTA] analysis due to the limited remaining useful life of the plant*." Fact Sheet, Attach. D, at 86 (emphasis added). Such statements suggest the Draft Permit's language may be intended merely to

reflect what Entergy has announced. To that end, Entergy's requested clarification should be readily satisfied.
148 *See* 10 C.F.R. § 50.82(a)(4)-(6).
149 *See, e.g.*, NRC, *Backgrounder: Decommissioning Nuclear Power Plants* (May 2015), at 5-6 (Table) (reflecting that most nuclear facilities for which decommissioning is planned have elected SAFSTOR).

3.1 The Draft Permit's Mandatory-Shutdown Language Is Both Unlawful And Unnecessary To Protect The Environment

3.1.1 Shutdown And Decommissioning Mandates Are Impermissible

A mandatory shutdown condition infringes on NRC's exclusive jurisdiction over nuclear-reactor operations and radiological decommissioning, and therefore is beyond the legal authority of EPA. In enacting the Atomic Energy Act of 1954 ("AEA"), Congress bestowed on the Atomic Energy Commission (now, NRC) exclusive jurisdiction over, among other things, the "operation" of nuclear power plants.[150] This field necessarily encompasses within its scope nuclear reactor operations, as well as issues related to such operations and shutdown, *e.g.*, *nuclear* fuel management, radiological safety and radiological discharges.[151] EPA and DEP are prohibited from encroaching on this exclusive domain, even when acting according to their respective general grants of authority to regulate water withdrawals or discharges. For decades the Supreme Court has made clear that Congress's grant of CWA authority to EPA was not intended to, and therefore did not, pare back the exclusive authority that Congress previously had bestowed on NRC to regulate nuclear reactor operations, as to which NRC plainly has superior expertise.[152] EPA therefore lacks the legal authority to command ("shall") Pilgrim to cease operating its nuclear reactor as of June 1, 2019, or to regulate facility operations in any way that "directly and substantially" affects the operator's decisions, including those "concerning nuclear safety levels," fuel management, spent fuel management or radiological discharges.[153]

As a state agency, DEP has no greater authority than EPA to dictate to PNPS that it must shut down its nuclear reactor by some date certain. Indeed, the federal courts have held that state law may not mandate even "temporary" shutdowns of nuclear-reactor operations,[154] nor may it "regulate the operation of [the] nuclear reactor," even if such regulation stops short of a shutdown mandate.[155]

In sum, the Draft Permit's language *mandating* that PNPS shut down on June 1, 2019 is inappropriate as a matter of law, because EPA and DEP lack the legal authority to impose such a condition.

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150 *See, e.g.*, *Pac. Gas & Elec. Co. v. State Energy Res. Conserv. & Dev. Comm'n*, 461 U.S. 190, 212 (1983).
151 *Id.* ("At the outset, we emphasize that the statute does not seek to regulate the construction or *operation* of a nuclear power plant. It would clearly be impermissible for California to attempt to do so, for such regulation, even if enacted out of non-safety concerns, would nevertheless directly conflict with NRC's exclusive authority over plant construction and *operation*." (emphasis added)); *accord Entergy Nuclear Vt. Yankee LLC v. Shumlin*, 733 F.3d 393, 411 (2d Cir. 2013) (observing that *Pac. Gas* "emphasiz[ed]" that a "state statute that seeks to regulate the construction or *operation* of a nuclear powerplant" would "directly conflict with the NRC's exclusive authority over plant construction or *operation*" (emphases added)); *County of Suffolk v. Long Island Lighting Co.*, 728 F.2d 52, 56 (2d Cir. 1984) ("[T]he NRC retains responsibility to regulate "the construction *and operation* of any production or utilization facility." (emphasis added)); *Missouri v. Westinghouse Elec., LLC*, 487 F. Supp. 2d 1076, 1084 (E.D. Mo.

2007) (reciting that in *PG&E* the Supreme Court "noted two general areas in which state regulation is pre-empted: the construction and *operation* of nuclear power plants…." (emphasis added)).
152 *Train v. Colo. Pub. Interest Research Group, Inc.*, 426 U.S. 1, 15-17 (1976) (holding that EPA's general authority under CWA to regulate discharges of pollutants does not trump NRC's exclusive authority under AEA to regulate handling of radionuclides); *see also Whitney Nat'l Bank v. Bank of New Orleans & Trust Co.*, 379 U.S. 411, 419-20 (1965) ("[W]here Congress has provided statutory review procedures designed to permit agency expertise to be brought to bear on particular problems, those procedures are to be exclusive.").
153 *See, e.g., English v. Gen. Elec. Co.*, 496 U.S. 72, 84-85 (1990); *United States v. Manning*, 434 F. Supp. 2d 988, 1007 (E.D. Wash. 2006); *Me. Yankee Atomic Power Co. v. Bonsey*, 107 F. Supp. 2d 47, 55 (D. Me. 2000).
154 *See, e.g.*, *County of Suffolk*, 728 F.3d at 59-60 (holding that state-law injunction "that even temporarily shuts down [a nuclear facility] would infringe on the NRC's authority over construction and operation").
155 *Boeing Co. v. Robinson*, No. CV 10-4839-JFW, 2011 WL 1748312, at *11 & n.11 (C.D. Cal. Apr. 26, 2011).

3.1.2 The Permit Must be Flexible About Shut Down Dates

The following comment was provided at the Public Hearing by Mr. Romeo of Entergy. Significant wholesale market conditions, brought about by record low fossil fuel prices and poor market design that does not value the carbon free base load electricity generated at Pilgrim, we made the decision to shut the plant down. With this context, I wanted to outline what lies next for the station during the last years of operation, specifically, as it relates to Pilgrim's permit. Again, our shut down is targeted for June of 2019. It will not surprise you that shutting down a major electricity supplier is a complicated matter. As a result, the exact timing of that shut down in 2019 depends on a variety of factors, including further discussions with the New England independent system operator, our fuel design and our fuel loading considerations.

For this reason, the permit must be flexible about shut down dates. Until that shut down, Pilgrim will continue to operate as usual with the flows and discharges that are permitted under Pilgrim's existing permit or the draft permit.

Response to Comments 3.0, 3.1, 3.1.1, and 3.1.2:

<u>Introduction</u>

The Agencies have not mandated that Entergy shut PNPS down or begin decommissioning "immediately" after shutdown; Entergy made the decision to close the plant—a decision it reaffirmed in this and other comments on the Draft Permit.[45] The BTA analysis in the Fact Sheet recognized Entergy's choice, and the Agencies' conclusion that no additional entrainment technologies are warranted is appropriately premised on the decision made by, and the date chosen by, Entergy. The comment offers no evidence that the Agencies had, or sought to have, any say in that decision or that date. In the Fact Sheet, the Agencies recognized the potential for PNPS to operate beyond June 2019 and advised that, in such a case, they would have to revisit the BTA analysis, as it could impact the basis for the conclusion that no additional entrainment technologies are warranted. Fact Sheet, Attachment D at 86. Entergy repeatedly and consistently reaffirmed both its decision and its chosen date, including in its comments on the Draft Permit, in

[45] *See, e.g.*, Entergy Redline of Fact Sheet at 9 ("*Entergy's decision to close Pilgrim* was based on numerous factors, including the Commonwealth's decisions to subsidize oil storage at natural gas facilities and hydropower utilities in Canada. These conditions rendered continued station operation uneconomical.") (emphasis added).

"Supplemental Comments" it submitted after the close of the public comment period, and in public filings with the NRC and ISO-NE before and after the issuance of the Draft Permit. Furthermore, Entergy never informed the Agencies that it had changed its position and intended to operate beyond June 1, 2019. In addition, Entergy continued to represent to the NRC its intent to cease power operations at PNPS permanently no later than June 1st, 2019. *See, e.g.*, Letter from Mandy Halter, Director of Nuclear Licensing, Entergy Nuclear Operations, Inc. to NRC (Nov. 16, 2018) (transmitting Pilgrim Nuclear Power Station's Post-Shutdown Decommissioning Activities Report) *See* AR-696. More importantly, on May 31, 2019, Entergy did in fact cease generating electricity at PNPS. Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019) *See* AR-688; Press Release, Entergy Corp., Pilgrim Nuclear Power Station Shut Down Permanently (May 31, 2019) (hereinafter, "Entergy May 2019 Press Release"). Further, on June 9, 2019, Entergy "permanently removed [the fuel] from the PNPS reactor vessel," acknowledging that its license therefore "no longer authorizes operation of the reactor." Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019). As a result, and as explained earlier, the Agencies have not included in the Final Permit the conditions from the Draft Permit that were to apply prior to June 1, 2019. Although these facts render irrelevant the comments that the Agencies lack the authority "to command" Entergy to "shut down" its nuclear reactor and that the "permit must be flexible about shut down dates," the Agencies provide additional response regarding the purported "shutdown and decommissioning mandate" below.

The BTA determination relies on Entergy's repeated and consistent public representations that it would permanently cease generating electricity at the plant of its own accord by June 1, 2019, and on the actual closure of PNPS undertaken by Entergy. Should the permittee decide to change its decision, it may submit an application for a permit modification informing the Agencies of its new plans, so that the Agencies may revisit the BTA analysis as necessary based on any updated factors, including the remaining useful life of the plant. In such a case, the Agencies would be properly authorized to make the decision as to the water pollution control criteria to which the facility's cooling system should be held in light of such changed conditions.

<u>"Shutdown"</u>

Pursuant to federal regulations at 40 C.F.R. §§ 125.94(d) and 125.98(f), EPA, as the NPDES permitting authority in Massachusetts, is required, in connection with the reissuance of the facility's NPDES permit, to establish site-specific requirements for entrainment for PNPS reflecting EPA's determination of the maximum reduction in entrainment warranted after consideration of several enumerated factors relevant for determining the best technology available for minimizing adverse environmental impact at the facility. The relative weight to assign to each factor is a matter given over to EPA discretion, based on the circumstances of each facility.[46] Among these factors is the consideration of the remaining useful life of the facility. Well before the Agencies published the Draft Permit, Entergy announced that it had decided to close PNPS "no later than June 1, 2019," and that, "[a]fter shutdown," the facility would "transition to decommissioning." Press Release, Entergy Corp., Entergy to Close Pilgrim Nuclear Power Station in Massachusetts No Later than June 1, 2019 (Oct. 13, 2015) (hereinafter,

[46] In an ongoing permit proceeding such as this one, the BTA determination may be based on some or all of the factors in § 125.98(f). 40 C.F.R. § 125.98(g).

"Oct. 2015 Press Release"). At around the same time as that announcement, Entergy sent ISO-NE a Non-Price Retirement request, indicating that PNPS would not participate in the forward capacity market after May 2019, which request was approved by ISO-NE on December 18, 2015. Further, in a November 10, 2015, letter to the NRC, Entergy certified that "it has decided to permanently cease power operations at the Pilgrim Nuclear Power Station no later than June 1, 2019." Letter from John Ventosa, Entergy, to NRC (Accession No. ML15328A053). In April 2016, Entergy publicly reiterated that it would "cease operations on May 31, 2019." Press Release, Entergy Corp., Entergy Intends to Refuel Pilgrim in 2017; Cease Operations on May 31, 2019 (Apr. 14, 2016) (hereinafter, "Apr. 2016 Press Release"). *See* AR-636. Email from Joe Egan to George Papadopoulos on October 13, 2015 citing news release announcing shutdown of Pilgrim no later than June 1, 2019. *See* AR-724.

EPA, relying on Entergy's numerous representations to the public, to ISO-NE, to the NRC, and directly to EPA, reasonably considered the remaining useful life of the plant to extend only through May 31, 2019. As EPA evaluated various entrainment technologies, it concluded that, of three potentially available technologies, two that could result in the greatest reduction in entrainment (namely, assisted recirculation and closed-cycle cooling[47]) most likely could not be constructed and operational prior to Entergy's self-imposed closure date. Consequently, EPA determined that neither was available within the remaining useful life of the plant and did not consider these technologies further in the BTA determination. Concluding that VFDs were available within this time frame, however, EPA considered their social costs and benefits, ultimately concluding that the social costs of VFDs at PNPS were not justified by the social benefits that would be provided over the extremely limited period during which they would operate. (The comment does not suggest that EPA incorrectly relied on the remaining useful life factor to rule these entrainment technologies out or to conclude that VFDs are available but not justified). Consequently, EPA concluded that no additional entrainment control requirements were necessary. EPA made clear, however, that this conclusion was predicated on Entergy's public announcement and actions to cease power operations at the facility by a date certain (again, a date of Entergy's own choosing) and, as a consequence, reduce cooling water

[47] The Agencies have not made a finding on the question of whether closed-cycling cooling is technologically feasible or infeasible at PNPS; it is unnecessary for the Agencies to do so in this permit proceeding. As the Fact Sheet explains, prior to the release of the Draft Permit, Entergy presented several arguments that closed-cycle cooling was not technologically feasible, which we agreed would present difficult issues for retrofitting PNPS but which did not themselves appear to be conclusive on the question of infeasibility. *See* Fact Sheet, Att. D at 37-46. For instance, in the Fact Sheet, we noted that PNPS concluded that conversion to closed-cycle cooling is infeasible because it would require frequent power reduction that "would substantially impact the capacity of the plant to generate electricity and is generally not consistent with a nuclear power plant designed for baseload generation." *Id.* at 40-43. We noted, however, that Entergy's modeling results evaluating larger cooling towers suggested that PNPS could potentially avoid that problem by operating closed-cycle cooling seasonally. *Id.* at 43-44. We also noted the potential for partially alleviating the concern by increasing the size of the condenser. *Id.* at 44. While Entergy argued for infeasibility on the basis that such a modification of the condenser would be unprecedented, we observed that "it does not necessarily follow that it is therefore infeasible." *Id.* at 45. Indeed, Entergy concluded that assisted recirculation, a technology similar to closed-cycle cooling, would be unprecedented but still feasible. *Id.* at 51. In any event, the Agencies concluded that closed-cycle cooling was not available within the remaining useful life of the plant and ruled it out as BTA at PNPS on that basis, *id.* at 76-77, obviating any need for the Agencies to make a finding regarding its technological feasibility at PNPS, *see also* AR-749. Furthermore, since the issuance of the Draft Permit and Fact Sheet, Entergy has shut PNPS down.

withdrawals by approximately 96%. As a result, the flow limits in the Draft Permit for the cooling water intake structure decrease from 466.4 MGD (avg. monthly) and 529.4 MGD (max. daily) to 7.8 (avg. monthly) and 15.6 MGD (max. daily) "following termination of electricity generation at the facility, no later than June 1, 2019." Draft Permit Part I.B.

Since the release of the Draft Permit and the close of public comment, Entergy continued to affirm its plans to cease power operations at PNPS permanently by June 1, 2019. For instance, on August 18, 2016, it asked NRC to defer compliance with various NRC requirements, in part based on "the limited operating time left . . . prior to the defueling of the plant" in 2019. Letter from John A. Dent, Jr., Site Vice President, Entergy, to NRC, Accession No. ML16250A018 (Aug. 18, 2016).[48] On December 8, 2017, it told NRC that it "plans to permanently cease operations of PNPS no later than June 1, 2019," and that "PNPS will permanently cease operation prior to the applicable compliance date of June 30, 2019 for [a particular NRC] order"). Letter from Brian R. Sullivan, Site Vice President, Entergy Nuclear Operations, Inc., to NRC (Dec. 8, 2017). In a June 11, 2018, email to EPA, an Entergy representative reiterated that the plant was "shutting down for good no later than 5/31/2019." AR-685. True to those representations, PNPS did, in fact, cease generating electricity on May 31, 2019, and permanently removed the fuel from the reactor vessel on June 9, 2019, placing it in the spent fuel pool. Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019); Entergy May 2019 Press Release. In other words, Entergy has shut PNPS down without any "mandate" from the Agencies.

In its written comments on the Draft Permit, Entergy opposed including in the Final Permit its chosen date for a reduction in cooling water intake structure withdrawals. Entergy requested instead that we simply strike the date and provide an open-ended authorization to continue such withdrawals. Such an open-ended condition, however, had the potential to result in indefinite continuation of withdrawals without re-analysis by the Agencies. It would have ignored and rendered irrelevant the factor that largely undergirded the BTA analysis—Entergy's repeated and consistent public representations about the limited remaining useful life of the plant and the drastic reduction in flows through the CWIS projected by Entergy to occur by June 2019. Thus, in the Agencies' views, the commenter's proffered solution would have resulted in permit conditions that were not supported by, and would not have reflected, the BTA analysis. Moreover, it would be incongruous to require a permitting authority on the one hand to factor the remaining useful life of a facility into its BTA analysis, 40 C.F.R. § 125.98(f)(2)(iv), only to prohibit the agency from factoring it into the permit conditions, particularly where, as here, the permittee had publicly, repeatedly, and consistently said that the remaining useful life of the plant did not extend even to the end of the five-year permit term, *see id.* § 122.46(a). The commenter's proposed open-ended condition could have significantly undermined the BTA determination and would not have ensured compliance with section 316(b). *See* CWA

[48] *Available at* https://www.nrc.gov/docs/ML1625/ML16250A018.pdf. *See also* Letter from Dent to NRC, Accession No. ML16250A017 (Aug. 18, 2016) ("Additionally, PNPS is informing the NRC that, in light of . . . the decision to permanently shut down and defuel in 2019, seismic activities being performed to meet the NRC 10 Code of Federal Regulation 50.54(f) request for information and any related commitments planned between now and the 2019 Cessation of Power Operations are requested to be deferred. With the limited operating time left, there is insufficient time to complete evaluations, design and approve changes to the plant, and then implement those changes such that a meaningful improvement to safety is achieved prior to the defueling of the plant."), *available at* https://www.nrc.gov/docs/ML1625/ML16250A017.pdf.

§ 402(a)(2); *see also* 40 C.F.R. §§ 122.4(a) (prohibiting the NPDES permitting authority from issuing a permit "[w]hen the conditions of the permit do not provide for compliance with the applicable requirements of CWA, or regulations promulgated under CWA"), 122.43(a) (requiring the permitting authority to "establish conditions, as required on a case-by-case basis, to provide for and ensure compliance with all applicable requirements of CWA and regulations"). Consequently, we do not agree that the inclusion of such an open-ended condition would have been appropriate. (Such a condition would have been unnecessary in any event because the PNPS stopped generating electricity on May 31, 2019, and Entergy removed the fuel from the reactor vessel shortly thereafter). The Agencies did not mandate the closure of the plant, but rather appropriately proposed permit conditions that reflected the permittee's decision to close "no later than June 1, 2019," that appropriately supported the conclusions of the BTA analysis, and that ensured compliance with applicable CWA requirements. The Agencies did not mean to imply that Entergy could not change its decision. As stated in the Fact Sheet, in such an event, the Agencies would need to revisit the BTA analysis. Fact Sheet, Att. D at 86.

In support of its comment to remove "no later than June 1, 2019," as an effective date for the applicability of the reduced intake flow limits, the comment asserts that the condition "infringes on NRC's exclusive jurisdiction over nuclear-reactor operations" and is beyond EPA's legal authority. Of course, the proposed permit conditions reflected Entergy's decision and would have placed the limits on PNPS's withdrawal that Entergy told the Agencies were the maximum necessary by that point in time, as explained above. See, for example, AR-520, AR-521. In any event, the commenter does not cite to any particular provision of the Atomic Energy Act ("AEA") to support its assertion, but instead mostly advances a legal argument regarding field pre-emption of state law by the AEA that is inapplicable to the CWA.[49] The doctrine of pre-emption is inapplicable to other federal laws because it derives from the Supremacy Clause of the U.S. Constitution, which provides that the Constitution and federal statutes are "the supreme law of the Land" and shall be binding on the states. U.S. Const. art. IV, cl. 2. Thus, although federal pre-emption may potentially apply to a particular state law, it does not apply to another federal law (*i.e.*, the Clean Water Act). *See, e.g.*, *POM Wonderful LLC v. Coca-Cola Co.*, 134 S.Ct. 2228, 2236 (U.S. 2014) (The "state-federal balance [of pre-emption] does not frame the inquiry" where two federal statutes overlap). Instead, "[t]he Supreme Court provides that 'it is a cardinal principle of construction that . . . . when there are two acts upon the same subject, the rule is to give effect to both.'" *United States v. Palumbo Bros.*, 145 F.3d 850, 862 (7th Cir. 1998)

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[49] For instance, the comment first cites to *Pacific Gas & Electric Co. v. State Energy Resources Conservation & Development Commission*, 461 U.S. 190, 212 (1983), a case in which a state law imposed a moratorium on the construction of new nuclear plants. *Id.* at 198. Incidentally, the Supreme Court upheld the state provision in this case, finding that it was <u>not</u> preempted by the AEA. *Id.* at 222. (In fact, four U.S. Supreme Court decisions have examined in detail claims that the AEA preempted a particular state law, and, in each case, the Court found the AEA did <u>not</u> preempt state law. *See also Virginia Uranium v. Warren*, 587 U.S. ___ (2019); *English v. Gen. Elec. Co.*, 496 U.S. 72 (1990); *Silkwood v. Kerr-McGee*, 464 U.S. 238 (1984)). Similarly, in *Entergy Nuclear Vermont Yankee v. Shumlin*, 733 F.3d 393, 409 (2d Cir. 2013), next cited in the comment, the owners of a nuclear power plant sued state officials alleging that the AEA preempted three state laws. 733 F.3d 393, 397-98 (2d. Cir. 2013). The other cases cited in the comment likewise involve preemption of state law by federal law. *See English v. Gen. Elec. Co.*, 496 U.S. 72, 78 (1990); *Cty. of Suffolk v. Long Island Lighting Co.*, 728 F.2d 52, 55 (2d. Cir. 1984); *Missouri v. Westinghouse Elec., LLC*, 487 F. Supp. 2d 1076, 1080-82 (E.D. Mo. 2007); *Boeing Co. v. Robinson*, No. CV 10-4839-JFW, 2011 U.S. Dist. LEXIS 52507, at *3 (C.D. Cal. Apr. 26, 2011); *United States v. Manning*, 434 F. Supp. 2d 988, 992 (E.D. Wash. 2006); *Maine Yankee Atomic Power Co. v. Bonsey*, 107 F. Supp. 2d 47, 48-49 (D. Me. 2000).

(quoting *United States v. Borden Co.,* 308 U.S. 188 (1939)). "Congressional intent behind one federal statute should not be thwarted by the application of another federal statute if it is possible to give effect to both laws." *Id.*; *see also Morton v. Mancari*, 417 U.S. 535, 551 (1974) ("[W]hen two statutes are capable of co-existence, it is the duty of the courts, absent a clearly expressed congressional intention to the contrary, to regard each as effective.").

Even where preemption is the applicable inquiry, EPA notes that a preemption analysis "starts with the basic assumption that Congress did not intend to displace state law," *Maryland v. Louisiana*, 451 U.S. 725, 746 (1981), and that, with respect to the AEA in particular, the U.S. Supreme Court has dismissed the notion that the AEA "is intended to preserve the federal government as the sole regulator of all matters nuclear," *Pacific Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n*, 461 U.S. 190, 205 (1983). Moreover, "the AEA contains no provision preempting state law in so many words." *Virginia Uranium, Inc. v. Warren*, 587 U.S. ___, ___, slip op. at 4 (2019). Rather, the courts have held that the federal government has occupied <u>the field of "nuclear safety concerns</u>," *Pacific Gas*, 461 U.S. at 212 (emphasis added); *see also Entergy Nuclear Vermont Yankee v. Shumlin*, 733 F.3d 393, 409 (2d Cir. 2013) ("*Radiological safety* . . . represents an arena of field preemption that Congress, acting within its proper authority, has determined must be regulated by its exclusive governance, thus precluding any regulation by the states.") (emphasis added) (internal quotation marks omitted); *Skull Valley Band of Goshute Indians v. Nielson*, 376 F.3d 1223, 1242 (10th Cir. 2004) ("[S]tate laws within the entire field of *nuclear safety concerns* are preempted, even if they do not directly conflict with federal law.") (emphasis added) (internal quotation marks omitted); *United States v. Kentucky*, 252 F.3d 816, 823 (6th Cir. 2001) ("[T]he AEA preempts any state attempt to regulate materials covered by the Act *for safety purposes*.") (emphasis added); *Illinois v. Kerr-McGee Chemical Corp.*, 677 F.2d 571, 581 (7th Cir. 1982) ("[T]he Atomic Energy Act has expressly and impliedly preempted regulation by the states *of the radiation hazards* associated with nuclear materials.") (emphasis added). In other words, the federal government has the exclusive authority to regulate for protection against radiation hazards. Thus, a state may not regulate on the basis of radiological safety or where state regulation, even if not based on nuclear safety, presents an "actual conflict" with the NRC's regulation of radiation hazards. *Kerr-McGee*, 677 F.2d at 582, 584. Courts have further held that a state law may be pre-empted by the AEA, if the decision to pass it was "grounded in radiological safety concerns," *id.* at 422 (quotation marks and brackets omitted); *but see Virginia Uranium, Inc. v. Warren*, 587 U.S. ___, ___, slip op. at 9-14 (2019) (questioning in the lead opinion the propriety of examining the state's purpose where the activity does not touch on activities in section 2021 of the AEA), or if the law has an actual effect on nuclear safety, *English v. Gen. Elec. Co.*, 496 U.S. 72, 84 (1990); *Entergy Nuclear Vermont Yankee*, 733 F.3d at 416-17; *Skull Valley*, 376 F.3d at 1247-48. But,

> not every state law that in some remote way may affect the nuclear safety decisions made by those who build and run nuclear facilities can be said to fall within the pre-empted field. We have no doubt, for instance, that the application of state minimum wage and child labor laws to employees at nuclear facilities would not be pre-empted, even though these laws could be said to affect tangentially some of the resource allocation decisions that might have a bearing on radiological safety. Instead, for a state law to fall within the pre-empted zone, it must have *some direct*

and substantial effect on the decisions made by those who build or operate nuclear facilities *concerning radiological safety levels*.

English, 496 U.S. at 85 (emphases added); *see also Virginia Uranium*, 587 U.S. at ___, slip op. at 5 (reiterating that the AEA should not be read to prohibit a State "from regulating any activity even tangentially related to nuclear power"); *Silkwood*, 464 U.S. at 256 ("It may be that the award of damages based on the state law of negligence or strict liability is regulatory in the sense that a nuclear plant will be threatened with damages liability if it does not conform to state standards, but that regulatory consequence was something that Congress was quite willing to accept."); *Pac. Gas*, 461 U.S. at 222 (dismissing the suggestion that "the promotion of nuclear power" is to be accomplished "at all costs"). The AEA also contains a savings clause at § 2021(k) that explains that "States remain free to regulate the activities discussed in §2021 for purposes *other than* nuclear safety without the NRC's consent." *Virginia Uranium*, slip op. at 6 (lead opinion), slip op. at 8 (concurring opinion) (both citing 42 U.S.C. § 2021(k)). Section 2021(k) provides that "Nothing in this section shall be construed to affect the authority of any State or local agency to regulate activities *for purposes other than protection against radiation hazards*." *Id*. (emphasis added).[50]

Here, the commenter does not describe any actual conflict between the (presumably state) permit condition and NRC's regulation of radiation hazards. Moreover, the comment does not explain what "direct and substantial effect" the permit condition will have "on the decisions made by [the permittee] concerning radiological safety levels," especially considering that the permittee had *already* decided to, and now actually has, shut the facility down. The permittee has not even alleged that the permit conditions are grounded in a concern about radiological safety. (They are not; as previously explained, the flow conditions are grounded in the BTA analysis and Entergy's public, repeated, and consistent statements that Entergy has decided to shut PNPS down). EPA has also recognized in its regulations that BTA determinations may appropriately be revised based on a demonstrated conflict with an NRC safety requirement, *see* 40 C.F.R. § 125.94(f), but the comment does not even allege, let alone demonstrate, that the flow limits or their timing would result in a conflict with any particular NRC safety requirement. "Invoking some brooding federal interest . . . should never be enough to win preemption of a state law." *Virginia Uranium*, 587 U.S. at ___, slip op. at 3 (lead opinion); *see also In re Town of Newmarket*, 16 E.A.D. 182, 217 (EAB 2013 (holding that vague and speculative arguments are insufficient to overturn a permit condition and do not demonstrate error); *In re Three Mountain Power, LLC*, 10 E.A.D. 39, 59 (EAB 2001) (same).

Not only did the comment fail to identify an actual conflict with the AEA or a particular NRC safety requirement and fail to explain how the BTA determination is grounded in a concern about radiological safety, it put the cart before the horse. Entergy made the decision to cease operating the plant *before* the Agencies issued a proposed BTA determination that would have lowered the flow limits by the date chosen *by Entergy* and to levels *Entergy told the Agencies it*

[50] Furthermore, the AEA also provides that "[n]othing in [the AEA] shall be construed to affect the authority or regulations of any Federal, State, or local agency with respect to the generation, sale, or transmission of electric power produced through the use of nuclear facilities licensed by the Commission: Provided, That this section shall not be deemed to confer upon any Federal, State, or local agency any authority to regulate, control, or restrict any activities of the Commission." 42 U.S.C. § 2018.

required. The flow conditions in the Draft Permit flowed from Entergy's decisions, not the other way around. Moreover, as has been stated many times, the Agencies recognized in the Fact Sheet that they would revisit the BTA analysis should Entergy change its decision.

There was no indication that NRC objected to Entergy's plans and intended to require Entergy to continue to operate PNPS beyond June 1, 2019. Entergy informed NRC that it "plans to permanently cease operations of PNPS no later than June 1, 2019." Letter from Brian R. Sullivan, Site Vice President, Entergy Nuclear Operations, Inc., to NRC (Dec. 8, 2017). It even told NRC that "PNPS *will* permanently cease operation prior to" June 30, 2019. *Id.* (emphasis added). In fact, NRC granted Entergy's request to defer actions that would otherwise be required at PNPS, based on Entergy's decision to cease power generation at the plant by June 1, 2019. Letter from Jane E. Marshall, Nuclear Regulatory Comm'n, to John Dent, Jr., Entergy Nuclear Operations, Inc. (Apr. 17, 2017). The flow limits in the Draft Permit that were proposed to become applicable following the cessation of electricity generation, or by June 1, 2019, reflected Entergy's decision and, as we have indicated, could have been revisited if that decision were to change. FS, Att. D at 86. Furthermore, NRC administrative case law recognizes the role of EPA and the states in selecting water pollution control criteria applicable to a nuclear plant as proper under the CWA and AEA. Thus, this provision would not have precluded Entergy from changing its decision to operate beyond June 1, 2019, and the comment does not demonstrate that it would have conflicted with any particular NRC safety requirement. On May 31, 2019, Entergy in fact did what it had publicly stated it would do by that date—it shut down electrical generation at PNPS. Further, on June 9, 2019, Entergy "permanently removed" the fuel "from the PNPS reactor vessel and placed [it] in the spent fuel pool." Letter from Brian Sullivan, Site VP, Entergy Nuclear Operations, Inc., to NRC (June 10, 2019). Consequently, pursuant to NRC regulations, Entergy may no longer operate the reactor. 10 C.F.R. § 50.82(a)(2). Thus, if any agency or regulations can be said to have "mandated" shutdown of the facility, it would be NRC and its regulations, not EPA or MassDEP.

Only one case cited in the comment interpreted a perceived overlap between two federal statutes (*i.e.*, the CWA and the AEA). *See Train v. Colorado Public Interest Research Group, Inc.*, 426 U.S. 1 (1976) (hereinafter, *Train*). In *Train*, the Supreme Court addressed EPA's refusal to regulate the discharge of "special nuclear materials," "by-product," and "source materials" on the basis that they were not encompassed in the CWA's definition of "pollutant." Although the Court agreed with EPA that these materials are not "pollutants" within the meaning of the CWA and, thus, not within EPA's authority to regulate, the Court did not issue the broad holding offered by the comment that "EPA's general authority under CWA to regulate discharges of pollutants does not trump NRC's exclusive authority under AEA to regulate handling of radionuclides." Comment at 23 n.152. Moreover, consistent with *Train*, the Fact Sheet explicitly notes that the permit does not regulate special nuclear materials, by-product, and source materials, since these are not "pollutants" under the CWA. Fact Sheet at 37, 44; *see also* Draft Permit, Part I.D.15. *Train* and the years of NPDES permitting of nuclear power plants across the country support the view that Congress intended that effect be given to both the CWA and the AEA, where possible, and that nuclear power plants would be regulated under the CWA insofar as they use cooling water intake structures and discharge pollutants within the meaning of CWA. The CWA and the AEA are quite clearly capable of co-existence, and PNPS itself has operated with a NPDES permit for over 40 years.

As noted above, EPA *has* indicated that it will defer to NRC where a permittee demonstrates that the BTA determination would result in a conflict with a safety requirement established by NRC, *see* 40 C.F.R. § 125.94(f), but, again, the comment cites no particular conflict or safety requirement. Furthermore, Entergy points to nothing in the AEA that expressly "forbids or limits" the CWA from regulating flows at cooling water intake structures at nuclear power plants, *POM Wonderful*, 134 S.Ct. at 2237, or that overrides EPA's authorization under the CWA to include flow conditions in a NPDES permit to further the objectives of the CWA, *see* CWA § 402(a)(2); 40 C.F.R. §§ 122.4(a), 122.43(a). Here, the permittee decided on its own to cease power operations "no later than June 1, 2019."[51] *See* AR-688, AR-691. Relying on Entergy's decision, the section 316(b) analysis determined that no additional entrainment controls were warranted based on the relatively short remaining useful life of the plant as determined by Entergy. EPA, in furtherance of the objectives of, and to ensure compliance with, the CWA and its implementing regulations, included permit conditions to regulate the withdrawal of seawater via the facility's CWIS by a date certain based entirely on the date chosen by Entergy and by which it certified to NRC that it would cease power operations. NRC did not reject that certification or otherwise indicate that PNPS would be required to operate beyond that date for safety, or other, reasons.[52] Moreover, during the public comment period, NRC did not submit any comments on the draft permit opposing the flow conditions (or any other aspect of the permit). Nor did it contact EPA after the close of the comment period to object to the flow limits proposed in the Draft Permit that were to become applicable by June 1, 2019. Entergy asserts with little, if any, explanation that the flow limits in the permit are beyond EPA authority, yet points to no specific "difficulty in fully enforcing each statute according to its terms." *POM Wonderful*, 134 S.Ct. at 2240. As the NRC itself has recognized, the CWA "leav[es] to EPA and the States the decision as to the water pollution control criteria to which a facility's cooling system [will] be held." *In re Philadelphia Elec. Co. (Peach Bottom Atomic Power Station, Unit 3)*, ALAB-523, 9 N.R.C. 279 (1979); *accord In re Pub. Serv. Co. of New Hampshire (Seabrook Station, Units 1 and 2)*, ALAB-366, 5 N.R.C. 39, 51-52 (1977); *see also In re Consolidated Edison Co. of New York*, 13 N.R.C. 448 (1981) (citing 33 U.S.C. § 1371(c)(2)). Thus, regulation of PNPS may proceed as it always has, with the permit regulating the facility's operations with respect to withdrawal of cooling water and discharges of pollutants and NRC regulating other aspects of its operations.

The permittee's comments could suggest that its objection over including intake flow limits in the Final Permit was more about *when* those limits would go into effect, rather than with their absolute inclusion. For instance, Entergy repeatedly emphasized in its written comments that June 1, 2019, was its "planned," "expected," "anticipated," or "targeted" shutdown date, suggesting that there was at least some concern on its part that that date might not be achieved, *see, e.g.*, Comments III.1.0, .3.0, .3.3, .5.2, .8.1, .9.0, .9.1; Entergy Redline attachment, *passim*, although, again, it has actually been achieved. Entergy's comments also suggest that it supported

[51] The Agencies note that, although Entergy objected to intake flow limits that would take effect "no later than June 1, 2019," *see e.g.*, Draft Permit Part I.B.1, Entergy used this particular phrase when informing NRC of its decision to shut down. Specifically, Entergy stated: "it has decided to permanently cease power operations at [PNPS] no later than June 1, 2019." [*See* AR-515]. It then suggested to NRC that the actual shutdown could, in fact, happen sooner. *Id*.

[52] NRC apparently acquiesced to Entergy's decision to close no later than June 1, 2019. *See* Letter from Jane Marshall, NRC, to John Dent, Entergy Nuclear Operations, Inc. (Apr. 17, 2017).

the use of the date in the development of the permit. For instance, Entergy did not object to the Agencies' use of the date in the BTA analysis and states in its comments that it "appreciates the incorporation into the Draft Permit of conditions relating to Pilgrim's planned cessation of electricity generation ('shutdown') in 2019." Comment III.1.0. Further, Entergy also suggested that Section 8.0 of the Fact Sheet (relating to 316(b) requirements) be revised to state that "[f]low reduction is commonly used to reduce impingement and entrainment," that "[u]nit closures provide clear reductions in flow," and that "*[f]low reductions resulting from PNPS's anticipated closure are reasonably included* as part of PNPS's impingement mortality and entrainment reductions strategy." Entergy Redline at 59 (emphasis added). In addition, Entergy's comments note the timing of the intake flow limits in the Draft Permit "may be intended merely to reflect what Entergy has announced." Comment IV.3.0 n.147. In oral comments offered at the public hearing, an Entergy representative requested that the permit be flexible, stating that "our shut down is targeted for June of 2019," but that "shutting down a major electricity supplier is a complicated matter" and that, consequently, "the exact timing of that shut down in 2019 depends on a variety of factors." The Agencies have no reason to disagree that shutting down PNPS is a "complicated matter," but to the extent the comment is actually an objection to when the flow limits were to go into effect, the comment is moot; the Agencies have not carried forward to the Final Permit the language regarding the effective date of the flow limits because Entergy has already shut PNPS down.

In short, the Draft Permit conditions were based on the BTA determination, which depended in large part on Entergy's decision and self-imposed shutdown date and were structured around this date. Before, during, and after the public comment period, Entergy repeatedly represented to the public, federal regulators, and the energy market that it did not intend to operate beyond this date, and, on its chosen date, Entergy actually did shut the facility down. The Agencies did not "mandate" the closure of PNPS.

<u>"Immediate" Decommissioning</u>

The Agencies do not view the Draft Permit as containing a "decommissioning condition" that would have required the permittee to begin decommissioning—as the commenter uses the term in the comment or as the term might suggest specific activities under the Atomic Energy Act (AEA)—by June 1, 2019. The Draft Permit and Fact Sheet used the words "decommissioning activities" in the sense that use of the CWIS following shutdown would involve withdrawals and discharges of significantly lower volumes of seawater to cool spent fuel rods and dilute nuclear materials regulated by the AEA that PNPS may discharge pursuant to NRC authorization. The Draft Permit did not, and was not intended to, require that decommissioning begin "immediately" after shutdown, but recognized that use of the CWIS would change significantly when PNPS shut down. As the references to decommissioning highlighted in the comment resulted in some confusion and were not clear, the Agencies have removed them from the CWIS Requirements of the Final Permit (now at Part I.C, previously Part I.F of the Draft Permit). Furthermore, as explained elsewhere, the Final Permit does not authorize certain pollutant discharges that may result from specific activities associated with decommissioning (e.g., demolition of buildings, dismantlement and decontamination of plant systems and structures) because Entergy did not characterize or provide details of the discharges that would result. *See also* Response to Comment IV.5.1.

3.1.3 There Is No Environmental Rationale For A Mandatory-Shutdown Mandate

Under EPA's Final 316(b) Phase II Rule, different BTA performance standards can be imposed to redress I&E that rises to the level of an adverse environmental impact.[156] We further agree with EPA that the existence of I&E precipitates the application of Section 316(B) and the Rule.[157] Here, as detailed in Section I.A.2.i below, we respectfully submit that Pilgrim satisfies the impingement mortality standard, particularly given that the Rule expressly provides for *de minimis* exceptions to the impingement mandates.[158]

With respect to entrainment (and where the impingement controls for the facility already meet the Rule, as is the case for Pilgrim), the Rule is designed to reflect a flexible, rationale approach that does not stand on technology forcing for its own sake. Thus, for instance, EPA recognizes that flows that are less than 5% of the waterbody in question are unlikely to have a demonstrable adverse environmental impact.[159] Similarly, EPA acknowledges the existence of impingement and entrainment survival, when adequately demonstrated.[160] Finally, EPA acknowledges that natural mortality cannot be improperly ascribed to CWIS.[161]

In this instance, where Pilgrim has in place sufficient impingement controls, EPA should consider the following scientific support for the absence of entrainment impacts. First, Pilgrim's withdrawal is far less than 5% of the source waterbody.[162] Second, Pilgrim's embayment, with its extremely low flows (of less than 0.05 fps), limit access to the intake structure.[163] Third, Pilgrim's leading national experts have demonstrated survival of many entrained species.[164] Finally, Pilgrim's entrainment is dominated by eggs, the fertilization of which is not demonstrated and which exhibit the highest natural mortality, with the result that there is ample evidence that Pilgrim's CWIS actual, causative mortality is at best limited.[165] These considerations are particularly provided for where remaining useful life of a facility is limited.[166]

Even if an additional BTA condition were appropriate here (it is not), the mandatory-shutdown mandate is legally unsupported because it is not a "technology" within the meaning of § 316(b) of the Clean Water Act.

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[156] 40 C.F.R. § 125.94(a)(2), (c), (d).

[157] *See, e.g.*, 79 Fed. Reg. at 48,303 ("In CWA section 316(b) and in this rulemaking, these impacts are referred to as adverse environmental impact (AEI)," an undefined term.).

[158] *See, e.g.*, 40 C.F.R § 124.95 (*de minimis* exception, impingement context).

[159] *See, e.g.*, 79 Fed. Reg. at 48,309 ("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 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).").

[160] *See, e.g.*, *id.* at 48,330 ("Impingeable organisms are generally not very small fish or early life stages (*e.g.*, those that can pass through 3⁄8-inch mesh screens), but typically are fish with fully formed scales and skeletal structures and well- developed survival traits such as behavioral responses to avoid danger. EPA's data demonstrate that, under

the proper conditions, many impinged organisms can survive."); *id.* at 48355 ("With regard to entrainment survival, EPA does allow for consideration of entrainment survival."); 40 C.F.R § 125.92(i) ("Entrainment mortality means death as a result of entrainment through the cooling water intake structure, or death as a result of exclusion from the cooling water intake structure by fine mesh screens or other protective devices intended to prevent the passage of entrainable organisms through the cooling water intake structure.").

161 *See, e.g.*, *id.* at 48,355 ("Finally, EPA is clear in the Rule's preamble that natural mortality is not be unreasonably attributed to CWIS.").

162 *See* Enercon Services, Inc., *Engineering Response to United States Environmental Protection Agency CWA § 308 Letter, Pilgrim Nuclear Power Station*, 8 (June 2008) ("Engineering Report"), at 2; AEI Report at 16.

163 *See, e.g.*, Scherer ASLB Aff. ¶¶ 10-11; NRC, NUREG-1437, Supplement 29 to Generic Environment Impact Statement for License Renewal of Nuclear Plants Regarding Pilgrim Nuclear Power Station, Vol. 1, Final Report (July 2007) ("FSEIS"), at 2-7.

164 *See supra*, "Environmental Context."

165 *See supra*, "Environmental Context."

166 *See, e.g.*, 79 Fed. Reg. at 48,332 ("A number of facilities are nearing the end of their useful life. Considering the long lead time to plan, design, and construct closed-cycle cooling systems, EPA determined that the Director should have the latitude to consider the remaining useful plant life in establishing entrainment mortality requirements for a facility. The remaining useful plant life, along with other site-specific information, will affect the entrainment reduction of closed-cycle cooling at a facility. For example, retrofitting to a closed-cycle system at a facility that is scheduled to close in three years will result in little entrainment reduction as compared to retrofitting to closed-cycle at a facility that will continue to operate for a significantly longer period.").

Response to Comment 3.1.3:

The comment argues that additional BTA conditions are not appropriate at PNPS because it already satisfies the impingement mortality standard, flows that are less than 5% of the waterbody are unlikely to have a "demonstrable" adverse environmental impact, impingement and entrainment survival has been adequately demonstrated, and that causative mortality from the CWIS is "at best, limited." Entergy also appears to argue that low flow velocities at the entrance to the embayment limit access to the cooling water intake structure, which EPA should consider as "scientific support for the absence of entrainment impacts" at PNPS. This last argument completely ignores the 30-plus years of entrainment reports demonstrating annual mean entrainment of 2.8 billion eggs and 354 million larvae, which plainly illustrate that PNPS has an adverse environmental impact through entrainment, and the comment fails to point to any deficiency in the summary of the entrainment impacts in Fact Sheet (Att. D at 15-19). Finally, Entergy reiterates that "the mandatory shutdown mandate is legally unsupported because it is not a 'technology' within the meaning of § 316(b)." EPA has explained that the Draft Permit did not include a "mandatory shutdown mandate" in Response to Comment 3.1.1 and 3.1.2, above. In later responses, the Agencies address Entergy's comments about the existing traveling screens and impingement survival, (Response to Comment III.3.1.4), entrainment (Response to Comment III.3.1.5), and the "mandatory shutdown mandate" (Responses to Comments III.3.1.6 and 3.1.7).

With respect to BTA, Entergy's comment appears to be that no additional controls for impingement or entrainment at PNPS are necessary because impingement is de minimis and the level of entrainment mortality at PNPS does not rise to an adverse environmental impact. Entergy raised similar views in Comment III.2.0 and III.2.1, above. As in those comments, Entergy does not provide any explanation or evidence to dispute the determination of adverse impact in the Fact Sheet, nor does the comment raise any new arguments or evidence which would alter EPA's determination since the issuance of the Draft Permit. On the contrary, the Fact Sheet demonstrates and these responses to comments confirm, that entrainment and impingement at PNPS's CWIS constitute adverse environmental impact to the waterbody even after considering the natural mortality of the organisms. *See* Response to Comment III.2.1.

According to Entergy, Pilgrim has no entrainment impact and does not need to implement additional controls for entrainment, because its withdrawal is less than 5% of the source waterbody and EPA purportedly acknowledges in the Final Rule that "flows that are less than 5% of the waterbody in question are unlikely to have a demonstrable adverse environmental impact." First, the references in the Final Rule to withdrawals less than 5 percent apply to the mean annual flow of a river, not a coastal waterbody like Cape Cod Bay. Second, the discussion in the preamble to the Final Rule about the mean annual flow example applies to impingement, not entrainment. EPA specifies that a permitting authority may determine that such a facility "is a candidate for consideration *under the de minimis provisions contained at § 125.94(c)(11)*," 79 Fed. Reg. at 48,309 (emphasis added), which does not apply to entrainment. *See also* 79 Fed. Reg. at 48,322 ("EPA notes that these provisions for impingement mortality [including the § 125.94(c)(11) "*De minimis rate of impingement*" provision] would not apply to entrainment."). Third, contrary to the comment, the Final Rule does not say that flows below the 5% level are "unlikely to have a demonstrable adverse environmental impact." *See* 79 Fed. Reg. at 48,309; *see also id.* at 48,371 ("The Director *may* want to consider facility withdrawal rates in relation to the mean annual flow of the river…when making a de minimis determination.") (emphasis added). Finally, a flow below 5% is unlikely to be definitive. For instance, in the benefits analysis for the Final Rule, EPA estimated that 30 percent of facilities on freshwater streams or rivers have actual intake flow (AIF) greater than 5 percent of the mean annual flow (MAF) of the source waters, meaning that 70 percent of these facilities have AIFs below 5 percent MAF. *See* 79 Fed. Reg. at 48,402. If EPA intended for a withdrawal rate of less than 5% of the MAF of the river to be a threshold for *de minimis*, most of the facilities on freshwater rivers would be excluded from having to address impingement mortality. Indeed, this is not borne out in the analysis of the Final Rule, which specifically provides that the *de minimis* provision may be applied "[i]n limited circumstances." 40 C.F.R. § 125.94(c)(11).

3.1.4 PNPS's Current Impingement Control Technology Meets The 316(b) BTA Standard

With respect to impingement, an existing facility presumptively satisfies Section 316(b), if its CWIS has the control technologies that EPA has established as the "best technology available" for impingement reduction on a nationwide basis.[167] Those technologies include, among others, "modified traveling screens,"[168] "such as modified Ristroph screens and *equivalent modified traveling screens* with fish-friendly fish returns."[169]

There is no serious question that PNPS's CWIS includes "modified traveling screens," as defined in the Final 316(b) Phase II Rule. Specifically, PNPS's CWIS incorporates "vertical traveling screens to prevent entrainment" of the requisite slot size, as well as dual "fish-return sluiceways," discharging primarily to the embayment that is separated from Cape Cod Bay by two breakwaters.[170]

EPA's seeming conclusion that "the existing traveling screens at PNPS are not consistent with the definition of modified traveling screens" in the Final 316(b) Phase II Rule[171] appears to suffer from various misperceptions. First, EPA suggests that screens may be too abrasive, when the 2014 Engineering Response Supplement explains that stainless steel is a "smooth" material that was selected and is used to prevent abrasion.[172] Second, EPA suggests that the fish returns may be rough or abrasive, when the 2014 Engineering Response Supplement establishes that "water-based epoxy resin emulsions" are used in the sluiceway to provide the requisite smooth surfaces.[173] Third, EPA suggests that Pilgrim's screens are not continuously rotating. The Rule, in fact, requires "continuous *or near continuous* rotation of screens and operation of fish collection equipment *to ensure any impinged organisms are recovered as soon as practicable*."[174] Pilgrim's screens rotate in response to pressure from loading, and thereby necessarily return impinged organisms to the waterbody "as soon as practicable" consistent with the rule.[175] Further, EPA's Draft Permit, albeit needlessly, requires continuous rotation of the screens moving forward, thus countering EPA's conclusion that Pilgrim's screen and fish return system, as contemplated by the Draft Permit, would not satisfy the Rule, even if EPA were to wrongly assume that continuous rotation is required. Fourth, EPA suggests that Pilgrim's traveling screens may use "narrow shelves" to carry away the fish that do not "minimize turbulence or prevent loss of fish from the collection system," but this is not correct. Indeed, Entergy is not aware of any turbulence in the screen baskets. Finally, EPA suggests that returning fish within the breakwater embayment may not be ideal because it could result in re-impingement.[176] Within the embayment, "average intake velocity is 0.05 ft. per second (fps)," velocities slower than the ambient surrounding tidal dynamic in Cape Cod Bay.[177] Indeed, the embayment velocity is an order on magnitude lower than the EPA Rule concludes is *automatic evidence* of compliance with the Rule's impingement standards, because such velocities are so readily avoided by impingeable fish.[178] For all of these reasons, Entergy respectfully submits that Pilgrim's modified travelling screens and fish returns satisfy the Final 316(b) Phase II Rule.

This is the case, even without regard to the fact that the Rule's impingement standard excludes fragile species: "The impingement mortality performance standard … requires that a facility must achieve a 12-month impingement mortality performance of all life stages of fish and shellfish of no more than 24 percent mortality, including latent mortality, *for all non- fragile species* that are collected or retained in a sieve with maximum opening dimension of 0.56 inches 39 and kept for a holding period of 18 to 96 hours."[179] Pilgrim's demonstrated impingement survival for fragile species also satisfies the Rule, particularly given that "EPA does not intend for such naturally occurring mortality," particularly cold shock that results in later impingement, "to be counted against a facility's performance in reducing impingement mortality."[180] Indeed, as discussed below in Section VI.C, the overwhelming majority of Pilgrim's historic impingement, and virtually all large-scale impingement events, are associated with natural mortality, *e.g.*, cold shock and predation.[181]

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[167] 40 C.F.R. § 125.94(c).

[168] *Id.* § 125.94(c)(5); 79 Fed. Reg. at 48,321 n.38 ("EPA has defined modified traveling screen at 40 CFR 125.92 to mean *any traveling water screen* that incorporates the specified measures that are protective of fish and shellfish. In this preamble, modified traveling water screen with a fish handling and return system is often referred to more simply a modified traveling screen.") (emphasis added).

[169] 79 Fed. Reg. at 48,337 (emphasis added).

[170] 40 C.F.R. § 125.92(s) (defining "modified traveling screen"); 79 Fed. Reg. at 48,321 n.39 ("Though less common, the EPA recognizes that 1⁄2 by 1⁄4 inch mesh are used in some instances and perform comparably to the 3⁄8 inch square mesh. Therefore, today's rule allows for facilities to apply a 1⁄2 by 1⁄4 inch sieve (diagonal opening of 0.56 inches) or a 3⁄8 inch sieve (diagonal opening of 0.53 inches) when discerning between impinged and

entrained organisms.").*see also* FSEIS at 2-7.
171 Fact Sheet at 88.
172 2014 Engineering Response Supplement at 48.
173 *See* Engineering Report.
174 40 C.F.R. 125.92(s) (emphasis added).
175 Engineering Report at 6.
176 *See* Fact Sheet at 89.
177 FSEIS at 2-7; *see* ENSR (2000), at 4-3 to -4 (reporting results of previous hydrodynamic investigations finding that nearshore surface velocities of up to 16.9 feet per minute (or 0.282 fps), offshore surface velocities of up to 30.4 feet per minute (or 0.51 fps), and velocities at a depth of 25 feet of up to 5.3 feet per minute (or 0.09 fps)).
178 79 Fed. Reg. at 48,321 (describing 0.5 fps, through screen velocity as "essentially pre-approved technologies requiring no demonstration or only a minimal demonstration that the flow reduction and control measures are functioning as EPA envisioned").
179 *Id.* (emphasis added); *see also id.* at 48,323 ("EPA included a definition for ''fragile species'' at § 125.92(m), as a species of fish or shellfish that has an impingement survival rate of less than 30 percent."); 40 CFR § 125.94(c)(5) ("(5) Modified traveling screens. A facility must operate a modified traveling screen that the Director determines meets the definition at § 125.92(s) and that, after review of the information required in the impingement technology performance optimization study at 40 CFR 122.21(r)(6)(i), the Director determines is the best technology available for impingement reduction at the site. As the basis for the Director's determination, the owner or operator of the facility must demonstrate the technology is or will be optimized to minimize impingement mortality of all nonfragile species.") and § 125.92(m) ("(m) Fragile species means those species of fish and shellfish that are least likely to survive any form of impingement. For purposes of this subpart, fragile species are defined as those with an impingement survival rate of less than 30 percent, including but not limited to alewife, American shad, Atlantic herring, Atlantic long-finned squid, Atlantic menhaden, bay anchovy, blueback herring, bluefish, butterfish, gizzard shad, grey snapper, hickory shad, menhaden, rainbow smelt, round herring, and silver anchovy."); Final 316(b) Phase II Rule at 48326 ("The Director must determine, based on a demonstration by the facility to the Director, that the system of technologies or operational measures, in combination, have been optimized to minimize impingement mortality of all non-fragile species.").
180 79 Fed. Reg. at 48,364. *See, e.g.*, *supra*, "Environmental Context," Section A.
181 If EPA doubted that the optimization of Pilgrim's screens and fish return had been achieved, its obligation under the Rule was to ask for additional study to achieve optimization sometime over the last 21 years, not to await the facility's closure to only then pronounce the system inadequate. *See, e.g.*, 79 Fed. Reg. at 48,321 ("In the case of Option (5), the facility must submit a site-specific impingement technology performance optimization study that must include two years of biological sampling demonstrating that the operation of the modified traveling screens has been optimized to minimize impingement mortality."); *id.* at 48321 n.38 ("Therefore EPA has defined modified traveling screen at 40 CFR 125.92 to mean any traveling water screen that incorporates the specified measures that are protective of fish and shellfish. In this preamble, modified traveling water screen with a fish handling and return system is often referred to more simply a modified traveling screen."); *id.* at 48321 n.39 ("Though less common, the EPA recognizes that 1⁄2 by 1⁄4 inch mesh are used in some instances and perform comparably to the 3⁄8 inch square mesh. Therefore, today's rule allows for facilities to apply a 1⁄2 by 1⁄4 inch sieve (diagonal opening of 0.56 inches) or a 3⁄8 inch sieve (diagonal opening of 0.53 inches) when discerning between impinged and entrained organisms.").

Response to Comment 3.1.4:

According to the comment, the Fact Sheet erroneously concludes that the existing traveling screens are not consistent with modified traveling screens as defined in the Final Rule at 40 C.F.R. § 125.92(s). *See e.g.*, Fact Sheet Attachment D at 35, 88. EPA maintains that the existing traveling screens are not consistent with the Final Rule's definition of modified traveling screens and, as such, the current operation of the traveling screens does not comply with any of the BTA standards for impingement mortality under the Final Rule. Having said that, EPA has not required PNPS to alter its existing traveling screen because EPA determined that an actual intake velocity no greater than 0.5 fps is the BTA for impingement. This requirement is met upon shutdown of the facility.

Entergy first argues that the existing traveling screens are not abrasive and references the 2014 Engineering Response Supplement (at 48) (AR-494), which, according to Entergy "explains that stainless steel is a 'smooth' material that was selected and is used to prevent abrasion." EPA could not find this reference on page 48 of the 2014 Response Supplement, which describes criteria for a re-designed fish return trough, one of which is that "all conveyance structures shall be smooth to prevent abrasion to the fish." For Modified Fish Handling and Return Option 1, Enercon selected fiber reinforced polymer pipe and high-density polyethylene pipe to provide a "smooth conveyance surface." *Id*. Neither the 2008 Engineering Response (AR-489) or the 2014 Response Supplement (AR-494) comment on the choice of stainless steel mesh for fish protection. At most, the screen material is described as "stainless steel oblong-shaped mesh with ¼-inch wide by ½-inch tall spacing[53] and are framed in a fiberglass support structure." *See* AR-494 at 6. The *Technical Development Document for the 2014 Final Rule* (the "TDD") (AR-535) at 6-27 discusses the benefits of screen mesh material of modified traveling screens such as woven wire mesh and SmoothTex flat wire, and contrasts these materials with stainless steel welded mesh screens. A more accurate description of the existing screen materials at PNPS in comparison to the definition of modified traveling screens (at 40 C.F.R. § 125.92(s) "screen panel materials with smooth woven mesh, drilled mesh, molded mesh, or similar materials that protect fish from descaling and other abrasive injury") has not been provided to date, nor does the comment and its supporting references clarify if the screen mesh is consistent with the smooth materials required for compliance with modified traveling screens under the Final Rule. As the Fact Sheet (Attachment D at 35) states, "it is not clear if the mesh panels adequately protect fish from descaling." Based on the comment, EPA cannot confirm if the stainless steel mesh of the existing screens is consistent with a "modified traveling screen" as defined in the Final Rule. At the same time, EPA has not required PNPS to replace the screen material of the existing traveling screens to meet the BTA for impingement mortality.

Next, Entergy indicates that the 2014 Engineering Response Supplement establishes that "water-based epoxy resin emulsions" are used in the sluiceway to provide the requisite smooth surfaces. The Fact Sheet (Attachment D at 35) describes an "epoxy-coated, corrugated metal sluiceway," which is consistent with this description. EPA could not find, nor did Entergy provide a reference for, any suggestion in the Fact Sheet that questions if the fish return is abrasive or that this aspect of the existing fish return system is inconsistent with the definition of "modified traveling screen" under the Final Rule.

The Fact Sheet (Attachment D at 35 and 89) expressed concern that the return location for the fish troughs (in the embayment near the CWIS for Outfall 003 and into the discharge canal for Outfall 012) may not satisfy the requirement for the outfall location to enable fish to avoid re-impingement and may not promote survival if fish are exposed to high temperatures in the discharge canal (where the delta-Ts may be up to 32°F). Enercon acknowledged in its 2014 Supplemental Response that it is not known "if re-impingement of live fish occurs among those

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[53] EPA notes that in several footnotes in the comment Entergy appears to justify the mesh size of the screens. EPA has not contested the mesh size as inconsistent with the Final Rule nor does the Draft Permit propose any modification to the mesh size of the existing traveling screens to comply with BTA standards for impingement mortality.

individuals returned via the current sluiceway." AR-494 at 46. The permittee suggests that the approach velocity in the embayment at Outfall 003 is 0.05 fps, which is lower than the velocity threshold for intake velocity in the Final Rule.[54] The permittee goes too far, however, in concluding that this velocity "is *automatic evidence* of compliance with the Rule's impingement standards, because such velocities are so readily avoided by impingeable fish." If the approach velocity in the embayment were "readily avoidable" such that no fish in the vicinity of the outfall would be exposed to re-impingement, it follows that no fish in the embayment would be impinged at the CWIS. In 2017, PNPS impinged 151,658 fish, all of whom were exposed to the embayment velocities in the vicinity of Outfall 003. *See* AR-713. The comment neither confirms nor refutes the potential for re-impingement or temperature-related stress with the current fish returns; however, the Draft Permit does not require the facility to make any changes to the current fish returns.

Third, Entergy comments on the proposed requirements related to continuous rotation of the existing traveling screens. The traveling screens at PNPS do not rotate continuously but rather "routinely, preemptively, and in response to an alarm" and are scheduled to rotate six times each week. See AR-489 at 6 and Fact Sheet Attachment D at 34. The Fact Sheet (Attachment D at 94) supports the decision to require continuous rotation in the Draft Permit, including that the site-specific impingement survival studies from 1980-1983 indicated that continuous rotation resulted in the greatest improvement in survival of non-fragile species at PNPS and that a 2005 PNPS impingement study observed greater initial survival for all impinged species combined when traveling screens were continuously rotated as compared to rotating on an 8-hour schedule. Improved survival was particularly notable for Atlantic silversides, which is a species that is considered non-fragile under the Final Rule, but which Entergy excluded as a fragile species in its biological evaluations of survival.

The comment does not contest EPA's analysis that continuous rotation would improve survival of impinged fish. Rather, the permittee argues that the Final Rule does not require continuous monitoring and that because PNPS's screens rotate in response to pressure from loading, the current operation is consistent with the requirement to return fish "as soon as practicable." As Entergy points out, the definition of modified traveling screens in the Final Rule includes "continuous or near continuous rotation of screens and operation of fish collection equipment to ensure any impinged organisms are recovered as soon as practicable." The TDD (AR-535 at 6-31) explains continuous rotation as it is used in the Final Rule:

> Evaluations at many different facilities over the last 30 years have generally shown that impingement mortality rates are lowest when traveling screens are rotated continuously at a fixed speed instead of the intermittent rotation schedule more common with conventional traveling screens. Continuous rotation ensures that any impinged fish will be caught on the screens for a minimum time period, but in some cases may not be necessary, at least for all seasons. Periodic full rotation cycles may be sufficient (i.e., some number of complete rotations per hour) when impingement is dramatically lower or non-existent during certain times of the year (e.g., seasonal migrations may limit the critical time period to a few weeks or

[54] The Final EIS (AR-321 at 2-7) states that the average intake velocity at the east fish-return sluiceway is 0.15 fps while the average velocity at the breakwaters during mid-tide is 0.05 fps.

months of the year). Additionally, new designs use composite materials to frame the traveling screens which weigh less and reduce wear on chains and drives.

This description of rotation speed from the TDD provides context for the language in the Final Rule and suggests that Entergy's interpretation of "as soon as practicable" is overly broad. Continuous rotation is clearly preferred for ensuring survival of impinged fish; however, in some cases (*e.g.*, where impingement has a seasonal component) continuous rotation may not be necessary. Even in these cases, EPA provides an example of periodic rotation as "some number of complete rotations per hour." Contrast this description with the existing schedule of one rotation every 6 to 8 hours at PNPS and it is clear that the current rotation schedule is not consistent with the Final Rule's definition for modified traveling screens. *See* AR-321 at 2-10. The comment attempts to justify the existing rotation schedule by explaining that screens are rotated in response to pressure from loading, yet provides no explanation of how much loading is necessary to trigger rotation and demonstrate that fish are transported to the source waterbody "as soon as practicable." If the screens respond to pressure from a single fish, or a few fish, it is possible that this operational mode would satisfy the Final Rule in that the impingement duration of fish would be minimized. In the Final EIS (AR-321 at 2-9), Entergy states that the alarm set point is triggered "when the difference in water level on each side of the screen reaches a specified threshold…typically set at 6 in. This level difference signifies that too much debris has collected on the screen. Level differences are rare and usually the result of a storm event." Based on this description, the alarm set point clearly targets debris and is not intended for fish protection. In the context of this comment, EPA maintains that the current operation of the traveling screens is not continuous or near-continuous as included in the definition of modified traveling screens in the Final Rule. EPA addresses to additional comments from the permittee about the necessity of continuous rotation in Response to Comment 3.2, below.

Fourth, Entergy disputes EPA's characterization of the "narrow shelves" on the traveling screens as not minimizing turbulence or preventing loss of fish from the collection system. Entergy is not aware of any turbulence in the screen baskets. Under the definition at 40 C.F.R. § 125.92(s) modified traveling screens must include "screens with collection buckets or equivalent mechanisms designed to minimize turbulence to aquatic life; additional of a guard rail or barrier to prevent loss of fish from the collection system…" which, taken together, are similar to the improvements pioneered by Fletcher for fish protection at traveling screens. *See* AR-535. The TDD (AR-535 at 6-28) describes collection buckets as "one of the more critical elements" of modified traveling screens. Collection buckets should extend across the screen's panel and the size and depth of the bucket should reflect target species. Fletcher's design improved on earlier collection buckets which were found to cause significant turbulence and, as a result, high mortality by including an additional lip on the bucket's leading edge and rail or guard that extends above the water surface before the rest of the bucket to prevent fish from escaping before being transferred to the fish return trough. Exhibit 6-13 of the TDD (AR-535 at 6-26) illustrates the differences between the original Ristroph fish bucket design and the Fletcher modifications. The TDD clearly associates collection buckets with the Ristroph design, which are buckets containing water that catch organisms as they are sprayed off the screen and into a collection trough.

The existing traveling screens at PNPS do not include either the Ristroph or Fletcher collection buckets. The 2008 Engineering Response explains that each of the screens includes "53 basket segments (or panels)" and alternately refers to "wire mesh panels" and describes the operation as follows:

> Under normal operation, seawater passes first through the ascending, and then the descending, screen baskets. The ascending basket is located on the upstream portion of the screen, and collects fish and/or debris as it passes up through the water. The aquatic life and/or debris are retained on the upstream face of the wire mesh panels as well as on the horizontal surface of the basket frame and the lifting lip that forms the lower, or trailing, edge of the mesh frame. The basket continues to rotate and descends into the water on the downstream side. Aquatic life and/or debris not washed off the screen basket may be washed off in the flow of water.

AR-489 at 6. The description of the screenwash system continues "a low pressure jet of water is used to wash living organisms from the screen and lifting shelves." *Id*. at 7. The turbulence that EPA describes in the Final Rule in reference to modified traveling screen occurs in the collection buckets located on the lower edge of the traveling screen panels. Entergy has not observed turbulence because the lifting shelves likely do not hold enough material or water to cause turbulence independent of the mesh panels. Indeed, the 2008 Engineering Response evaluated upgrading the existing screens at PNPS with "Ristroph buckets," which makes clear that the existing screens are not equipped with the technology. Enercon concluded that, because most of the impinged organisms are Atlantic menhaden or Atlantic silversides and are not expected to survive impingement regardless of the screening technology, the addition of Ristroph buckets would not reduce impingement mortality. AR-489 at 36. The traveling screen at PNPS lack collection buckets as required by the Final Rule and, as such, do not meet the definition of modified traveling screens.

Finally, Entergy argues that the demonstrated impingement survival for fragile species satisfies the impingement mortality standard in the Final Rule. Normandeau excludes Atlantic silversides from its evaluation of impingement survival at PNPS, although this species is not defined as a fragile species in the Final Rule. Including Atlantic silversides in the calculation of impingement mortality would prevent PNPS from complying with this standard. *See* Fact Sheet Attachment D at 91-92. Second, ongoing monitoring is required to demonstrate compliance with the impingement mortality performance standard under the Final Rule (at 40 C.F.R. § 125.94(c)(7)) for at least the first full permit term. *See also* 79 Fed. Reg. 48376. The Draft Permit does not require impingement monitoring once the facility ceases energy production and will comply with the actual intake velocity BTA standard for impingement mortality at 40 C.F.R. § 125.94(c)(3).

At the close of Comment III.3.1.4, Entergy includes a footnote claiming that "if EPA doubted the optimization of Pilgrim's screens and fish return had been achieved, its obligation under the Rule was to ask for additional study to achieve optimization sometime over the last 21 years, not to await the facility's closure to only then pronounce the system inadequate." The Final Rule which put forth standards for modified traveling screens was promulgated in August 2014 and became effective in October 2014, just 20 months prior to public notice of the Draft Permit. EPA did not have a standard over the last 21 years to compare to the operation of traveling screens at PNPS.

Moreover, the Final Rule has several options by which to comply with the BTA standards for impingement mortality which would not require changes to the existing traveling screens. Finally, the Final Rule dictates that the BTA for entrainment shall be established on a site-specific basis first, after which the facility must come into compliance with one of the impingement mortality standards as soon as practicable. 40 C.F.R. § 125.94(b)(1). Aligning the compliance deadlines for entrainment and impingement controls in this way allows a facility to take advantage of entrainment controls that may also satisfy one of the impingement compliance alternatives. In fact, this is the case at PNPS, where the facility's substantial reduction in seawater withdrawals will be commensurate with the flow reduction achieved by closed-cycle cooling and, at which time PNPS will be able to comply with the impingement mortality standard for actual through-screen velocity under most conditions without any additional upgrades to the traveling screens.

In sum, the comment lists several reasons why the existing traveling screens meet the definition of modified traveling screens consistent with the BTA standard for impingement mortality at 40 C.F.R. § 125.94(c)(5), all of which EPA has countered. EPA maintains that the traveling screens are not modified traveling screens as defined in the Final Rule. Having said that, neither the Draft Permit nor the Final Permit require PNPS to make any physical alterations to the existing screens and has instead, determined that the BTA for impingement at PNPS is an actual through screen velocity of no more than 0.5 fps.

3.1.5 Based On A Site-Specific Assessment, PNPS Does Not Require Further Entrainment Controls To Meet The BTA Standard

With respect to entrainment reductions, EPA did not set a nationwide BTA standard in the Final 316(b) Phase II Rule, as it did with impingement, but instead established a procedure for determining entrainment controls "for each intake on a site-specific basis." The site-specific determination may consider, *inter alia*, the "[e]ntrainment impacts on the waterbody," "thermal discharge impacts," credits for prior flow reductions, and impacts on energy reliability.[183] Application of the mandated site-specific assessment does not warrant further entrainment controls for Pilgrim.

As detailed above in the "Environmental Context" Section, nearly five decades of environmental monitoring data and object-specific studies have demonstrated that Pilgrim's historic operations, including specifically its water withdrawals and thermal discharges, have produced no more than *de minimis* adverse impacts on the aquatic community of Cape Cod Bay.[184] Indeed, EPA previously concluded, in connection with the 2004 version of its Section 316(b) rule for existing facilities, that PNPS "already meet[s] otherwise applicable performance standards based on existing technologies and measures."[185] The Fact Sheet contains no information that supports a different conclusion, including with respect to any particular species.[186]

182 40 C.F.R. § 125.94(d).
184 *See supra*, "Environmental Context."
185 *See* 69 Fed. Reg. 41,576, 41,646, 41677 (July 9, 2004) (listing PNPS as being among facilities that "already meet otherwise applicable performance standards based on existing technologies and measures," and for which EPA "projected zero compliance costs"). *See also* 68 Fed. Reg. 13522, 13567 and n.23 (Mar. 19, 2003); *Case Study*

Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule (EPA-821-R-02-002), Part G: Seabrook and Pilgrim Facilities Case Study (Feb. 2002).
186 *See supra*, "Environmental Context," Section A.6, and *supra*, note 76.

Response to Comment 3.1.5:

The Draft Permit did not propose any additional entrainment control requirements at PNPS beyond what the Facility would achieve based on Entergy's self-imposed plan to shut the facility down by June 1, 2019, and the drastic reduction in flow as of that action. *See* Fact Sheet at 85-86. Accordingly, the Final Permit, like the Draft Permit, does not include any additional entrainment control requirements. EPA does not agree, however, with the comment that Pilgrim's water withdrawals "have produced no more than *de minimis* adverse impacts on the aquatic community of Cape Cod Bay." *See* Response to Comment III.2.1 and 2.3

EPA agrees that the 2014 CWA § 316(b) Final Rule requires EPA to "establish BTA standards for entrainment for each intake on a site-specific basis." 40 C.F.R. § 125.94(d). The rule also provides that 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." *Id.* EPA notes, however, that the comment only recites factors in section 125.98 on which a permitting authority *may* base its BTA determination, and even then only some of those factors. *See id.* § 125.98(f)(3)(i)-(vi). The comment omits the factors on which a permitting authority *must* base its BTA determination, including "[n]umbers and types of organisms entrained," "impact of changes in particulate emissions or other pollutants," "land availability," "[r]emaining useful plant life," and "[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." *Id.* § 125.98(f)(2)(i)-(v). In other words, the Final Rule sets forth a framework for a site-specific analysis that includes a number of factors beyond those listed in the comment, some of which are mandatory and others of which are discretionary. For this permit, as has been explained previously, EPA undertook a site-specific analysis and determined that three potentially available entrainment technologies (closed-cycle cooling, assisted recirculation, and VFDs) were not warranted, based in large part on Entergy's representations regarding the facility's limited remaining useful life. For this reason, EPA generally agrees that, based on the site-specific analysis, no additional entrainment control requirements are warranted at PNPS beyond what the Facility will achieve based on Entergy's self-imposed shut down.

Next, EPA addresses the comment that "EPA previously concluded, in connection with the 2004 version of its Section 316(b) rule for existing facilities, that PNPS 'already meet[s] otherwise applicable performance standards based on existing technologies and measures.'" As an initial matter, the preamble to the 2004 regulations does not state that EPA "concluded" that PNPS already meets "otherwise applicable performances standards . . . ."[55] Rather, the full sentence from the preamble reads: "These are facilities for which EPA *projected* that they would already meet otherwise applicable performance standards based on existing technologies and measures." 69 Fed. Reg. at 41,646 (emphasis added). And neither the preamble nor the other documents cited by the commenter include a detailed analysis documenting the comment's purported

[55] Nor do the other citations in footnote 185 of the comment include any such statements about PNPS.

conclusion by EPA. But more importantly, in 2007, EPA suspended the 2004 regulations, including the "performance standards" referred to in the quoted sentence, following judicial review by the U.S. Court of Appeals for the Second Circuit in *Riverkeeper, Inc. v. United States EPA*, 475 F.3d 83 (2d Cir. 2007).[56] 72 Fed. Reg. 37,107 (July 9, 2007). Moreover, the "measures" mentioned in the quoted sentence seemingly would encompass a provision of the 2004 regulations that allowed for compliance with § 316(b) through the use of habitat "restoration measures,"[57] —a provision the Second Circuit expressly invalidated. *Id.* at 108-10 (finding that compliance with section 316(b) via restoration measures is not authorized under the Act). Furthermore, the 2004 regulations were replaced by a new set of regulations in 2014 that includes neither the 2004 performance standards nor any habitat restoration measures, but rather establishes a framework for a site-specific BTA determination based on a number of relevant factors in 40 C.F.R. § 125.98(f), as explained earlier.[58] EPA's BTA determination for PNPS in this permit was established pursuant to the 2014 regulations. Thus, even if EPA had concluded that PNPS already met the "otherwise applicable performance standards" established in the 2004 regulations, "based on existing technologies and measures," those performance standards and (at least some of those) measures are no longer legally applicable. In other words, an EPA statement that a facility is "projected" to meet "performance standards" that are no longer in effect, potentially based in part on measures that a court has since invalidated, is not equivalent to a statement that the facility complies with currently applicable § 316(b) requirements (*i.e.*, the 2014 regulations). Nor does the comment provide any explanation why it should be.

In addition, the comment quotes a statement from the preamble that appeared in the context of a provision of the 2004 regulations that provided a so-called cost-cost variance, which the Second Circuit also expressly invalidated and remanded to the agency. *Riverkeeper, Inc. v. United States EPA*, 475 F.3d 83, 111-13 (2d Cir. 2007). The Court remanded this variance provision in part because it was "expressly premised on the validity of the BTA determination [in the Phase II Rule]," which the court had also remanded, but also because EPA "did not afford adequate notice of the costs associated with specific facilities promulgated in the final Rule" and an opportunity to comment on the basis for a particular facility's cost figures that EPA established. *Id.* In other words, the court specifically found that the cost projections in Appendix A—including the projection that PNPS would incur costs of $0 to comply with the 2004 regulations and the corollary projection that PNPS "would already meet otherwise applicable performance standards based on existing technologies and measures"—must be remanded because they had been improperly promulgated. In essence, the court remanded the projection that PNPS "would already meet" the performance standards. The court expressly noted that, "[b]ecause the Agency has calculated the costs it believes specific facilities will incur in adopting the appropriate BTA technologies (*as currently defined*) and then promulgated these costs in the final Rule, *any*

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[56] The only applicable provision that remained, section 125.90(b), provides that CWISs previously subject to the suspended Phase II regulations would continue to be subject to CWA § 316(b), but that permitting authorities would establish such requirements on a case-by-case, BPJ basis.

[57] Former 40 C.F.R. § 125.94(c) provided "With the approval of the [permitting authority], you may implement and adaptively manage restoration measures that produce and result in increases of fish and shellfish in your facility's watershed in place of or as a supplement to installing design and control technologies and/or adopting operational measures that reduce impingement mortality and entrainment."

[58] Moreover, the 2014 regulations include no specific projections (or conclusions) about whether PNPS currently employs the best technology available for minimizing entrainment.

change in the selection of BTA on remand will necessarily alter these costs." *Id.* at 111 n.23 (emphases added). Of course, "the selection of BTA on remand" did change, and the 2014 regulations include no conclusion, or even a projection, that PNPS would already meet the new BTA requirements.[59] For all of the above reasons, the Region does not find the statement quoted in the comment to be of particular relevance to the BTA determination in this permit proceeding.

Lastly, EPA notes that Entergy states elsewhere in its comments regarding CWA § 316(b) requirements that "courts have properly recognized . . . 'the most salient characteristic of th[e Clean Water Act's] statutory scheme' [to be] its 'technology-forcing' character, which contemplates that a 'series of progressively more demanding technology-based standards' would 'stimulate' and 'press development of new, more efficient and effective technologies." Comment IV.3.1.6, *infra*. Under this interpretation, even if EPA had "concluded" (which it did not) in 2004 that no entrainment technologies were needed at PNPS, that would not by itself mandate the same conclusion in 2018. *See Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 235 (2009) (Breyer, J., concurring); *see also* 2014 316(b) Regulations RTC at 15 (Essay 10).

3.1.6 Even If Some BTA Measure Were Necessary For PNPS, The Mandatory-Shutdown Mandate Would Still Be Unlawful Because It Is Not A "Technology"

On its face, Section 316(b) requires a CWIS's "location, design, construction, and capacity" to "reflect the best *technology* available for minimizing adverse environmental impact."187 EPA's Final 316(b) Phase II Rule further defines a CWIS as a discrete portion of the facility that comprises "the total physical structure and any associated constructed waterway used to withdraw cooling water from the waters of the U.S.," and that "extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps."188 As a matter of this plain language, a permit condition must reflect a "technology," and also must "have [some]thing to do with the location, the design, the construction, or the capacity of cooling water intake structures," *i.e.*, cannot be "unrelated to the structures themselves."189 Courts have accordingly held that Section 316(b) does not license EPA's efforts to reduce I&E by any means available, but instead authorizes the agency to use only *particular* means in pursuing that goal, *viz.*, technology related to the "location, design, construction, and capacity of the cooling water intake structure."190

A mandatory-shutdown condition does not fall within the category of authorized I&E mitigation measures that Section 316(b) authorizes EPA to mandate. It is plainly not a CWIS "technology." On the contrary, it is a *prohibition against making use of the CWIS technology* for cooling water. It is also inconsistent with what courts have properly recognized as "the most salient characteristic of th[e Clean Water Act's] statutory scheme," namely its "technology-forcing" character, which contemplates that a "series of progressively more demanding technology-based standards" would "stimulate" and "press development of new, more efficient and effective technologies."191 No such "technology-forcing" incentives attend a mandatory-shutdown

[59] In fact, the preamble to the 2014 regulations emphasized that EPA could not "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 2014 regulations. 79 Fed. Reg. at 48,304.

requirement. Nor can a mandatory-shutdown requirement be fairly described as being related to the "location, design, construction, and capacity" of the CWIS, all of which will remain unchanged (but merely go unused) as a result.[192]

We recognize that EPA has taken the position that "flow reductions, seasonal operations, [and] unit closures" may be part of a "system of technologies, management practices, and operational measures" that together can serve as the best technology available ("BTA") for a facility.[193] Even setting aside whether EPA's interpretation can survive judicial scrutiny as a matter of Section 316(b)'s plain language and "technology-forcing" structure,[194] nothing in EPA's Final 316(b) Phase II Rule suggests that the *permanent shutdown* of the facility as a whole can be imposed on a facility as a BTA requirement, as opposed to merely a means by which the facility, *at its sole election*, can claim credit for purposes of minimizing I&E as a result of planned unit closures.[195] To the extent EPA implicitly concludes otherwise by incorporating a permanent mandatory-shutdown requirement as BTA, it is in error.

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187 33 U.S.C. § 1326(b) (emphasis added).
188 40 C.F.R. § 125.92(f).
189 *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 189 (2d Cir. 2004).
190 *ConocoPhillips Co. v. EPA*, 612 F.3d 822, 839 (5th Cir. 2010) (holding that CWA Section 316(b) does not license the regulation of a facility's "location," "design," "construction," or "capacity" generally, but only insofar as they relate to the "cooling water intake structure"); *Robertson Cnty.: Our Land, Our Lives v. Tex. Comm'n on Envtl. Quality*, No. 03-12-00801-CV, 2014 WL 3562756, at *4-6 (Tex. Ct. App. July 17, 2014) (holding that BTA requirement did not apply to a water-transfer pump which did not constitute part of the "cooling water intake structure" as defined under EPA regulations); *Surfrider Found. v. Cal. Reg'l Water Quality Control Bd.*, 211 Cal. App. 4th 557, 579-80 (4th Dist. 2012) ("[B]y referring solely to the 'location, design, construction and capacity of cooling water intake structures,' section 316(b) … specifically focuses *only* on the nature of the intake structures themselves, *to the exclusion of other measures for limiting environmental harm*.") (emphasis added); *see also Dir., Office of Workers' Comp. Programs v. Newport News Shipbuilding & Dry Dock Co.*, 514 U.S. 122, 136 (1995) ("Every statute purposes, not only to achieve certain ends, but also to achieve them by particular means.").
191 *Nat. Res. Def. Council v. USEPA*, 822 F.2d 104, 123-24 (D.C. Cir. 1987).
192 *See, e.g.*, Webster's Third New Int'l Dictionary 330 (2002) ("capacity" defined to mean ""the *power or ability* to hold, receive, or accommodate" something, or "the measured *ability* to contain" something (emphasis added)).
193 79 Fed. Reg. at 48,326.
194 *But see, e.g.*, *Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427, 2443 (2014) ("[A]n agency interprestation that is 'inconsisten[t] with the design and structure of the statute as a whole,' … does not merit deference." (citation omitted))
195 *See* 79 Fed. Reg. at 48,331-32, 48,342 (allowing EPA to take account of flow reductions resulting from unit closures and remaining life of the facility as part of the BTA analysis).

Response to Comment 3.1.6:

As a preliminary matter, EPA does not agree that the permit includes a "prohibition against making use of the CWIS technology for cooling water." To the contrary, the permit authorizes, among other things, the continued use of the cooling water intake structure. Entergy has ceased generating power at PNPS, but it continues to use the CWIS, though at a reduced capacity. Furthermore, EPA disagrees that the permit includes a mandatory shutdown condition or incorporates shutdown as a technology. Rather, EPA's BTA analysis concludes, based in large part on Entergy's representations regarding the remaining useful life of the PNPS, that no additional entrainment control requirements are necessary, provided that Entergy followed through on its public pronouncements to cease cooling water withdrawals at PNPS for the main condenser by May 31, 2019, which EPA expected to result in an approximately 92% reduction in entrainment. Because this conclusion relies to a large extent on Entergy's own decision to cease electricity generation permanently by May 31, 2019, the Draft Permit reasonably incorporated that decision and included a corresponding reduction in the flow limit that reflects the basis for EPA's determination that no additional entrainment controls are warranted.[60] *See also* Response to Comments III.3.0, III.3.1, III.3.1.1, III.3.1.2. Nowhere in the comment does the commenter suggest that the agencies improperly relied on the remaining useful life factor, or weighed it too heavily, in the BTA determination. Nor does the commenter suggest that the agencies should have considered a different time period to represent the remaining useful life of the plant. Indeed, the commenter reiterates in several places in its comments that "shutdown is expected to occur no later than June 1, 2019." Entergy Comments at 22.[61] Furthermore, Entergy followed through with its decision and stopped generating electricity at the plant on May 31, 2019. Entergy May 2019 Press Release. With respect to impingement, EPA's BTA analysis concludes that, following Entergy's self-imposed shutdown, PNPS will likely comply with the impingement mortality standard of 0.5 fps or lower actual through-screen velocity, and that improvements necessary to install alternative impingement control technologies prior to shutdown would, therefore, likely have been rendered obsolete before, or only a short time after, becoming operational. Similar to the BTA analysis for entrainment, EPA's conclusion is heavily influenced by Entergy's decision to cease electricity generation at PNPS on or before May 31, 2019, which Entergy publicly attributed to conditions other than EPA or MassDEP regulation under the NPDES permit program. *See* Oct. 2015 Press Release; *see also* Pilgrim Closure FAQs (last visited January 13, 2017) ("Why was the decision made to close Pilgrim? The economics simply do not support continued operation. Pilgrim's revenues continue to be significantly impacted by low wholesale energy prices driven by historically low natural gas prices. The decision to close Pilgrim was based not on operational issues, but financial factors."). Accordingly, EPA's BTA analysis concludes that compliance with the BTA for impingement mortality would be achieved on June 1, 2019. Thus, as explained in the Responses above, EPA disagrees that the permit mandates a permanent shutdown. Moreover, Entergy shut the plant down on its own before the Final Permit was issued.

3.1.7 A Mandatory-Shutdown Mandate Is Not Necessary To Meet The MWQS

Massachusetts law, in particular Massachusetts's surface water quality standards ("MWQS"),

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[60] "Generally, two basic approaches can be used to reduce impingement mortality and entrainment. The first approach is flow reduction, where the facility installs a technology *or operates in a manner to reduce or eliminate the quantity of water being withdrawn*." 79 Fed. Reg. at 48,331 (emphasis added). "Flow reduction is commonly used to reduce impingement and entrainment. . . . Some common flow reduction technologies are variable frequency drives and variable speed pumps, seasonal operation or seasonal flow reductions, unit retirements, use of alternate cooling water sources, water reuse, and closed-cycle cooling systems." *Id.* "EPA expects flow reductions due to unit closures could be reasonably included as part of a facility's impingement mortality and entrainment reductions strategy." *Id.* at 48,332.

[61] *See also, e.g.*, Entergy Comments at 1 ("Entergy further appreciates the incorporation in the Draft Permit of conditions relating to Pilgrim's planned cessation of electricity generation ('shutdown') in 2019."), 25 (referring to the remaining useful life of the facility as "limited"), 27 n.181 (referring to "the facility's closure" as being contemporaneous with the issuance of the Draft Permit), 33 (referring to PNPS "equipment transitioning to and through shutdown. *i.e.*, at the end of its useful life . . . ."), 35-41 and 51-58 (referring to various post-shutdown operations expected to occur within the term of the reissued Final permit),

likewise provides no basis for either EPA or DEP to impose technology-forcing conditions on the use of PNPS's CWIS under its NPDES/MCWA permit, beyond any that may be imposed by virtue of the federal CWA.[196] There are several reasons for this.

First, although the MWQS claim that DEP "has the authority" under the MCWA "to assure compliance of the withdrawal activity with" the MWQS, including "compliance with narrative and numerical criteria and protection of existing and designated uses,"[197] that provision, as the Supreme Judicial Court of Massachusetts has held, is not self-executing.[198] On its face, the provision is not action- or technology-forcing. As the Supreme Judicial Court has held, it "not only … ha[s] no self-executing effect, [but it] purport[s] not to regulate at all," its "literal terms … go[ing] no further than declaring that [DEP] has the *authority* to regulate CWISs."[199] In short, DEP lacks any "self-executing, enforceable regulations" establishing limitations on CWISs.[200]

Second, the CWA Section 401 water quality certification ("WQC") process likewise provides an inadequate basis to impose limiting conditions on the use of PNPS's CWIS. Section 401 authorizes DEP to deny or to impose conditions on the grant of a WQC only if doing so is necessary to comply with "applicable" water quality standards.[201] Water quality standards, however, are not "applicable" under the CWA unless and until EPA has approved them under Section 303.[202] The provision of the MWQS concerning CWISs, however, is still being reviewed by EPA, as the agency's website reflects.[203] It therefore is not an "applicable" water quality standard for purposes of the Section 401 WQC process, and thus provides no basis for imposing conditions on PNPS's use of its CWIS.[204]

Even if the MWQS provision concerning CWISs were somehow "applicable," it still would be insufficient to impose action- or technology-forcing requirements in PNPS's NPDES/MCWA permit. The only "authority" that the provision claims for DEP is that of impos[ing] conditions on CWISs in order to "assure compliance of the withdrawal activity with … narrative and numerical criteria and protection of existing and designated uses" as elsewhere prescribed by the MWQS.[205] With respect to impingement and entrainment ("I&E"), however, there are no limiting "narrative and numerical criteria" under the MWQS.[206] Further, the "designated uses" of a waterbody cannot impose any action- or technology-forcing requirements with respect to I&E or thermal discharges that are more stringent than those set by Section 316, *i.e.*, satisfaction of the federal standards under Section 316 of the CWA necessarily also satisfies the MWQS. That is because the MWQS provision under which DEP asserts its ostensible "authority" to regulate PNPS's CWIS purports on its face to be a "Temperature" standard.[207] Under Section 303(g) the CWA, "[w]ater quality standards relating to heat shall be consistent with the requirements of [Section 316]," which necessarily includes those provided Section 316(b).[208] Because the CWA thus mandates that DEP apply the MWQS consistent with the federal standards that apply under Section 316(b), any attempt to apply the MWQS in a manner that attempts to impose a different standard on PNPS's CWIS would conflict with the federal CWA and necessarily be preempted.[209] Accordingly, the MWQS provide no basis for imposing more stringent requirements on the use of PNPS's CWIS than those that exist under federal law.

Finally, even if the MWQS could provide a basis for imposing more stringent requirements on the use of PNPS's CWIS, there is no evidence that more stringent requirements are necessary to achieve the narrative standard. In relevant part, the MWQS provide that conditions may be imposed on CWISs located in Class SA waters such as Cape Cod Bay in order to "assure compliance of the withdrawal activity with 314 CMR 4.00, including but not limited to, compliance with narrative and numerical criteria and protection of existing and designated uses,"[210] *i.e.*, "excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation."[211] The lack of adverse impact on aquatic species in the vicinity of PNPS obviates the imposition of final Permit conditions ensuring the "reproduction, migration, growth and other critical functions" of aquatic life under the SWQS.[212] That is because the lack of any demonstrated harm to the populations of fish and other aquatic species in the vicinity of PNPS over its 40+-year operating history demonstrate that the protection of those species' biological functions already is assured, as the Fact Sheet concludes.[213]

* * *

In sum, there is no legal or biological rationale for imposing a mandatory-shutdown condition – or any modification to PNPS's CWIS – pursuant to Section 316(b) or MWQS.[214] Further, upon shutdown, the vast majority of PNPS's cooling water withdrawals and discharges will be further reduced, to in excess of 97%. It follows that no BTA or similar limitations on water withdrawals via PNPS's CWIS are necessary or appropriate in order to comply with Section 316(b) or MWQS after PNPS has shut down, either.

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196 *See* 314 Code Mass. Regs. Part 4.00.
197 314 Code Mass. Regs. § 4.05(4)(a)(2)(d).
198 *Entergy Nuclear Generation Corp. v. Dep't of Envtl. Prot.*, 944 N.E.2d 1027, 1035 & n.14 (Mass. 2011).
199 *Id.* at 1035.
200 *Id.* at 1035 n.14.
201 *See* 33 U.S.C. § 1341(a)(1), (d).
202 *See id.* § 1313(c)(3).
203 *See* EPA, *Water Quality Standards Regulations: Massachusetts, State Standards in Effect for CWA Purposes*, https://www.epa.gov/wqs-tech/water-quality-standards-regulations-massachusetts (last visited July 22, 2016) (providing copy of MWQS, effective Sept. 19, 2007), which contains annotations noting that as of Dec. 1, 2010, "EPA is still reviewing … [r]evisions concerning the applicability of Mass DEP's water quality standards to cooling water intake structures at 314 CMR … 4.05(4)(a)(2)(d)").
204 The Supreme Judicial Court's decision in *Entergy*, *supra*, is not to the contrary. The Court addressed only the general permissibility of using the MWQS to regulate CWISs through the federal WQC process; it did not consider or decide the specific issue whether the MWQS provision at issue in that case, and here, is "applicable" for purposes of that process because it has not yet been approved by EPA under Section 303's review process. *See Entergy*, 944 N.E.2d at 1039.
205 314 Code Mass. Regs. § 4.05(4)(a)(2)(d).
206 *See id.* § 4.05(4)(a)(1)-(8), (5)(a)-(e).
207 *Id.* § 4.05(4)(a)(2).
208 33 U.S.C. § 1313(g).
209 *See* 33 U.S.C. § 1370 (preserving state authority to adopt or enforce more stringent water quality standards and effluent limitations than provided for under the CWA, "*[e]xcept as expressly provided in this chapter*…." (emphasis added)).
210 314 Code Mass. Regs. § 4.05(4)(a)(2)(d).
211 *Id.* § 4.05(4)(a).
212 *See* 314 Code Mass. Regs. § 4.05(4)(a)(2)(d).
213 *See supra*, "Environmental Context."
214 *See generally* 2014 Update; AEI Report; Normandeau Associates, Inc., *Entrainment and Impingement Studies Performed at Pilgrim Nuclear Power Station, Plymouth, Massachusetts from 2002 to 2007* (June 2008) ("I&E Report"); Letter from Elise N. Zoli to Damien Houlihan, EPA (July 1, 2008); *see also, generally*, Economics

Report; Engineering Report.

Response to Comment 3.1.7:

Entergy comments that Massachusetts surface water quality standards ("MWQS") "likewise provide[] no basis for either EPA or DEP to impose technology-forcing conditions on the use of PNPS's CWIS under its NPDES/MCWA permit, beyond any that may be imposed by virtue of the federal CWA." The comment heading identifies a "Mandatory Shutdown-Mandate" as a particular condition that Entergy believes may not be imposed. Although the comment specifically calls out 314 CMR 4.05(4)(a)(2)(d) as inadequate, it includes a broad assertion that nothing at all in 314 CMR 4.00, "Massachusetts Surface Water Quality Standards," provides a basis for any CWIS-related condition at PNPS before the shutdown or after. The comment then provides several "reasons" for its broad claim.

As an initial matter, the Agencies do not agree that the permit includes a "Mandatory Shutdown-Mandate." See Response to Comments III.3.0, 3.1, 3.1.1, and 3.1.2. Moreover, Entergy has already shut PNPS down on its own, making any comment that the Agencies "mandated" a shutdown incorrect and irrelevant. Furthermore, contrary to the basic premise of the comment, the permit does not impose conditions on the facility's CWIS "beyond any that may be imposed by virtue of the federal CWA." *Id.* Nor does Part I.L of the Draft Permit (State Permit Conditions) include any additional conditions on the CWIS.[62] Although the lack of a "shutdown mandate" or any conditions on the CWIS "beyond" those that "may be imposed by virtue of the federal CWA" renders irrelevant the "reasons" listed in the comment, EPA and MassDEP choose here to address them because the comment mischaracterizes state and federal law.

First, the Supreme Judicial Court of Massachusetts (hereinafter, "Massachusetts SJC") did not hold in *Entergy Nuclear Generation Co. v. Massachusetts Department of Environmental Protection*, 944 N.E.2d 1027 (Mass. 2011) (hereinafter "*Entergy v. MassDEP*") that MassDEP "lacks any 'self-executing, enforceable regulations' establishing limitations on CWISs." (emphasis added). The Massachusetts SJC was not reviewing all Massachusetts WQS in that case; the only provisions at issue were 314 CMR 4.05(4)(a)(2)(d) and similar paragraphs.[63] *Id.* at 1030-31. To the extent the commenter is suggesting that the Massachusetts SJC was commenting on the full panoply of Massachusetts WQS, it is mistaken.

More importantly, even if the Massachusetts SJC had ruled that way, the comment does not explain how an absence of self-executing WQS would support a claim that Massachusetts' WQS "provide[] no basis" for EPA or MassDEP to impose conditions on PNPS' CWIS. Water quality standards need not be self-executing. A permitting authority looks to a state's WQS to determine whether conditions must be added to a particular permit to ensure compliance with the standards

[62] The comment seems to view permit conditions added pursuant to the CWA § 401 certification process as "conditions beyond any that may be imposed by virtue of the federal CWA." The federal CWA, however, provides a process whereby conditions may be imposed pursuant to § 401. In other words, such conditions may be imposed "by virtue of the federal CWA." In any event, the permit does not include any conditions on the CWIS pursuant to § 401.

[63] *I.e.*, 314 CMR 4.05(3)(b)(2)(d), 4.05(3)(c)(2)(d), 4.05(4)(a)(2)(d), and 4.05(4)(c)(2)(d).

and, if so, what those conditions should be. In other words, the permit is the means by which such WQS are executed. Thus, whether a particular WQS is self-executing has no bearing on whether it may form the basis for conditions in a NPDES permit.[64] The state provisions directly at issue in *Entergy v. MassDEP* recite that MassDEP "has the authority . . . to condition the CWIS to assure compliance of the withdrawal activity with 314 CMR 4.00 [entitled "Massachusetts Surface Water Quality Standards"], including, but not limited to, compliance with narrative and numerical criteria and protection of existing and designated uses." *See id.* at 1030. The Massachusetts SJC agreed that MassDEP has such authority under state law and correctly observed that "[t]here is nothing improper" with the state exercising that authority in permitting actions. *Id.* at 1039; *see also id.* at 1035 & n.14.

The comment also asserts that Massachusetts' WQS may not be used to establish CWIS-related permit conditions because 314 CMR 4.05(4)(a)(2)(d) is not an "applicable" water quality standard for purposes of CWA § 401 and because it "purports on its face to be a 'Temperature' standard." The Agencies first reiterate that the permit does not impose conditions on the CWIS pursuant to CWA § 401; thus, whether 314 CMR 4.05(4)(a)(2)(d) is "applicable" for that purpose is irrelevant. Moreover, 314 CMR 4.05(4)(a)(2)(d) is not the source of MassDEP's authority. MassDEP interpreted its WQS to apply to CWISs even before it promulgated this provision. *See, e.g.*, Brief for Amicus Curiae Massachusetts Dep't of Envtl. Prot. at 5-12, *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490 (EAB 2006) (NPDES Appeal No. 03-12). The later additions to the state regulations merely "put the regulated community on notice" of that authority. *Entergy v. MassDEP*, 944 N.E.2d at 1035 n.14. There would be nothing improper about MassDEP exercising its authority through the CWA § 401 certification process based on WQS that have been approved by EPA. *See id.* at 1039. As the comment seems to recognize, WQS are comprised not only of water quality criteria (numeric or narrative), but also of designated uses. *In re Chukchansi Gold Resort*, 14 E.A.D. 260, 262 (EAB 2009) (citing CWA § 303(c)(2)(A), 40 C.F.R. §§ 131.10-12); *In re Carlota Copper Co.*, 11 E.A.D. 692, 698-99 (EAB 2004). Thus, whether there are "narrative and numerical criteria" expressly applicable to impingement and entrainment is an incomplete inquiry into whether Massachusetts WQS are applicable to CWIS—designated uses may also form the basis for NPDES permit conditions. *PUD No. 1 of Jefferson Cty. v. Washington Dep't of Ecology*, 511 U.S. 700, 715 (1994). And, the Environmental Appeals Board has expressly held that Massachusetts' designated uses—including the designated use of Cape Cod Bay, *i.e.*, "excellent habitat for fish and other aquatic organisms"—may be relied upon to develop permit conditions applicable to impingement and entrainment. *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490, 628 (EAB 2006) (citing *PUD No. 1 v. Washington Dep't of Ecology*, 511 U.S. 700 (1994)); *see also United States Steel Corp. v. Train*, 556 F.2d 822, 838 (7th Cir. 1977) ("It is clear from §§ 301 and 510 of the [Clean Water] Act, and the legislative history, that the states are free to force technology."); *In re Gov't of D.C. Mun. Separate Sewer Sys.*, 10 E.A.D. 323, 343 n.23 (EAB 2002); *Entergy v. MassDEP*, 944 N.E.2d at 1038 ("In areas with a designated use as aquatic habitat (such as Cape Cod Bay where Pilgrim's CWIS operates), therefore, CWISs hinder the attainment of water quality standards.").

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[64] The Massachusetts SJC made the statements regarding self-executability in the context of whether the plaintiff (Entergy) had standing to challenge the Massachusetts regulations at issue in that case—not as any comment on whether Massachusetts' WQS could form the basis for permit conditions. *Entergy v. MassDEP*, 944 N.E.2d at 1035 n.14.

As to the commenter's view that even the designated uses cannot be used to establish permit conditions that would be more stringent than the standards set in the CWA for cooling water withdrawals, the commenter apparently contends that the mere appearance of 314 CMR 4.05(4)(a)(2)(d) under the heading "Temperature" in MassDEP's regulations renders that provision a "[w]ater quality standard[] relating to heat" and that the Commonwealth has ceded any and all authority it otherwise had under the CWA to impose CWIS-related conditions in a § 401 certification simply by placing it under such a heading. The comment presents an overly strained reading of Massachusetts regulations and CWA § 303(g). More importantly, the comment is beside the point; it is immaterial whether 314 CMR 4.05(4)(a)(2)(d) appears under the heading "Temperature" because the designated uses do not, *see* 314 CMR 4.05(4)(a), and they are a part of the WQS under which CWIS regulation may undeniably occur,[65] *Dominion Energy*, 12 E.A.D. at 628 (citing *PUD No. 1*, 511 U.S. at 715). In any event, as we have noted, the state regulation at 314 CMR 4.05(4)(a)(2)(d) simply "put the regulated community on notice" of MassDEP's already existing authority to regulate CWISs. *Entergy v. MassDEP*, 934 N.E.2d at 1035 n.14. It makes little sense to conclude that 314 CMR 4.05(4)(a)(2)(d) becomes a WQS "relating to heat" merely by organizing it under the heading "Temperature," and the comment offers no real justification for its contrary view. The plain language of the provision makes clear that it is not a WQS "relating to heat" any more than <u>any</u> state regulation related to cooling water intake structures is a WQS "relating to heat." Such a reading of 314 CMR 4.05(4)(a)(2)(d) and § 303(g) would contradict the "policy of the Congress" established in the Act "to recognize, preserve, and protect the primary responsibilities and rights of States to prevent, reduce, and eliminate pollution [and] to plan the development and use (including restoration, preservation, and enhancement) of . . . water resources. CWA § 101(b), 33 U.S.C. § 1251(b); *see also* CWA § 301(b)(1)(C), 33 U.S.C. § 1311)b)(1)(C). Nor is there any reason or authority offered in the comment to read state regulations related to cooling water intake structures as WQS "relating to heat" and thereby prohibited by § 303(g). Indeed, such a reading would directly contradict EPA regulations that provide for the establishment of "more stringent requirements as best technology available for minimizing adverse environmental impact if the [permitting authority] determines that compliance with the applicable requirements of this section would not meet the requirements of applicable State . . . law, <u>including compliance with applicable water quality standards (including designated uses</u>, criteria, and antidegradation requirements)." 40 CFR § 125.94(i) (emphasis added).

Turning to the language of section 303(g), it provides that "Water quality standards relating to heat shall be <u>consistent with</u> the requirements of section [316]" of the Act. 33 U.S.C. § 1313(g) (emphasis added). The comment in effect argues that this can only mean that 314 CMR 4.05(4)(a)(2)(d) must be <u>equivalent to</u> the requirements of § 316(b), although the comment provides no explanation for this view. Of course, the Agencies do not agree that the applicable designated uses or 314 CMR 4.05(4)(a)(2)(d) are WQS "relating to heat" and, thus, that § 303(g) is applicable, *see supra*, but, in any event, the CWA is generally not structured in the way the commenter advocates. Rather, the Act sets a federal floor and allows the states to develop more stringent requirements, should they so choose. CWA § 510, 33 U.S.C. § 1370; 40 CFR § 131.4; *see also* CWA § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C). The comment suggests in a footnote

[65] The comment does not assert that the designated uses have not been approved by EPA or are somehow "[w]ater quality standards relating to heat" within the meaning of CWA § 303(g).

that CWA § 510 should not apply to impingement and entrainment conditions, because § 303(g) "expressly provide[s]" otherwise, but the comment fails to elaborate or explain this point in any meaningful way. To interpret § 303(g) in this case as prohibiting the application of any more stringent impingement and entrainment requirements pursuant to a state's WQS would conflict with the statute and established case law. *See* CWA § 316(b) (cross-referencing CWA § 301), 33 U.S.C. § 1326(b); *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 200-02 (2d. Cir. 2004); *Dominion Energy*, 12 E.A.D. at 626-28. To reiterate, the permit does not apply any more stringent impingement or entrainment requirements pursuant to Massachusetts' WQS, but we do not agree with the comment that the Agencies would be prohibited from doing so in an appropriate situation.

Finally, to the extent the comment asserts that operation of PNPS' CWIS did not result in adverse environmental impact within the meaning of § 316(b), the Agencies disagree. *See* Response to Comment III.2.1.

3.2 The Final Permit Should Not Require Continuous Rotation Of Traveling Screens

PNPS does not currently rotate its traveling screens on a continuous basis. Instead, they are rotated when necessary, *e.g.*, based on pressure representing the presence of impinged organisms or debris) or "for 8 hours prior to conducting the impingement sampling,"[215] where appropriate.[216] Nonetheless, the Draft Permit proposes that PNPS continuously operate and rotate the traveling screens when circulating water is in use and monitor the through-screen velocity, which EPA maintains –without rationale – would ensure that it is no greater than 0.5 feet per second in most circumstances in post-shutdown conditions.[217]

These new requirements are not supported by any stated biological or engineering calculations. Further, they are a dubious mandate for equipment transitioning to and through shutdown, *i.e.*, at the end of its useful life, particularly when the technology was not designed for continuous rotation. Again, as detailed above in Section I.A.2.i, Pilgrim's modified traveling screens and fish returns satisfy the letter and spirit of the Final 316(b) Phase II Rule, obviating the need for more. The post-shutdown reduced water usage at PNPS further decreases the credible basis for continuous rotation.[218] Indeed, EPA and DEP have not imposed such mandates on other recent NPDES/MCWA permit applicants. Thus, for example, the final NPDES/MCWA permit issued for Canal Generating Station on August 1, 2008 contains neither a continuous screen-rotation requirement, nor any requirement to monitor through-screen velocities, despite the fact that the permit authorizes water withdrawals via its once-through CWIS of up to 518 MGD.[219]

In lieu of continuous screen rotation and/or monitoring of through-screen velocity, Entergy requests that Part I.F.1 and .2 of the Draft Permit be revised so as to provide for operation of the traveling screens in the manner currently managed (defined as proposed below in Section VI.C below).

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215 FSEIS at 4-28; *see also* Engineering Report at 5-6.
216 *Id.*; *see also* Normandeau Associates, Inc. ("NAI"), Impingement of Organisms on the Intake Screens at Pilgrim Nuclear Power Station, Report No. 67, January through December 2005 (Apr. 30, 2005).
217 *See* Draft Permit at 33. Of course, this through-screen velocity is one third of Pilgrim's current calculated

through-screen velocity, which would otherwise exempt Pilgrim from the Rule's impingement mandates. 40 C.F.R. § 125.94(c)(3).

218 *See Nat. Res. Def. Council v. EPA*, 859 F.2d 156, 170 (D.C. Cir. 1988) (EPA "is powerless to impose permit conditions unrelated to the discharge itself"); 314 Code Mass. Regs. § 3.11(2)(a), (2)(a)(5) (DEP is authorized to impose permit conditions that "provide for and assure compliance with all applicable requirements of the [G. L. c. 21, §§ 26-53] and the [CWA]," including "monitoring requirements *and other means of verifying the compliance of the discharge with a permit*" (emphasis added)).

219 *See, e.g.,* Mirant Canal, LLC, Permit No. MA0004928, Part I.A.2, .12.a (providing only that permittee "shall rotate and visually inspect the intake screens of the cooling water intake structures for Units 1 and 2 at least every eight hours that the unit circulation pumps are operated," similar to the requirement under PNPS's current permit); *FCC v. Fox Television Stations, Inc.*, 556 U.S. 502, 515 (2009).

Response to Comment 3.2:

In this comment, Entergy continues the discussion from Comment 3.0, above, that the Draft Permit conditions that PNPS continuously rotate the traveling screens and monitor through-screen velocity during post-shutdown dilution water usage are factually unsupported, lack any environmental rationale, and should be deleted from the Final Permit. According to Entergy, these new requirements are not supported by any stated biological or engineering calculations and are a "dubious mandate" for equipment at the end of its useful life, particularly when the technology was not designed for continuous rotation.

Entergy's core issue in this comment appears to be that the post-shutdown impingement requirements in the Draft Permit are unnecessary. See also Comment 3.3 in which Energy proposed deleting all Draft Permit requirements associated with post-shutdown operation of the traveling screens. In fact, as the Fact Sheet clearly explains (Attachment D at 6-7), the permittee must comply with the BTA standards for impingement mortality under the Final Rule, even after the facility ceases generation of electricity, for as long as the CWIS withdraws water from Cape Cod Bay and uses a portion of this water (at least 25%) for cooling. The BTA determination for PNPS is proceeding under 40 C.F.R. § 125.98(g) because EPA determined that sufficient information has already been collected and the permit proceeding was already in progress at the time the Final Rule was promulgated. Having said that, EPA sought to be consistent with the BTA standards for impingement mortality at 40 C.F.R. § 125.94(c) in its determination. The post-shutdown requirements to maintain an actual intake velocity of 0.5 fps or less, which will be demonstrated through monitoring or calculation. PNPS can achieve this velocity because of the substantial decrease in cooling water withdrawals after shutdown. When the actual through-screen velocity exceeds 0.5 fps, for instance, during limited operation of one of the circulating water pumps, the Permittee must also continuously rotate the screens. These requirements, which will minimize the adverse environmental impacts of impingement, are established on a site-specific basis pursuant to 40 C.F.R. § 125.98(g) and informed by the BTA standards for impingement mortality at § 125.94(c). In other words, the requirements are necessary to comply with the regulations for CWISs at existing facilities. EPA explains that factual and biological basis for the Draft Permit requirements below.

Entergy comments that the existing traveling screens at PNPS are modified traveling screens and satisfy "the letter and spirit" of the Final Rule without any additional requirements.[66] EPA explained in the Fact Sheet (Attachment D at 34-36) and in Response to Comment 3.1.3, above, that the existing traveling screens are not consistent with the BTA standard for modified traveling screens at 40 C.F.R. § 125.94(c)(5) because the existing screens do not include the elements required of a modified traveling screen as defined at 40 C.F.R. § 125.92(s). EPA determined that the BTA for impingement mortality is an actual through-screen velocity of no greater than 0.5 fps, consistent with 40 C.F.R. § 125.94(c)(3). *See* Fact Sheet Attachment D at 87. The Permittee will comply with this standard under most circumstances now that it has permanently shut down.[67] This technology is more protective than the existing traveling screens which, based on analysis provided by the permittee's own consultant, do not protect the majority of individuals impinged at PNPS. *See* AR-489 at 35. A through-screen velocity sufficiently low to allow most fish to escape impingement is protective even of fragile species that are not likely to survive impingement (*e.g.*, rainbow smelt, alewife, and Atlantic menhaden), as well as Atlantic silversides, which is not considered a fragile species under the Final Rule but has demonstrated low site-specific survival upon contact and transport through the fish return system at PNPS. Atlantic menhaden, alewife, and Atlantic silversides were three of five species that comprised over 98% of total impingement in 2017.

Part I.C.1.b of the Draft Permit requires monitoring of the through-screen velocity or, alternatively, calculation of the intake velocity, in order to demonstrate compliance with the BTA standard. The actual through-screen velocity BTA standard at 40 C.F.R. § 125.94(c)(3) specifies that "[t]he owner or operator of the facility must submit information to the Director that demonstrates that the maximum intake velocity as water passes through the structures components of a screen measured perpendicular to the screen mesh does not exceed 0.5 feet per second" and continues that "[i]n lieu of velocity monitoring at the screen face, you may calculate the through-screen velocity using water flow, water depth, or the screen open areas." In addition, 40 C.F.R. § 125.96(a) authorizes the permitting authority to establish monitoring requirements in addition to those specified at § 125.94(c) including intake velocity and flow measurements. Finally, 40 C.F.R. § 125.96(e) requires permittees to conduce either visual inspections or employ remote monitoring devices during the period the cooling water intake structure in in operation to ensure that any technologies operated to comply with § 125.94 are maintained and operated to function as designed. Thus, the rationale for the monitoring requirements for the through-screen velocity is to ensure compliance with the BTA standard for impingement mortality at 40 C.F.R. §

[66] The Final Rule establishes requirements for minimizing impingement and entrainment mortality at CWISs at existing facilities that withdraw more than 2 MGD and which use 25 percent or more of this water exclusively for cooling, which includes PNPS. 40 C.F.R. §§ 125.90(a) and 125.91(a). Pursuant to 40 C.F.R. § 125.94(c), all facilities subject to the Final Rule must comply with one of the alternatives in paragraphs (c)(1) through (7); Entergy claims to satisfy the "letter and spirit" of the Final Rule but has failed to identify a BTA standard for impingement mortality with which it complies.

[67] In footnote 217, Entergy's statement that a through-screen velocity of 0.5 fps "would otherwise exempt Pilgrim from the Rule's impingement mandates" is inaccurate. A design or actual through-screen velocity of 0.5 fps are two possible means of complying with the BTA standards for impingement mortality under the Final Rule. In other words, a low through-screen velocity does not *exempt* a facility from the mandates of the Final Rule; rather, a facility achieving a through-screen velocity of 0.5 fps is *in compliance with* the Final Rule. 40 C.F.R. § 125.94(c).

125.94(c)(3), which informed the determination at PNPS which proceeds under 40 C.F.R. § 125.98(g).

Compliance with the actual through-screen velocity standard at 40 C.F.R. § 125.94(c)(3) will be achieved when the facility ceases production of electricity, which occurred on May 31, 2019. However, even after cessation of electricity generation, the actual through-screen velocity will be exceeded for limited periods when the circulating water pump is operating, which the permittee is authorized to do for up to 48 hours during any calendar month. For this reason, EPA sought to establish additional controls post-shutdown for the existing technology (traveling screens) to minimize impingement mortality for non-fragile species during these limited periods when the circulating water pumps are operated.[68] *See* Fact Sheet Attachment D at 92-93. EPA evaluated available data, including the relative costs and benefits, and determined that no additional technology would be warranted for impingement given that the facility will comply with the BTA standards in the Final Rule within a short period of time from the effective date of the permit under most circumstances. However, when the circulating pump operation will cause PNPS to exceed the actual through-screen intake velocity of 0.5 fps post-shutdown, EPA determined that continuous rotation of the existing traveling screens is a minimum step that is both feasible and will likely provide additional benefits for impinged fish.

In Comment 3.1.3, Entergy presents an argument, which is repeated in the comment above, that rotating the traveling screens "when necessary, (*e.g.*, based on pressure representing the presence of impinged organisms or debris) or 'for 8 hours prior to conducting the impingement sampling' where appropriate" is "as soon as practicable" consistent with the Final Rule. In this comment, Entergy also argues that the requirement for continuous rotation was not supported by any biological or engineering calculations. EPA has addressed this first point about the rotation schedule in Response to Comment 3.1.3 and maintains that the current operation of the traveling screens does not comply with the "as soon as practicable" mandate of the Final Rule.

Regarding biological justification for the rotation requirements, the Fact Sheet (Attachment D at 93-95) presents laboratory, field, and site-specific data from PNPS indicating that survival of non-fragile species impinged at PNPS could be improved with operational changes. Site-specific impingement survival studies from 1980-1983 indicated that continuous rotation resulted in the greatest improvement in survival of non-fragile species (*e.g.*, grubby, winter flounder) at PNPS. *See* AR-460. In addition, a 2005 PNPS impingement study observed greater initial survival for all impinged species combined when traveling screens were continuously rotated as compared to

[68] Although the circulating water pumps does not withdraw seawater for cooling, by its terms, section 316(b) applies to "cooling water intake structures," and Entergy's comments establish that PNPS will continue to use its CWIS. The Final Rule applies to point sources that use a CWIS with a cumulative design intake flow greater than 2 MGD to withdraw water from a water of the U.S., and which use 25 percent or more of the withdrawal on an actual intake flow basis exclusively for cooling. 40 C.F.R. § 125.91(a). It is this last requirement at 40 C.F.R. § 125.91(a)(3) that clarifies that the Final Rule establishes BTA requirements for the CWIS, which may withdraw water for purposes other than cooling, so long as at least 25 percent of the actual intake flow is used for cooling. *See also* 79 Fed. Reg. 48,300 at 48,306 (Aug. 15, 2014) ("Once water passes through the intake, water can be apportioned to any desired use, including uses that are not related to cooling. However, as long as at least 25 percent of the water is used exclusively for cooling purposes, the intake is subject to the requirements of today's rule."); *see also Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49, 83, 84 (2d. Cir 2018) (finding that the EPA reasonably determined that "an intake structure that withdraws some amount of cooling water is a 'cooling water intake structure'" that may be regulated pursuant to CWA § 316(b)). *See also* Response to Comment III.4.1.

rotating on an 8-hour schedule. *See* AR-449. In this study Atlantic silversides, which is a species that is impinged in high numbers at PNPS, experienced an increase in initial survival from 15% with 8-hour rotations to 62% with continuous rotation. *Id*. A similar improvement in survival would have resulted in an average of 4,683 additional Atlantic silversides saved annually based on the mean annual impingement from 1980 through 2015. AR-722 at 81. EPA maintains that the biological data, including site-specific data from PNPS, support a requirement for continuous rotation in order to improve survival of non-fragile species. Entergy has not contested the Fact Sheet's biological analysis or conclusion that continuous rotation will improve survival of non-fragile species.

Entergy comments that the post-shutdown reduced water usage at PNPS further decreases the basis for continuous rotation. To the extent that the reduction in post-shutdown water usage enables PNPS to comply with an actual through-screen velocity of 0.5 fps, EPA agrees that continuous rotation is unnecessary and is not required in the Draft Permit. Part I.F.1.e of the Draft Permit *only* requires continuous rotation of traveling screens post-operation when one of the circulating water pumps is operating, because the actual through-screen velocity will exceed 0.5 fps. Based on the parameters provided in the 2008 Engineering Response (AR-489 at 6) and the anticipated post-shutdown circulating water flows, the actual through-screen velocity at a maximum daily intake flow of 13,500 gallons per minute (gpm) (19.4 MGD) over 4 screens will be 0.07 fps. During a 48-hour period each month, the maximum daily intake flow will increase to 169,000 gpm (13,500 gpm + one circulating pump at 155,500 gpm) resulting in a calculated actual through-screen velocity of 0.82 fps, which is less than the current velocity of 1.56 fps but still higher than the BTA standard. Because the BTA standard for impingement mortality will be exceeded during this time, and because, as explained above, biological data collected by PNPS suggests that continuous rotation will improve survival of non-fragile fish, the Draft Permit establishes an additional requirement for PNPS to continuously rotate the traveling screens for the 48-hour period each month when the actual through-screen velocity exceeds 0.5 fps.

Entergy comments that the requirement is a "dubious mandate" for equipment at the end of its useful life, particularly when the technology was not designed for continuous rotation. Entergy does not comment or demonstrate that continuous rotation is infeasible at PNPS, only that the requirement is "dubious." The 2008 Engineering Response indicates that the existing traveling screens do operation continuously when the water temperature drops below 30°F, which demonstrates that, at least for limited time periods, the screens can be operated continuously. *See* AR-489 at 6. *See also* Fact Sheet Attachment D at 34. The commenter does not explain or provide support from the statement that the technology is at the end of its useful life. The plant could be considered at the end of its useful life because it was scheduled to, and indeed did, shutdown in 2019. However, the fact that the plant is shutting down due to, as Entergy has stated in the past, changes in the energy market, does not mean that the traveling screens (the technology at issue here) are necessarily at the end of their physical life.

Finally, in support of its request to remove the traveling screen requirements from the Final Permit, Entergy references a final NPDES permit issued for Canal Generating Station (MA0004928) in 2008, which was issued many years prior to October 2014 when the Final Rule and its new requirements for CWISs at existing facilities became effective. The Final Permit was appealed by the permittee and has not yet gone into effect pending the resolution of the appeal.

Entergy states that the 2008 Final Permit for Mirant Canal contains neither a continuous screen-rotation requirement, nor any requirement to monitor through-screen velocities, even though cooling water withdrawals up to 518 MGD are authorized. The provisions of the Final Permit to which Entergy refers (Part I.A.12) are requirements for Unusual Impingement Events. In fact, the Final Permit requirements for operation of Canal Station's CWIS, listed at Part I.A.13, are similar to the definition of modified traveling screens at 40 C.F.R. § 125.92(s), and include improvements to the fish buckets (at I.A.13.b), low pressure spray (at I.A.13.c), reconfigured fish return (at I.A.13.e), and *continuous operation of the traveling screens when the corresponding circulating water pumps are in operation* (at I.A.13.f). Entergy is correct that no velocity monitoring is required in the 2008 Final Permit; velocity monitoring was not necessary because the through-screen velocity at Mirant Canal's traveling screens does not meet the BTA standard for impingement mortality and, as such, through-screen velocity is not a technology this facility employs to minimize the adverse impacts of impingement. Thus, EPA has included similar requirements for continuous rotation in other NPDES permits to minimize adverse impacts from impingement, including in the 2008 Mirant Canal Station Final Permit.

3.3 Suggested Revisions To The Language Of Part I.F Of The Draft Permit

For all the reasons detailed above, Entergy proposes the following changes to Part I.F of the Draft Permit:

Section 316(b) of the CWA, 33 U.S.C. § 1326(b), dictates that this permit must require that the cooling water intake structure's (CWIS) design, location, construction, and capacity reflect the best technology available for minimizing adverse environmental impact (BTA), including the CWIS's entrainment and impingement of various life stages of aquatic organisms (*e.g.*, eggs, larvae, juveniles, and adults). Accordingly, EPA has determined the BTA for PNPS' CWIS and has specified requirements reflecting this BTA below in Parts I.F.1 and I.F.2 of this permit.

> The permittee has informed EPA and MassDEP that it ~~will~~**is expected to** terminate **electricity-generating** operations at PNPS **no later than June 1, 2019,** ~~and enter a~~ **and ultimately to decommission the facility under the direction of the U.S. Nuclear Regulatory Commission**~~ing phase no later than June 1, 2019. As of this date~~ **Following the termination of electric-generating operations ("shutdown")**, PNPS will terminate ~~cooling~~ **circulating** water withdrawals for main condenser **cooling, except that** will be authorized to continue withdrawing ~~cooling~~ water ~~only~~ as necessary to support ~~decommissioning activities and to cool the spent fuel rods for a limited period of time following~~ **post-**shutdown ~~of PNPS~~ **operations at PNPS, *e.g.*, dilution or fire-protection water**. The BTA requirements in this permit reflect the current operations of PNPS prior to shut down ~~or June 1, 2019, whichever comes first and~~**, and** the anticipated operations from **and after shutdown** ~~June 1, 2019~~ through the ~~end of the decommissioning phase or the~~ expiration of this permit~~, whichever comes first~~.
>
> 1. Upon termination of generation of electricity ~~or no later than June 1, 2019~~ **and solely to the extent of continued periodic operation of the circulating water system as**

provided herein, the permittee shall~~:~~ **cease water withdrawals for the circulating water system, except that the permittee shall be authorized, *e.g.*, for the purpose of providing dilution water consistent with the facility's Off-Site Dose Calculation Manual, to operate one (1) circulating water pump of the permittee's choosing once every rolling twenty-eight (28) day period for up to forty-eight (48) hours per calendar month, for an average monthly maximum of 16 MGD.**

~~a. Operate the traveling screens with a maximum through-screen intake velocity no greater than 0.5 feet per second. Limited exceedances of the maximum through-screen velocity are authorized for the purposes of maintaining the CWIS and when the circulating water pumps are required to withdraw water to support decommissioning activities not to exceed five (5) percent of the time on a monthly basis.~~

~~b. Monitor the through-screen velocity at the screen at a minimum frequency of daily. Alternatively, the permittee shall calculate the daily maximum through-screen velocity using water flow, depth, and screen open area. For this purpose, the maximum intake velocity shall be calculated during minimum ambient source water surface elevations and periods of maximum head loss across the screens. The average monthly and maximum daily through-screen intake velocity shall be reported each month on the DMR. See Part I.B.1. of this permit.~~

~~c. Cease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD. Cooling water withdrawals at the salt service water pumps shall be limited to a maximum daily flow of 15.6 MGD.~~

~~d. Withdrawal of seawater using a single circulating water pump not to exceed five (5) percent of the time on a monthly basis is authorized to support decommissioning activities.~~

~~e. Continuously rotate the traveling screens when operating the circulating water pumps.~~

2. From the effective date of the permit until termination of generation of electricity~~, no later than June 1, 2019~~**and solely to the extent of continued periodic operation of the circulating water system as provided herein**, the permittee shall ~~continuously rotate~~ **operate** the traveling screens **during circulating water use to the extent necessary or appropriate to mitigate UIEs, as defined above in Part I.D.12, or to reduce debris loading**.

3. Upon termination of generation of electricity and in the absence of nuclear safety considerations, service water withdrawals at the service water pumps shall be limited to a maximum daily flow of 19.4 MGD and an average monthly flow of 15.6 MGD.

~~3~~4. Any change in the location, design, or capacity of any CWIS, except as expressed in the above requirements, must be approved in advance and in writing by the EPA and MassDEP.

Response to Comment 3.3:

As part of its comments on the Draft Permit, Entergy has suggested revised permit conditions for Part I.F. EPA has addressed comments that request these revisions in the responses to the comments in Section III of this document. Part I.C of the Final Permit establishes the BTA requirements to minimize impingement mortality and entrainment at the cooling water intake structure at PNPS. The Agencies have justified any changes to the BTA requirements from the Draft to the Final Permit in responding to Entergy's comments. *See* Responses to Comments III.2, III.3, III.4, and III.8.

4.0 The Final Permit's Volumetric Flow Limitations With Respect To Dilution Water and Service Water Must Be Revised To Reflect Post-Shutdown Needs

The Draft Permit provides, in Part I.F.1.c, that PNPS shall, post-shutdown, "[c]ease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD."[220] In Part I.F.1.d, "[w]ithdrawal of seawater using a single circulating water pump" is further limited so that it may not "exceed five (5) percent of the time on a monthly basis … to support decommissioning activities."[221] With respect to service water withdrawals, Part I.F.1.c of the Draft Permit limits such withdrawals via the "salt service water pumps … to a maximum daily flow of 15.6 MGD."[222]

As detailed below, these limits reflect calculation errors and do not fully account for PNPS's post-shutdown operational needs. As such, they should be revised, consistent with the proposed revisions provided above in Section I.D and below in Sections II.A and II.B.

220 Draft Permit, Part I.F.1.c, at 33.
221 *Id.*, Part I.F.1.d, at 33.
222 *Id.*, Part I.F.1.c, at 33.

Response to Comment 4.0:

The commenter states that the Draft Permit's post-shutdown flow limits at Outfalls 001 and 010 reflect calculation errors and do not fully account for the post-shutdown operational needs of the Facility. EPA disagrees that the Draft Permit limits include calculation errors, and the comment does not provide any support for its statement. Regarding the operational needs of the Facility, the Draft Permit limits at Part I.F.1.c reflect the communication from the permittee (J. Egan) to EPA (G. Papadopoulos) in an email of October 28, 2015 (AR #521). Since this communication, and after review of the Draft Permit, Entergy has provided more detail on the anticipated flow requirements at PNPS. See Comments and Responses 4.1 and 4.2, below. Part I.A.1 of the Final Permit authorizes a maximum daily limit of 224 MGD at Outfall 001, which reflects the operation of a single circulating water pump. The Permittee must report the average monthly flow, and operation of the single circulating water pump may not exceed 48 hours over a single calendar month. *See* Part I.C.4. Part I.A.3 of the Final Permit authorizes a maximum daily flow of 19.4 MGD at Outfall 010. Entergy has stated that these requirements will meet its anticipated post-shutdown requirements for the Facility. Moreover, these limits will still result in a flow reduction greater than 97% at Outfall 001 and an overall reduction of nearly 93% (based on the maximum cooling water flows at Outfall 010 and limited operation of a circulating water pump for a full 48 hours every 28 days). These flow reductions, which the Facility will achieve as a result of ceasing generating operations, are commensurate with the best technology available to minimize adverse environmental impact from the operation of PNPS's cooling water intake structure.

4.1 Circulating Water Withdrawal Limits

The Draft Permit contemplates operation of a single historic circulating water pump, primarily to supply dilution flow for the facility's NRC-authorized liquid radiological waste disposal system, and on an emergency basis for fire protection. Thus, this former circulating water will no longer serve a cooling function and therefore will not constitute cooling water pursuant to Section 316(b).[223]

Further, this dilution water will not contain any pollutants subject to EPA's or DEP's jurisdiction.[224] To the contrary, it will contain only liquid radioisotopes ("radiological wastes"), at NRC-approved discharge levels.[225] More specifically, at PNPS, "[t]he function of the liquid radioactive waste system is to collect, treat, store, and/or dispose of all radioactive liquid wastes."[226] Such wastes are initially "collected in sumps and drain tanks at various locations throughout the plant and … then transferred to the appropriate receiving tank for processing."[227] Liquid radiological wastes are classified and processed for disposal "as either clean (liquids having a varying amount of radioactivity and low conductivity), chemical (liquids having low concentrations of radioactive impurities and high conductivities), or miscellaneous radwastes (liquids having a high detergent or contaminant level, but with a low radioactivity concentration)."[228] Once processed, "[v]ery low levels of radioactivity may be released in plant effluents if they meet the limits specified in the [NRC] regulations"; "[t]hese releases are closely monitored and evaluated for compliance with NRC restrictions in accordance with the PNPS ODCM [Offsite Dose Calculation Manual]."[229] "If it is determined that the liquid radioactive waste meets the ODCM criteria for controlled release, it can be discharged on a controlled basis into the circulating water discharge canal through the liquid radioactive waste discharge header."[230] During this process, "the radioactivity level is continuously monitored," and "[a]ccidental discharge is protected against by instrumentation for detection and alarm of abnormal and administrative controls," so that "the discharge is automatically terminated if the activity exceeds preset levels."[231] That will remain the case when PNPS ultimately begins the decommissioning process, during which "any radioactive liquids from operation of decommissioning activities in the facility will be processed and disposed of" via the liquid radioactive waste system, again consistent with the "[c]ontrols for limiting the release of radiological liquid effluents [that] are described in the facility's ODCM" and NRC regulations.[232]

In sum, the post-shutdown use of circulating water at PNPS for dilution purposes will not be cooling water and will contain no otherwise regulated "pollutants," as defined under the federal CWA or the MCWA. Because this is so, as a legal matter, the post-shutdown use of circulating water at PNPS consists, from EPA's and DEP's perspective, merely of the withdrawal and immediate release (without any legally meaningful alteration) of seawater. That activity is no different in principle from the type of water transfers that hydroelectric dams and some municipal water systems perform, for which no NPDES permit is necessary.[233] As the Supreme

Court has repeatedly acknowledged, because the scope of the NPDES program covers only "discharges of pollutants," no permit is required for a water usage that is equivalent to merely "tak[ing] a ladle of soup from a pot, lift[ing] it above the pot, and pour[ing] it back into the pot," without more.234 That analogy applies perfectly to PNPS's post-shutdown use of circulating water, meaning that it is unnecessary for that discharge to be covered by any NPDES permit authorization at all.235

It also bears repeating that there is no biological rationale for requiring a more stringent limit on post-shutdown water withdrawals and discharges, including of dilution water, than has been applied to PNPS during its electric-generating operations. As detailed above in the "Environmental Context" section, nearly 50 years of consistent, extensive and robust environmental monitoring has demonstrated that PNPS's historic permitted intakes and discharges, which are much greater in volume than those contemplated once Pilgrim shuts down, have had no demonstrable adverse impact on aquatic species. As such, it follows that PNPS's much smaller-volume post-shutdown discharges also will continue to result in no adverse impact. Accordingly, the volumetric limitation on the use of dilution water, via Outfall 001, that is imposed in Part I.B.1 and also reflected in Part I.F.1.d of the Draft Permit should be deleted.236

Even if the Draft Permit's volumetric limitation on post-shutdown circulating water use is not deleted from the final Permit, the limitation needs to be adjusted and the relevant language of the Draft Permit, which refers to this discharge variously as "cooling water" and "circulating water," revised to avoid potential confusion.237 More specifically, Part I.B.1 of the Draft Permit imposes a limitation on post-shutdown "discharge of cooling water to support shutdown operations through Outfall Serial Number 001" of no more than an average monthly volume of 11.2 million gallons per day ("MGD"), with a maximum daily flow of 224 MGD.238 This limitation is apparently meant to be reflected also in Part I.F.1.d of the Draft Permit, which states that "[w]ithdrawal of seawater using a single circulating water pump not to exceed five (5) percent of the time on a monthly basis is authorized to support decommissioning activities," equating to 11.2 MGD given the design flow capacity of a single circulating water pump of 155,500 gallons per minute ("gpm").239

The language of both these provisions is potentially confusing, because it describes the discharge as "cooling water" and "circulating water," even though this water usage will serve neither of these purposes during PNPS's post-shutdown activities, but instead will be used solely for dilution water. To the extent this limitation is retained in the final Permit, Entergy therefore respectfully requests referring to this discharge consistently as "dilution water," as reflected in the proposed revisions provided in Section I.D above.[[69]] Part I.B.1 also should be revised to make clear that the volumetric limits provided there are solely those related to dilution water use, and are exclusive of the flows that are separately authorized under the remainder of Part I.B, all of which ultimately empty through the same physical outfall as Outfall 001, even though they carry different Outfall Serial Numbers.

With respect to the volumetric limits themselves, Entergy agrees that the maximum daily flow of 224 MGD is adequate for dilution water – provided, again, that this limitation is meant to reflect

[69] There is no "Section I.D" in Entergy's comments. This is probably a reference to Section 1.C of Entergy's comments, which appears in the Agencies' Response to Comments as Comment III.3.3.3 above.

only dilution water flow, and no other flows that will discharge via the same physical outfall, *e.g.*, service water, etc.

With respect to the average monthly flow, however, Entergy respectfully requests that they be revised to allow for the provision of dilution flow, consistent with the facility's ODCM, that reflects the use of up to one circulating water pump for a period not to exceed 48 hours, no more frequently than once each rolling 28-day period (to account for the short month of February, which allows for fewer days over which dilution water use can be averaged). In most circumstances, Entergy expects that it would need to run that single pump for only 24 hours or less to achieve the dilution level that NRC mandates for the relevant liquid radiological waste. However, unforeseen circumstances may arise during the post-shutdown phase – a new operational dynamic for the PNPS facility – that may require up to an additional day of pump use, for conservatism. Likewise, while not expected, Entergy would like to retain the ability to withdraw and discharge seawater on an emergency basis for fire-protection purposes. On a monthly average basis, this flow dynamic equates to approximately 16 MGD.[240]

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223 *See* 40 C.F.R. 125.92(e) (defining "cooling water" as "water used for contact or non-contact cooling").

224 *See Train*, 426 U.S. at 25 (holding that "the 'pollutants' subject to regulation under the [Clean Water Act] do not include source, byproduct, and special nuclear materials"); *see also PG&E*, 461 U.S. at 207 (NRC retains "exclusive jurisdiction to license the transfer, delivery, receipt, acquisition, possession, and use of nuclear materials…. Upon these subjects, no role was left for the States." (citation omitted)).

225 *See* 10 C.F.R. Part 20, Appendix B, Table 2.

226 FSEIS at 2-13.

227 *Id.*

228 *Id.*

229 *Id.*; *see also* Pilgrim Nuclear Power Station Offsite Dose Calculation Manual, Rev. 9 (2003) ("PNPS ODCM"), at 3/4-11 to -15 (providing radiation dosage limits at and beyond site boundary for radiological liquid effluents); 10 C.F.R. Part 20, Appendix B, Table 2 (providing NRC mandated radiological dose limits for members of public as well as facility personnel).

230 FSEIS at 2-14; *see also* PNPS ODCM at 6-1.

231 FSEIS at 2-14; *see also* PNPS ODCM at 3/4-3 ("The radioactive liquid effluent monitoring instrumentation channels shown in Table 3.1-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Controls 3.2.1 are not exceeded during periods when liquid wastes are being discharged via the radwaste discharge header.").

232 NRC, NUREG-0586, Supplement 1, Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Vol. 1, Final Report (Nov. 2002) ("Decommissioning GEIS"), at 3-10.

233 *See, e.g.*, 73 Fed. Reg. 33,697, 33,699 (June 13, 2008) ("[T]he agency concludes that water transfers, as defined by the rule, do not require NPDES permits because they do not result in the 'addition' of a pollutant."); *see also L.A. County Flood Control Dist. v. Nat. Res. Def. Council*, 133 S. Ct. 710, 712-13 (2013) (holding that "a 'discharge of pollutants' [does not] occur when polluted water 'flows from one portion of a river that is navigable water of the United States, through a concrete channel or other engineering improvement in the river,' and then 'into a lower portion of the same river'").

234 *See L.A. County Flood Control Dist.*, 133 S. Ct. at 713 (quoting *Catskill Mountains Chapter of Trout Unlimited, Inc. v. New York*, 273 F.3d 481, 492 (2d Cir. 2001)); *S. Fla. Water Mgmt. Dist. v. Miccosukee Tribe*, 541 U.S. 95, 109-10 (2004) (same).

235 *See, e.g.*, *Waterkeeper Alliance, Inc. v. EPA*, 399 F.3d 486, 504 (2d Cir. 2005) ("Unless there is a 'discharge of any pollutant,' there is no violation of the Act, and point sources are, accordingly, neither statutorily obligated to comply with EPA regulations for point source discharges, nor are they statutorily obligated to seek or obtain an NPDES permit.").

236 *See* Draft Permit, Part I.B.1, at 11; *id.*, Part I.F.1.d, at 33.

237 *See* Draft Permit, Part I.B.1, at 11; *id.*, Part I.F.1.d, at 33.

238 *See* Draft Permit, Part I.B.1, at 11.

239 *Id.*, Part I.F.1.d, at 33; *see also, e.g.*, FSEIS at 2-7 (providing design flow capacity of each circulating water pump).
240 155,500 gpm * 60 min/hr * 24 hr/day = 223.9 MGDD * 2 days = 447.8 MGD over 48 hours or 2 days. 447.8 MGD divided by 28 days is approximately equal to 16 MGD.

Response to Comment 4.1:

In the Draft Permit at Part I.F.1.d, the Agencies proposed to authorize limited operation of a single circulating water pump not to exceed five percent of the time on a monthly basis to support post-shutdown activities. As the Fact Sheet explains, the limited use of the circulating pump to support shutdown operations was based on communications with PNPS staff. *See* AR-520, AR-521. In an October 2015 email (AR-521), a PNPS representative responded to an EPA question about whether the seawater intake via the circulating water pump would be used for cooling by saying that the pump would be "run for *more than just* cooling water" (emphasis added).[70] The Draft Permit included provisions based on the best available information at the time, which indicated that the circulating water pump would be necessary to supply water for cooling and other purposes to support shutdown operations. In the comment above Entergy has provided new information about the purpose of this intake water.

According to the comment, the seawater withdrawn via the circulating water pump will not be used for cooling but will be used "primarily to supply dilution flow for the facility's NRC-authorized liquid radiological waste disposal system, and on an emergency basis for fire protection." Consequently, comments Entergy, the water withdrawn via the circulating pump is not subject to regulation under the CWA. The water withdrawn via the service water pumps, which is withdrawn via the same intake structure, is used for cooling purposes, however. *See* Comment III.4.2. The fact that a portion of the seawater withdrawal is not used for cooling does not exempt that intake volume from requirements under CWA § 316(b) or the Final Rule. By its terms, section 316(b) applies to "cooling water intake structures," and Entergy's comments establish that PNPS will continue to use its CWIS. The Final Rule applies to point sources that use a CWIS with a cumulative design intake flow greater than 2 MGD to withdraw water from a water of the U.S., and which use 25 percent or more of the withdrawal on an actual intake flow basis exclusively for cooling. 40 C.F.R. § 125.91(a). It is this last requirement at 40 C.F.R. § 125.91(a)(3) that clarifies that the Final Rule establishes BTA requirements for the CWIS, which may withdraw water for purposes other than cooling, so long as at least 25 percent of the actual intake flow is used for cooling. *See also* 79 Fed. Reg. 48,300 at 48,306 (Aug. 15, 2014) ("Once water passes through the intake, water can be apportioned to any desired use, including uses that are not related to cooling. However, as long as at least 25 percent of the water is used exclusively for cooling purposes, the intake is subject to the requirements of today's rule."); *see also Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49, 83, 84 (2d. Cir 2018) (finding that the EPA reasonably determined that "an intake structure that withdraws some amount of cooling water is a 'cooling water intake structure'" that may be regulated pursuant to CWA § 316(b)). PNPS withdraws seawater through its CWIS for cooling via the service water pumps and, based on the comment, for dilution via the circulating water pumps. Both volumes are included in the calculation of actual intake flow, defined as:

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[70] In AR-521, the permittee states that it is "trying to obtain more information regarding this subject" although more information was not provided prior to issuance of the Draft Permit in May 2016.

> [T]he average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three years. After October 14, 2019, Actual Intake Flow means the average volume of water withdrawn on an annual basis by the cooling water intake structures over the previous five years. Actual intake flow is measured at a location within the cooling water intake structure that the Director deems appropriate. The calculation of actual intake flow includes days of zero flow. AIF does not include flows associated with emergency and fire suppression capacity.

40 C.F.R. § 125.92(a). Whether actual intake flow is calculated over three years or five years, pre-shutdown or post-shutdown, PNPS is a point source and uses a CWIS with a design flow greater than 2 MGD, through which more than 25 percent of the flow on an annual basis is used exclusively for cooling. *See id.* § 125.91(a).[71] Thus, the CWIS at PNPS is subject to BTA requirements based on § 316(b) and the Final Rule regardless of whether some of the intake volume is used for purposes other than cooling water.

Entergy further comments that there is no biological rationale for limiting post-shutdown withdrawals because the greater volumes withdrawn during PNPS's operation over the decades "have had no demonstrable adverse impact on aquatic species." The Agencies fundamentally disagree with the premise; the Agencies maintain that the PNPS's historically permitted intake of seawater constituted an adverse environmental impact under § 316(b) of the CWA and reject Entergy's arguments that environmental impact must be observed at the population level before it may be considered adverse. *See* Response to Comment III.2.1. The Agencies agree that reduced withdrawals post-shutdown will likely reduce the adverse environmental impact from PNPS' CWIS, but it does not follow that the adverse environmental impact will disappear altogether, and the comment provides no evidence to support such a conclusion. The volumetric limitation on seawater intake via the circulating water pump in Part I.B.1 and operating conditions in Part I.F.1.d of the Draft Permit are warranted to ensure that impingement mortality and entrainment are minimized post-shutdown. *See* 40 CFR §§ 122.4(a), 122.43(a).

Having established that the CWIS is subject to impingement and entrainment controls, EPA turns to Entergy's comment that the circulating pump volume is dilution water and will not contain any pollutants subject to EPA's or MassDEP's jurisdiction. The comment states that the dilution water pumped via the circulating water pumps and discharged at Outfall 001 will contain "only liquid radioisotopes" and explains that these isotopes are regulated by the NRC and are not considered pollutants under the CWA.[72] EPA agrees that radioactive materials regulated under

[71] A point source is defined as "any discernable, 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." 40 C.F.R. § 122.2; *see also* CWA § 502(14). . On an annual basis, the post-shutdown seawater intake volumes will still include 46% for the service water system, which is used for cooling.

[72] The comment confusingly states that the dilution water discharged at Outfall 001 will contain "liquid radioisotopes ('radiological wastes'), but then suggests that such wastes are actually discharged from a separate outfall—referred to in the comment as the "liquid radioactive waste discharge header." *See also* FS at 11 (noting that "liquid radioactive waste" is released "into the circulating water discharge canal through the liquid radioactive waste

the Atomic Energy Act of 1954, as amended, are not considered "pollutants" under the CWA. *See* 40 C.F.R. § 122.2 (definition of "pollutant" and accompanying Note); *Train v. Colorado Pub. Interest Research Grp.*, 426 U.S. 1, 25 (1976); *see also* Responses to Comments I.2.2 and I.2.5; Fact Sheet at 37, 44. The Draft Permit did not include any limitations or conditions for radioactive wastes, including the radioactive isotopes discussed in the comment. The post-shutdown Draft Permit conditions for Outfall 001 were based on the information provided by PNPS at the time the Draft Permit was prepared, which indicated that at least a portion of the circulating pump intake volume would be used for cooling and to support shutdown activities. The comment provides more information about the nature of the effluent from Outfall 001.

As the comment points out, the Final EIS for NRC's Relicensing of PNPS (AR-321) describes the radioactive waste management systems and effluent control systems, including the processing system and procedures for liquid radiological waste. These systems are designed and operated to meet the dose design objectives of 10 C.F.R. Part 20 and Part 50 (Appendix I). Liquid radioactive waste with very low levels of radioactivity may be released in plant effluents if they meet the limits specified by the NRC. See Fact Sheet at 44. The comment explains that post-shutdown, the circulating pump intake volume will be used to dilute discharges of liquid radiological waste for PNPS to achieve these limits. Again, the Agencies have not included any limitations or conditions associated with radioactive isotopes in the plant's effluents.

In short, the comment asserts that PNPS will stop discharging cooling water or any "pollutants" (within the meaning of the CWA) via Outfall 001 once PNPS stops generating electricity and that the discharge from Outfall 001 "will be used solely for dilution water." As previously noted, PNPS stopped making electricity on May 31, 2019. The Agencies agree that without the discharge of heat or other "pollutants" added to the intake water discharged via Outfall 001, the effluent limitations included in the Draft Permit applicable to Outfall 001 should be removed because there would not be a "discharge of a pollutant" within the meaning of the CWA. *See* CWA §§ 301(a), 402(a)(1), 502(12). Consequently, the Agencies have not included in the Final Permit the limits for heat and pH that were included in the Draft Permit for post-shutdown operation of 001. *Compare* Draft Permit at Part I.B *to* Final Permit at I.A.1. As a result, the permittee is not authorized to discharge any "pollutants" within the meaning of the CWA from Outfall 001. Having said that, the Agencies note that volumetric limitations and other conditions related to the intake of seawater via the CWIS and subsequent release to the discharge canal via Outfall 001 are still required under the Act and appropriate, as explained earlier in this Response.

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header"), 12 (noting that "liquid radioactive waste . . . can be discharged on a controlled basis into the circulating water discharge canal through the liquid radioactive waste discharge header"), 44 (noting that the "discharge of radiological waste water ('Radwaste Effluents') directly into the discharge canal occurs via a diffuser pipe submerged at the upstream (proximal) end of the canal, adjacent to the discharge structure"); Entergy's Redline of the FS at 15 ("Radioisotopes that meet the facility's Offsite Dose Calculation Manual (ODCM) criteria for controlled release can be discharged on a controlled basis into the circulating water discharge canal through the liquid radioactive waste discharge header."), 24 (describing the discharge from Outfall 001 with no mention of radiological wastes), 51 ("The discharge of radiological waste water ("Radwaste Effluents") directly into the discharge canal occurs via a diffuser pipe submerged at the upstream (proximal) end of the canal, adjacent to the discharge structure"). This would suggest that the discharge from Outfall 001 does not actually include liquid radioactive waste.

The Agencies further agree that the permit language related to this intake and release can be clarified based on the new information provided in the comment about the use of post-shutdown circulating water. We have eliminated the reference to post-shutdown cooling water in Part I.A.1 of the Final Permit and clarified that the permitted volume applies to the discharge from Outfall 001 prior to combining with any other wastestream in the discharge canal. EPA has also granted Entergy's request to authorize the use of up to one circulating water pump for a period not to exceed 48 hours in a calendar month. The comment requests that operation of the circulating water pumps be authorized for 48 hours no more frequently than once each rolling 28-day period (to account for the short month of February, which allows for fewer days over which dilution water use can be averaged). However, a rolling 28-day period is not consistent with the monthly reporting period established in the NPDES permit and may introduce reporting conflicts for the additional (up to) 3 days per month. EPA expects that Entergy's request was intended to allow additional flexibility that the Draft Permit's proposed limit (5 percent of time on a monthly basis) does not. As Entergy points out, a limitation of the percentage of time that the circulating water pumps can operate would be more stringent in February (34 hours) than in August (37 hours). The Final Permit condition that authorizes operation of one circulating water pump for a period not to exceed 48 hours in a calendar month maintains consistency in the limit from month to month and is more consistent with the monthly DMR reporting period than a rolling 28-day period.

As explained above, there was some uncertainty about the circulating pump operation during development of the Draft Permit. The change in circulating pump operation from 5% of the time on a monthly basis to no more than 48 hours per month will still enable PNPS to achieve a 92% reduction in seawater withdrawals as compared to the current permit, which is a reduction in flow commensurate with what the facility would achieve with closed-cycle cooling and does not alter the BTA determination. In addition, Entergy expects that that operation up to 48 hours would only be necessary in the event of "unforeseen circumstances" related to its new post-shutdown "operational dynamic" and that operation of a single circulating pump will likely be less than 48 hours per month in most circumstances resulting in actual flow reductions even greater than 92% which is based on the maximum circulating pump withdrawal. Because the Final Permit limits the operation of the circulating water pump, EPA has eliminated the average monthly flow limit and instead has included a requirement to report average monthly flow, which is sufficient to ensure that the restrictions on operating time have been met.

4.2 Service Water Withdrawal Limits

Post-shutdown, PNPS also will need to make withdrawals from Cape Cod Bay for the service water system. As NRC has explained, during operation, this system serves "an essential role [during normal operations] in the mitigation of and recovery from accident scenarios involving the potential for core-melt," and thus it fulfills a vital nuclear-safety function.[241] NRC also has explained that service water remains necessary to ensure nuclear safety once a nuclear power plant shuts down and begins the decommissioning process. More specifically, after PNPS has ceased generating electricity, Entergy will be obligated to permanently remove all nuclear fuel from the reactor vessel and store it, initially, in PNPS's spent fuel pool. The spent fuel pool is "a specially designated water-filled basin" where spent fuel is placed before being moved to a different storage location, *e.g.*, dry-cask storage in an independent spent fuel storage installation

(“ISFSI”), “[a]fter the fuel has cooled adequately.”[242] Spent fuel pool cooling is necessary because “[e]ven after the nuclear reactor is shut down, the fuel continues to generate decay heat from the radioactive decay of fission products.”[243] “Storing the spent fuel in a pool of water provides an adequate heat sink for the removal of heat from the irradiated fuel.”[244] “Typically, transfer of spent fuel to an ISFSI occurs after the fuel has cooled for 5 years,”[245] which is also the maximum NPDES/MCWA renewal term allowed under federal and Massachusetts law.[246] Use of the service water system may remain necessary during that time in order to provide “spent fuel pool cooling” essential for safe and effective nuclear-fuel management.[247] Service water supports spent-fuel pool cooling.

PNPS’s service water system consists of five service water pumps, each with a design flow capacity of up to 2,700 gallons per minute, providing for a maximum service water capacity of 13,500 gpm or approximately 19.4 MGD, employing all five pumps.[248] During PNPS’s current electric-generating operations, up to four of the pumps are typically in use at one time, with the fifth kept in reserve.[249] Historically and currently (including under PNPS’s current, administratively continued, 1994-amended NPDES permit), therefore, service water usage has been authorized up to 19.4 MGD, but typically involved lower flows.[250]

As proposed in Part I.B.3 and further reflected in 1.F.1.c, the Draft Permit scrambles this history, and proposes to limit PNPS’s service water withdrawals to a monthly average limit of 7.8 million gallons per day, with a daily maximum limit of only 15.6 million gallons per day.[251] These limits reflect a limitation that PNPS use no more than four service water pumps,[252] which reportedly is based on predictions by PNPS personnel that up to four service water pumps may be needed during post-shutdown operations at any given time.[253] While this may be correct, given the absence of operational experience in shutdown and the essential nuclear safety functions served by service water, Entergy respectfully requests that the final Permit authorize, on a maximum daily limit basis, all of them to be used, and allow four pumps to be used on a monthly average basis.

There also is no biological or other environmental rationale for reducing PNPS’s currently allowed service-water usage during the post-shutdown period. As detailed above in the Environmental Context Section and in Sections I.A.2.a and I.A.2.b, the available scientific evidence, including data and object-specific studies amassed during nearly fifty years of biological monitoring, demonstrates the absence of demonstrable adverse impact to aquatic species in the vicinity of the Station reasonably attributable to its operations. If PNPS’s current and historic water withdrawals and discharges have been sufficient to assure the protection of the aquatic ecosystem, then there is no basis for paring back its water usage after the facility has ceased its electric-generating operations and eliminated approximately 97% percent of its current water usage.

For all of these reasons, Entergy requests that the maximum daily limitation on service water use be revised in the final Permit to allow for the use of all five pumps, resulting in a maximum daily flow of up to 19.4 MGD. With respect to the average monthly limitation, Entergy requests that it be revised so as to allow for the use of up to four service water pumps each day, for an authorized average monthly flow of 15.6 MGD. Entergy anticipates that PNPS’s actual service water needs may turn out in practice to be substantially lower than these conservatively large flow authorizations may suggest. To that end, Entergy also recommends that EPA and DEP allow PNPS to operate under the service water usage authorizations proposed here for up to two years following shutdown, at the end of which period Entergy may propose to modify the permit to align the monthly averages to reflect PNPS's actual post-shutdown experience.254

Similar to its concern, stated above, with respect to dilution water, Entergy also recommends that the language of Part I.F.1.c the Draft Permit with respect to service water be revised to avoid potential confusion.255 Specifically, that portion of the Draft Permit directs that PNPS "shall … [c]ease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate" that reflects the average monthly rate provided for service water usage in Part I.B.3 of the Draft Permit.256 This language is confusing because service water is not "for the main condenser," only circulating water (which will become dilution water during the post-shutdown period) is. As such, it is unclear whether the average monthly limitation is meant to apply to service water or to dilution water. Proposed revisions are provided above in Section I.E.[[73]]

241 NRC, NUREG/CR-5379, PNL-6560, RM, R9, Nuclear Plant Service Water System Aging Degradation Assessment, Phase I, Vol. 1 (June 1989), at iii.
242 Decommissioning GEIS at 3-12 to -13.
243 *Id.* at 3-12.
244 *Id.*
245 *Id.* at 3-13.
246 *See* 40 C.F.R. § 122.46(a); G. L. c. 21, § 43(7); 314 Code Mass. Regs. § 3.11(8).
247 *See* Decommissioning GEIS at 3-9.
248 *See* FSEIS at 2-22.
249 *See id.* at 2-9.
250 *See* Modification of Authorization to Discharge Under the National Pollutant Discharge Elimination System, Federal Permit No. MA0003557 (Aug. 30, 1994) ("1994 Amended NPDES Permit"), Part I, at 6, 8-12.
251 *See* Draft Permit, Part I.B.3, at 14; *id.*, Part I.F.1.c, at 33; *see also* Fact Sheet at 34.
252 *See* Draft Permit, Part I.F.1.c, at 33; *see also id.*, Part I.B.3, at 14; Fact Sheet at 34.
253 *See* Fact Sheet at 34 (citing telephone discussion with PNPS Senior Environmental Engineer Joe Egan on Dec. 21, 2015).
254 *See* 40 C.F.R. § 124.5(a); G. L. c. 21, § 43(10); 314 Code Mass. Regs. § 3.13(1).
255 *See* Draft Permit, Part I.F.1.c, at 33.
256 *Id.*; *see also id.*, Part I.B.3, at 14.

Response to Comment 4.2:

The Fact Sheet states that PNPS (pre-shutdown) "typically operates a maximum of 4 of the 5 [service water] pumps at a time under most conditions" and that DMR data for the facility reveal a "highest recorded flow for Outfall 010 of 14.5 MGD during the monitoring period." Fact Sheet at 34. Similarly, the comment states: "During PNPS's current electric-generating operations, up to four of the pumps are typically in use at one time, with the fifth kept in reserve." After Entergy's 2015 announcement to shut the facility down, EPA communicated with a representative of PNPS to determine the facility's expected post-shutdown volumetric needs for service water, and was told that the Permittee expected PNPS would use up to two SSW pumps for the majority of the time (average monthly limit of 7.8 MGD) and a maximum of four SSW

[73] There is no "Section I.E" in Entergy's comments. This is probably a reference to Section 1.C of Entergy's comments, which appears in the Agencies' Response to Comments as Comment III.3.3.3 above.

pumps (maximum daily limit of 15.6 MGD). *See* Fact Sheet at 34. Thus, it is not clear why the commenter concludes that "the Draft Permit scrambles this history." The pre-shutdown flow "history" recounted in the comment appears to agree with that in the Fact Sheet, and the post-shutdown flow limits in the Draft Permit for Outfall 010 reflect the flows that PNPS told EPA would meet PNPS' post-shutdown needs. These flows result in a substantial reduction in overall cooling water intake consistent with closed-cycle cooling technology—which is the best performing technology to minimize adverse environmental impact under CWA § 316(b)—and were determined to be the BTA for PNPS.

In any event, in its comment, Entergy expresses concern that, while the "predictions by PNPS personnel that up to four service water pumps may be needed during post-shutdown operations at any given time. . . may be correct," these limits are not based on operational experience during shutdown and should be increased in light of this uncertainty and "the essential nuclear safety functions served by service water." Given that post-shutdown operations are new to PNPS and that service water needs may be difficult to predict with certainty at this time, the Agencies agree that an increase in the SSW flow limits in the Draft Permit is reasonable. PNPS ceased operations as of May 31, 2019, and began transferring the fuel from the reactor shortly thereafter. AR-691 (certifying to NRC that, on June 9, 2019, Entergy permanently removed the fuel from the reactor vessel and placed it in the spent fuel pool). The cooling requirements of the spent fuel pool were likely highest during the summer of 2019, when the spent fuel was first transferred to the pool and residual heat in the fuel was highest. The cooling needs will decrease over time as the fuel rods cool, as there is no other source of heat remaining at the Facility. *See* AR-714 at 3-12. As mentioned in the comment, the NRC has stated that spent fuel is typically removed from the spent fuel pool "after the fuel has cooled for 5 years." *Id*. at 3-13 Moreover, both Entergy and Holtec have filed Post-Shutdown Decommissioning Activities Reports ("PSDAR") with the NRC stating that the transfer of spent fuel from the spent fuel pool is expected to occur before then, with Entergy estimating that it would "be complete by mid-year 2022," Entergy PSDAR at 11 (Nov. 16, 2018) (AR-692), and Holtec estimating that it would occur in 2021, Holtec PSDAR at 17 (Nov. 16, 2018) (AR-696).

In the comment, Entergy requests that the maximum daily flow of 15.6 MGD proposed in the Draft Permit be increased to 19.4 MGD. A maximum daily flow limit of 19.4 MGD will still achieve an overall flow reduction commensurate with closed-cycle cooling, and the increase from the proposed limit in the Draft Permit is relatively small compared to the overall flow reduction achieved by reducing the flow at the circulating water pumps. Because PNPS will still achieve a 96% reduction in flow during the post-shutdown operation of the circulating water pumps, and because, if necessary, the duration of operation of all five salt service water pumps is likely to be relatively short-lived[74] and reflects potential nuclear safety needs for the spent fuel pool that were not well understood during development of the Draft Permit and remain difficult for the permittee to predict with certainty, the Final Permit establishes a post-shutdown, maximum daily flow limit of 19.4 MGD for the salt service water pumps at Outfall 010 (equivalent to five pumps operating).

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[74] *See* AR-692 at 22; Letter from Louise Lund, NRC, to Brian Sullivan, Entergy (July 5, 2019) (noting that "within a few months following permanent shutdown of the reactor, the decay heat levels present in the pool become very low").

In the comment, Entergy also requests that the average monthly flow of 7.8 MGD proposed in the Draft Permit be increased to 15.6 MGD, which represents operation of 4 (rather than 2) of the 5 salt service water pumps. According to the comment, during pre-shutdown operations "up to four of the pumps are typically in use at one time, with the fifth kept in reserve." The comment also states that pre-shutdown service water usage, while authorized up to 19.4 MGD, has "typically involved lower flows." *See also* AR-321 at 2-9. DMR data from 2000 through 2018 bear this out—indicating that average monthly flows at Outfall 010 did not exceed 15.6 MGD. Thus, the comment requests an increase in the post-shutdown flow limits that were in the Draft Permit similar to use during normal pre-shutdown operations. The Agencies find that the requested increase in the average monthly limit from 7.8 MGD to 15.6 MGD is reasonable, for the same reasons given above for the maximum daily limit. In a letter to EPA sent May 20, 2019, well after the public comment period had ended, however, Entergy requested that the average monthly flow limit at Outfall 010 be increased even further—to 19.4 MGD (equivalent to operation of all 5 salt service water pumps and higher than average monthly flows seen during normal pre-shutdown operations). *See* AR-687. The Agencies note, however, that in November 2018, Entergy filed the above-referenced PSDAR with NRC, which states in relevant part that, "after the plant is shut down and defueled, the amount of water used by the service water system *will be much less than during normal operation of the plant*." AR-692 at 22 (emphasis added); *see also* AR-696 at 21 ("The amount of water used by the service water system after shutdown will also be reduced."). As explained above, "normal" operation of the plant was up to four service water pumps in operation, and PNPS has now shut down and defueled. The higher average monthly limit requested in the untimely comment letter, therefore, appears to contradict the statement noted above that Entergy made to NRC in its PSDAR (and the similar statement Holtec made in its PSDAR). Entergy's late comment letter neither acknowledges these earlier statements nor clearly explains why PNPS requires a higher average monthly flow limit than Entergy requested in its timely comments on the Draft Permit.[75] On August 8, 2019, EPA asked a representative for PNPS to explain the apparent contradiction between the statements to NRC and Entergy's untimely request to EPA, AR-723, but the representative responded on September 19, 2019, by simply repeating verbatim the May 20, 2019, request, without addressing the apparent contradiction, AR-756. On September 25th, EPA contacted the PNPS representative to notify him that his September 19th response did not address the apparent contradiction in any way and once more asked the PNPS representative to reconcile the May 20th request with the PSDARs, AR-760. On October 3, 2019, during a phone call with EPA, the PNPS representative again merely reiterated the May 20th request without offering any explanation. AR-757. Based on Entergy's contradictory statement to NRC in the November 2018 PSDAR and Entergy's failure to clarify the apparent contradiction when expressly given several opportunities to explain why the higher limit is nonetheless necessary, we cannot reasonably conclude based on the record that Entergy has justified its late request for an average monthly flow limit of 19.4 MGD. The Agencies recognize that Entergy's statement in the PSDAR (and Holtec's similar statement in its PSDAR) that, after defueling, service water use will *decrease* also does not completely align with Entergy's request in its timely comments for limits consistent with previous levels associated with normal operations (*i.e.*, the limits do not reflect a decrease, which Entergy and

[75] To the extent Entergy is asserting in the May 2019 letter that an average monthly limit lower than 19.4 MGD "runs afoul of NRC mandates," it is not clear from the record why, if that were the case, Entergy would tell the NRC that, once defueled, the plant's service water use would decrease. We are not aware that NRC objected to this statement in Entergy's PSDAR, and the May 2019 letter provides no explanation for any such assertion.

Holtec separately report in their PSDARs). Neither PSDAR, however, quantifies the expected decrease and, unfortunately, representatives for the facility did not provide additional explanation. DMRs submitted since the shutdown report that, at least initially, maximum daily and average monthly flows have decreased, which supports statements that the salt service cooling water use will decline after shutdown. The Agencies acknowledge, however, that there may still be uncertainty associated with exactly how much, and how consistent, a decrease to expect. Consequently, the Agencies have conservatively selected a post-shutdown, average monthly flow limit in the Final Permit of 15.6 MGD for the salt service water pumps at Outfall 010 (four pumps operating) in the interest of nuclear safety and for all the other reasons explained herein.

In its comment and in its 2019 Letter, Entergy recommends that the Agencies allow PNPS to operate with higher service water flow limits than those proposed in the Draft Permit for up to two years following shutdown, at the end of which period it may propose to modify the permit to align the monthly averages to reflect PNPS's actual post-shutdown experience. The Agencies and the Permittee may discuss modifying the permit to impose more stringent flow limits for Outfall 010 based on new information from the Permittee or the Agencies' review of flow data over the next two years of post-shutdown operations to align the flow limitations with actual operating data. *See* 40 C.F.R. § 122.62.

EPA disagrees with Entergy's statements that there has been no demonstrable adverse impact to aquatic species in the vicinity of the Station attributable to operation of the CWIS and that PNPS's current and historic water withdrawals have been sufficient to assure the protection of the aquatic ecosystem. In fact, EPA maintains that the withdrawal of seawater through the CWIS when PNPS was operating resulted in the impingement and entrainment of billions of aquatic organisms each year, which is an adverse environmental impact. *See also* Response to Entergy's Comment 2.1. However, even with a moderate increase in SSW flows, the Final Permit generally maintains a flow reduction from 324,500 gallons per minute (gpm) at the circulating water and 13,500 gpm at the SSW pumps to a maximum flow of 13,500 gpm at the SSW pumps (and average monthly rate of 10,800 gpm), with an additional limitation to operate the circulating water pumps no more than 48 hours in a single calendar month. On a monthly basis, PNPS will achieve greater than a 92% reduction in flow, which is commensurate with the projected flow reduction that would be achieved with closed-cycle cooling.[76] In other words, by ceasing generation of electricity in PNPS as of June 1, 2019, the facility achieved flow reductions commensurate with the best performing technology for minimizing impingement and entrainment. This conclusion is also consistent with the determination of BTA made in the Draft Permit and, as such, the moderate increase in permitted service water withdrawals, had it been proposed in the Draft Permit, would not have altered the BTA determination. Further, the continued cooling water withdrawals of seawater via the SSW pumps will cease when the spent fuel is transferred to dry cask storage, which is anticipated to occur within 5 years from shutdown (*i.e.*, in 2nd quarter of 2024). At that time, all cooling water withdrawals, and associated impingement and entrainment, at PNPS will be eliminated.

[76] EPA understands that the seawater intake via the circulating water pump is not for cooling purposes; however, for the purposes of calculating the *actual intake volume* under the Final Rule, EPA includes all seawater withdrawals. See 40 C.F.R. § 125.92(a) and Response to Entergy's Comment 4.1, above.

Entergy also recommends revising the language at Part I.F.1.c the Draft Permit ("shall … [c]ease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate") to clarify the average monthly limits that apply to the circulating water and salt service water. The limitation for operation of the circulating water pump is based on hours of operation, rather than flow. For this reason, EPA has revised the permit to replace an average monthly flow limit at Outfall 001 with a limit on hours of pump operation. The average monthly flow limits for both Outfalls have been revised to require reporting only. Part I.A.1 of the Final Permit requires the Permittee to report the average monthly flow and the number of hours of operation for the circulating water at Outfall 001, and Part I.A.3 of the Final Permit requires the Permittee to report the average monthly flow at Outfall 010. Part I.C.4 of the Final Permit limits the operation of the circulating water pump to no more than 48 hours in a calendar month. As Entergy notes, the service water is for cooling the spent fuel and to ensure nuclear safety, while the additional seawater withdrawals via the circulating water pump are to support other functions (e.g., dilution of the radiological waste disposal system and fire protection) and will not be used for cooling water for the main condenser. As of June 9, 2019, PNPS permanently shut down the reactor and removed the fuel rods, thereby eliminating the need for condenser cooling. *See* AR-691. Consequently, Part I.C of the Final Permit eliminates the phrase "cease cooling water withdrawals for the main condenser."

5.0 The Final Permit's Thermal Limitations And Authorizations For Backwashing Must Be Revised

5.1 The Draft Permit's Authorization Of The Use Of "Thermal" And "Non-Thermal" Backwash Requires Revision

Parts I.A.2 and I.B.2 of the Draft Permit expands the current permit's regulation of "thermal backwashes" to regulate so-called "non-thermal backwashes" as well, both before and after shutdown.[257] "Thermal backwash" refers to a process used to control biofouling in the CWIS via non-chemical means: the plant is reduced to 50 percent power, seawater is heated to approximately 105°F, and two of PNPS's traveling screens are rotated in reverse to allow this heated seawater to flow back over the screens and into the intake embayment.[258] Under PNPS's current permit, thermal backwashes are authorized at a frequency of up to 3 hours per day, twice a week, subject to a maximum daily flow of 255 MGD and a maximum daily temperature of 120°F.[259] These thermal backwashes are typically conducted only 3 to 5 times per year, and scheduled so as to be coordinated with the highest tide.[260] Additionally, the current permit allows for additional backwashes ("unscheduled backwashes") as necessary to address "[i]nfrequent, abnormal environmental conditions" that would not be adequately addressed by the regularly scheduled thermal backwashes, *e.g.*, as a result of storm events, and requires that "[t]hese conditions will be described in the subsequent monthly DMR submittal."[261]
As mentioned, the Draft Permit expands the coverage of the discharge limitations provided with respect to Outfall Serial Number 002 to include "thermal and non-thermal backwash."[262] For the pre-shutdown period, both are authorized, provided that they are limited to a duration of no more than 3 hours per day, and a frequency of no more than once per week, with a maximum daily effluent temperature limitation of no more than 115°F and a daily maximum flow limitation of 28 MGD.[263] For the post-shutdown period, thermal backwashing is prohibited, but non-thermal backwashing continues to be authorized, subject to the same frequency and daily maximum flow

limits.[264]

Neither the Draft Permit nor the Fact Sheet, however, defines the term "non-thermal backwash," except insofar as the Fact Sheet states that these are "occasional" and "conducted as necessary," but "which do not use heated water."[265] To the extent that the term "non-thermal backwashes" is meant to refer to the unscheduled backwashes authorized under the current permit to address "[i]nfrequent, abnormal environmental conditions," it is incorrect to describe them as "nonthermal backwashes" that "do not use heated water." Unscheduled backwashes in fact do involve the use of heated seawater to control biofouling, except that the water typically is heated to a level below that normally which is used for regularly scheduled thermal backwashes, *i.e.*, below 105°F.

Entergy therefore recommends that the final Permit delete all references to "non-thermal backwashes" in Part I.A.2 and Part I.B.2. Instead, with respect to Part I.A.2, the final Permit should limit regularly scheduled thermal backwashing as currently specified in the Draft Permit – *i.e.*, with the same frequency, duration, daily maximum flow and daily maximum temperature limitations as currently appear in Part I.B.2 – but restore the current permit's authorization to conduct more frequent, unscheduled backwashing, as necessary to respond to infrequent, abnormal environmental conditions. Such restoration is necessary, because of the continued potential that more frequent backwashing may be necessary due to events, such as storms, that may occur shortly after a regularly scheduled thermal backwash. We therefore suggest revising footnote 4 of Part I.A.2 (addressed to "Discharge Duration") as follows:

> The discharge from a thermal backwash shall not be more frequent than three hours per event and not more frequent than once per week per intake bay. In addition, the time between thermal backwash events shall be at least seven (7) consecutive calendar days. For example, if a thermal backwash occurred on a Tuesday, the next thermal backwash could occur no earlier than on the following Tuesday. **More frequent unscheduled backwashes, at a temperature not to exceed 105°F, shall be authorized to the extent necessary to respond to infrequent, abnormal environmental events.** The permittee shall record the backwash duration for each event and the backwash frequency on a monthly basis. **Such reports shall also describe the conditions necessitating any unscheduled backwashes that were undertaken at a frequency in excess of once per week during the reporting month**~~The permittee shall explain any exceedance of the discharge frequency and/or duration on the DMR cover letter. The frequency and duration of non-thermal backwashes shall be reported in an attachment to the DMR for each month.~~[266]

Importantly, as the Fact Sheet acknowledges, PNPS's current and historic practices with respect to backwashing have been determined by both EPA and DEP to have resulted in no appreciable harm to the balanced indigenous population or community of fish, shellfish and wildlife in and on Cape Cod Bay.[267] Revising Part I.A.2, as suggested above, will not represent any change to

PNPS's historic and current use of backwashing for the purpose of biofouling control in the CWIS, and thus finds ample legal support under both Section 316(a) of the CWA and the MWQS.[268]

With respect to the post-shutdown period, Part I.B.2 of the Draft Permit should be revised, consistent with the procedure that PNPS uses and historically has used for the type of unscheduled backwashes that will be the only type of backwash authorized during this period.[269] Specifically, rather than specifying a "Discharge Duration" of only once per week, Part I.B.2 should include the following footnote, which is modeled on the revised language suggested above for footnote 4 to Part I.A.2:

> The discharge from a backwash shall not be more frequent than once per week per intake bay. In addition, the time between scheduled backwash events shall be at least seven (7) consecutive calendar days. For example, if a scheduled backwash occurred on a Tuesday, the next scheduled backwash could occur no earlier than on the following Tuesday. More frequent unscheduled backwashes shall be authorized to the extent necessary to respond to infrequent, abnormal environmental events. The permittee shall record the backwash duration for each event and the backwash frequency on a monthly basis. Such reports shall also describe the conditions necessitating any unscheduled backwashes that were undertaken at a frequency in excess of once per week during the reporting month.

Finally, Part I.B.2.a of the Draft Permit must be revised, consistent with the Comments provided in Section I.A. Specifically, consistent with our comments above in Section I.A, the words "and not later than June 1, 2019" that follow the phrase "beginning on the date following termination of electricity generation" should be deleted.[270]

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257 *See id.*, Part I.A.2, at 5; *id.*, Part I.B.2, at 13; Fact Sheet at 25.
258 *See* FSEIS at 2-11.
259 *See* 1994 Amended NPDES Permit, Part I, at 8.
260 *See* FSEIS at 2-11.
261 1994 Amended NPDES Permit, Part I, at 8.
262 *See* Draft Permit, Part I.A.2, at 5; *id.*, Part I.B.2, at 13; Fact Sheet at 25.
263 *See* Draft Permit, Part I.A.2, at 5.
264 *Id.*, Part I.B.2, at 13.
265 Fact Sheet at 11.
266 *See* Draft Permit, Part I.A.2, at 6 n.4; *see* 1994 Amended NPDES Permit, Part I, at 8.
267 *See* Fact Sheet at 50; *id.*, Attach. C, at 33.
268 *See* 40 C.F.R. § 125.73(a), (c); 314 Code Mass. Regs. § 4.05(4)(a)(2)(c).
269 *See* Draft Permit, Part I.B.2, at 13.
270 *See id.*

Response to Comment 5.1:

In the comment, Entergy requests clarification of the permit conditions for the discharge of screen backwash water via Outfall 002. Regarding the issue of pre-shutdown backwashes, Part

I.A.2, footnote 4 has been eliminated from the Final Permit because PNPS ceased electricity production as of May 31, 2019. As a result, and as explained in the Introduction and elsewhere in this Responses to Comment document, the conditions and limitations of the Draft Permit that would have applied prior to shutdown at PNPS have been eliminated from the Final Permit. The comment also requests that Part I.B.2.a be revised to eliminate the phrases “and not later than June 1, 2019” that follows the phrase “beginning on the date following termination of electricity generation.” Both quoted phrases have been deleted from the Final Permit because PNPS has ceased generating electricity. *See* Response to Comment III.3.1.

Turning to post-shutdown backwash conditions, EPA drafted the permit with the understanding that non-thermal or unheated (that is, ambient temperature) backwashes will be necessary. This is an excerpt from a 10/28/15 email from Joe Egan (Pilgrim) to George Papadopoulos (EPA):

> While there will be no thermal backwashes (post-shutdown), it is possible that some regular (unheated) backwashes of the Circ. Water system will be necessary.

AR-521. Therefore, while drafting the permit, it was EPA’s understanding that “non-thermal” discharges did not involve heated water.

Although the comment suggests that heated backwashes will continue post-shutdown, in a 5/17/19 phone conversation, Mr. Egan confirmed that EPA’s original understanding was correct and that only unheated backwashes would occur. *See* AR-715. Mr. Egan also explained that the Facility will no longer be capable of conducting a thermal backwash, because intake water cannot be heated once the reactor has shut down. Therefore, only occasional, unheated backwashes are authorized and would occur in order to assure that the intake of cooling water for the spent fuel pool via the SSW cooling system is not impeded by any buildup of debris or aquatic organisms. For the purposes of this permit, only unheated or non-thermal backwashes can occur and are authorized post-shutdown since the Facility is no longer capable of heating the intake water which is then run back through each of the intake bays as necessary.

The comment requests that the Final Permit authorize more frequent, unscheduled backwashing, as necessary to respond to infrequent, abnormal environmental conditions similar to the 1991 Permit. According to Entergy, backwashing more than once per week may be necessary, for example, to respond to a storm that occurs during the same week as a regularly scheduled backwash. Post-shutdown backwashing will use ambient temperature water and will not have a thermal impact on the receiving water. In addition, there is a potential that, if the Permittee is unable to conduct a backwash when a large amount of debris is occluding the screen (such as after a storm), the traveling screens could be damaged or the cooling water flow necessary to cool the spent fuel pool could be disrupted. Backwashing the screens in this event will also ensure that a protective through-screen velocity is maintained. For these reasons, the Final Permit includes a condition in Part I.A.2 (footnote 4) authorizing the backwash frequency to exceed once per week in order to respond to infrequent, abnormal events.

5.2 The Final Permit's Thermal Discharge Limits With Respect To Post-Shutdown Service Water Discharges And Pre-Shutdown Circulating Water Discharges Must Be Revised

Prior to PNPS's anticipated shutdown, the Draft Permit maintains the thermal limitations for circulating water discharges contained in PNPS's current NPDES permit, which allows PNPS to discharge heated effluent with a maximum daily temperature of 102°F and a temperature rise or "delta T" (as measured by the difference between the intake and the discharge water temperatures) of up to 32°F.[271] Consistent with this current NPDES permit, there are no thermal limitations on service water discharges prior to shutdown.[272]

After PNPS's anticipated shutdown, however, the Draft Permit proposes more restrictive limits for service water discharges that may be problematic for PNPS's post-shutdown operations. As to circulating water, the Draft Permit reduces the effluent temperature limits to an average monthly cap of 80°F, with a maximum daily limit of 85°F and a delta T of 3°F.[273] Entergy expects that these limitations should be manageable under PNPS's post-shutdown regime, provided that reduced flows throughout the system do not contribute to increased effluent temperatures and delta Ts.

With respect to service water discharges, the Draft Permit conditions are not sufficiently supported in at least two respects. First, it is unclear whether an 85°F maximum daily cap on effluent temperature for service water can reasonably support the use of service water for necessary nuclear-safety functions post-shutdown, particularly given that this period will represent a greatly reduced flow dynamic compared to PNPS's historic electric-generating operations. Effluent temperature is a function of many variables, including flow, which in turn is a function of the number of service water pumps available to generate that flow. As discussed above in Section II.B, the Draft Permit proposes to limit the number of service water pumps available for PNPS's use compared to historic operations, while at the same time imposing thermal limits on service water discharge for the first time in the facility's history. Such a regime may present a needlessly challenging dynamic for Pilgrim. The Draft Permit's limitations also need to be set in a manner that properly accounts for the fact that PNPS's instruments have inherent limitations on their accuracy, in that they can accurately measure temperature only within 1°F of the actual water temperature.

Further, there is substantial uncertainty concerning what the typical effluent temperature of a service water discharge alone likely will be. Historically separate temperature monitoring has not been required for the service water discharge at PNPS, in recognition of the fact that this discharge has almost always been commingled with, and heavily diluted by, the much larger circulating water discharge.[274] As a result, there is only limited temperature monitoring data that reflects that reflects the discharge associated with service water alone: such data would be from periods when PNPS has taken an outage, which tend to be highly infrequent, typically occurring on a 24-month cycle.[275] Accordingly, the maximum daily temperature limit for post-shutdown service water discharges must be revised; given the paucity of useful historic temperature monitoring data for service water alone that can serve as a baseline, Entergy suggests a limit of 90°F, subject to reduction upon review after a year of post-shutdown operations.

The 3°F delta T limitation for service water is as, if not more, unsupported. As a matter of physics, the temperature rise or delta T for a fluid heating system is, in large part, a function of volumetric flow. More specifically, delta T (or *ΔT*) is a function of both the volumetric flow rate (*Q*) and the heat flow or heat rejection rate (*H*), as represented by the following equation:

$$\Delta T = \frac{H}{QC_p\rho}$$

where C_p and ρ represent the specific heat capacity and density of the fluid (*i.e.*, water), values that are essentially constant. As can be seen from the equation above, delta T and volumetric flow have an inverse relationship such that, all else equal, the delta T will always be greater if the flow rate is less. Yet the Draft Permit proposes to impose the same delta T limitation on service water discharges as it does on circulating water discharges, even though the allowed volumetric flow of circulating water discharges post-shutdown is more than 15 times greater (244 million gallons per day versus only 15.6 million gallons per day).[276]

The only basis cited in the Fact Sheet for imposing the same thermal limitations on two discharges that are so dissimilar is a single e-mail message from PNPS personnel stating that PNPS expects the delta T of an effluent that EPA "assumed" to be service water discharge likely "will be up to 3°F above the intake temperature, presumably due to [the] fact that even after the shutdown there will be some ongoing equipment cooling discharges associated with the [service water] system."[277] The Fact Sheet admits, however, that service water, as opposed to circulating water, is "not specified" in the e-mail being relied upon.[278] Even assuming that the 3°F applies to service water, the Fact Sheet omits the fact that PNPS has also stated in conversations with EPA that (1) 3°F represents the low end of an expected range of 3°F to 5°F for delta T post-shutdown, and (2) the range is necessarily uncertain given the paucity of historic temperature monitoring data reflecting only service water discharges, as discussed above.

The Fact Sheet makes no attempt to show that the 3°F delta T for post-shutdown service water discharges is technically grounded or otherwise rational. This is particularly true given the Fact Sheet's acknowledgement that "EPA concludes … that a continued § 316(a) variance for temperature allowing a delta T of 32°F during normal (pre-shutdown) operations will 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."[279] The Fact Sheet points to no basis for concluding that the much more stringent 3°F limit for service water is necessary post-shutdown, given that the health of the biota already is "assured" by a 32°F limit.[280] Accordingly, the 3°F delta T limit for post-shutdown service water discharges must be revised; given the paucity of useful historic temperature monitoring data for service water alone that can serve as a baseline, Entergy suggests a limit of 10°F, subject to reduction upon review after a year of post-shutdown operations.

Finally, the Draft Permit should be modified in one final respect: for the remainder of PNPS's electricity-generating operations, *i.e.*, pre-shutdown, Part I.C.11 carries forward conditions limiting the rate of change in delta T for circulating water discharges (Outfall 001), which also are found in the 1994 Amended NPDES Permit, but which never have had any application to PNPS's generating activities and still do not. Specifically, Part I.C.11.a provides that the rate of change in delta T shall not exceed "[a] 3°F rise or fall in temperature for any sixty (60) minute period during normal steady state operation," while Part I.C.11.b limits the rate of change in delta T to 10°F over the same period "during normal load cycling."[281]

Under "normal steady state operations," however, there are no circumstances in which the delta T for the circulating water discharge would rise or fall by more than 3°F in an hour. Such changes in delta T can be reasonably expected only under special circumstances, such as a scheduled refueling outage, *i.e.*, *not* during "normal steady state operations." "[N]ormal load cycling" is even more confusing. As a nuclear power plant, PNPS is a "baseload" facility, meaning that it normally generates and supplies electricity to the grid on a constant basis, with the only exceptions being scheduled refueling outages.[282] It therefore does not "cycle" its load – *i.e.*, increase or decrease the amount of electricity supplied in response to changes in demand – as, say, a peaking unit does. While the conditions carried forward in Part I.C.11 of the Draft Permit have no possible application to PNPS's operations, they have recently served to breed confusion concerning the scope of PNPS's obligations under its current 1994 Amended NPDES Permit.[283] In the interest of avoiding such confusion and promoting clarity, therefore, Entergy recommends the deletion of Part I.C.11 of the Draft Permit.

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271 *Compare* Draft Permit, Part I.A.1, at 3 *with* 1994 Amended NPDES Permit, Part I, at 6.
272 *Compare* Draft Permit, Part I.A.4, at 9 *with* 1994 Amended NPDES Permit, Part I, at 10.
273 *See* Draft Permit, Part I.B.1, at 11.
274 *See* 1994 Amended NPDES Permit, Part I, at 10.
275 *See* FSEIS at 2-13, 2-100.
276 *Compare id.* at 11 *with id.*, Part. I.B.3, at 14.
277 *See* Fact Sheet at 23-24 (citing e-mail from Joe Egan of PNPS dated Oct. 28, 2015).
278 *Id.* at 24.
279 Fact Sheet at 24; *see also generally* Fact Sheet, Attach. C (presenting DEP's species-by-species analysis of effects of pre-shutdown thermal discharge on marine organisms, and ultimately concluding that effects are either *de minimis* or otherwise do not warrant alteration of the discharge).
280 *See* 33 U.S.C. § 1326(a).
281 Draft Permit, Part I.C.11, at 31; *see also* 1994 Amended NPDES Permit, Part I, at 3.
282 *See, e.g.*, FSEIS at 8-7 n.(d), 8-44.
283 *See* Letter from Elise N. Zoli, on behalf of PNPS, to Margaret Sheehan, Ecolaw (Dec. 7, 2012), at 13.

Response to Comments 5.2:

The comment identifies issues with effluent limitations and conditions from the Draft Permit that apply prior to and following the cessation of power generation at PNPS (the "pre-shutdown" and "post-shutdown" limits, respectively). The Agencies have reviewed and considered comments on both the pre- and post-shutdown limits. However, as explained in the Introduction to this Responses to Comments, PNPS ceased operating as of May 31, 2019. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the facility prior to the shutdown date, including the condition related to the rate of temperature change in Part I.C.11, are no longer applicable. Consequently, the pre-shutdown effluent limitations and conditions identified in the comment have been eliminated from Final Permit. As such, the Agencies do not provide further responses to the comments specific to the pre-shutdown limits that were removed from the Final Permit except where a concern or issue about the pre-shutdown limit would also be relevant to the post-shutdown limit.

The comment indicates that the proposed, post-shutdown limits for service water discharges may be problematic for PNPS's post-shutdown operations, although Entergy indicates that it expects that the temperature limits (including a monthly average limit of 80°F, maximum daily limit of 85°F, and a delta T of 3°F) "should be manageable under PNPS's post-shutdown regime, provided that reduced flows throughout the system do not contribute to increased effluent temperatures and delta Ts." In other words, Entergy suggests that it could potentially meet the more restrictive temperature limits proposed in the Draft Permit, but, given the scarcity of temperature data on the existing salt service water operation and Entergy's uncertainty about the post-shutdown cooling needs of the spent fuel pool, Entergy requests moderate increases in the maximum daily temperature limit (from 85°F to 90°F) and delta T (from 3°F to 10°F) at Outfall 010.

According to Entergy, it is unclear whether an 85°F maximum daily limit for service water can reasonably support the use of service water for necessary nuclear-safety functions post-shutdown, particularly given that this period will represent a greatly reduced flow dynamic compared to PNPS's historic electric-generating operations. When the Facility was operating, the circulating water pumps provided cooling water for the condenser at a flow of 447 MGD and delta T of 32°F. Following shutdown of the reactor, the salt service pumps will operate with a maximum daily flow of 19.4 MGD. EPA acknowledges Entergy's considerable uncertainty regarding the anticipated flow and temperature requirements for cooling the spent fuel pool, as this represents an entirely new operating regime as compared to operations under the current permit.[77] In addition, the cooling water from the salt service water pumps serves a critical function to maintain nuclear safety. Finally, the cooling requirements at PNPS will be at a maximum during the first year after the reactor is shutdown, which occurred on May 31, 2019, and the cooling needs will decrease as the residual heat in the fuel rods decay. In other words, the heat load to Cape Cod Bay from the remaining thermal effluent at Outfall 010 will decrease over time.

As discussed in Response to Comment III.4.2., the Draft Permit post-shutdown temperature limits at Outfall 010 reflect the flows that Entergy indicated to EPA during development of the permit would meet PNPS' post-shutdown needs. *See* AR-519 and Fact Sheet at 36. In its comments on the Draft Permit, Entergy has requested higher temperature limits at Outfall 010 given that it is uncertain of the actual thermal load and to ensure that the Permittee is authorized to operate with sufficient cooling water flow to meet the nuclear safety demands of cooling the

[77] In its comment, Entergy asserts that the Draft Permit imposes thermal limits at Outfall 010 "for the first time in history." The Draft Permit imposes thermal limits at Outfall 010 only *after* cessation of electrical generating activities. Prior to shutdown, the cooling water at Outfall 010, which included flows from the turbine building cooling water and the reactor building cooling water systems, combined with the condenser cooling water flow in the discharge canal upstream of the monitoring location for Outfall 001. The volume of effluent at 010 was substantially less than the volume at Outfall 001 and, as such, the overall contribution of heated effluent to Cape Cod Bay from Outfall 010 was much less. The temperature limits at Outfall 001, which were recorded after combining with other wastestreams, including heated effluent from Outfall 010, were sufficient to protect Cape Cod Bay. Post-shutdown, effluent at Outfall 010 represents the non-contact cooling water flow from the spent fuel pool, which according to Entergy is the sole remaining source of heated effluent at the Facility. The circulating water effluent from Outfall 001 operates intermittently and has no source of heat. Therefore, it is appropriate to regulate the temperature at Outfall 010 to reflect an entirely new operating scheme in which the thermal effluent to Cape Cod Bay originates at this outfall.

spent fuel pool. Under the current permit limits, which reflect operating conditions for generating electricity at PNPS, the total heat load to Cape Cod Bay from the circulating water pumps is about 14,336 mmBTU/day. EPA and MassDEP determined that the proposed pre-shutdown delta-T limit of 32°F, upon which the calculation is based, is protective of the balanced indigenous population. *See* Fact Sheet Attachments B and C. After shutdown and under the Draft Permit temperature and flow limits for Outfall 010 (maximum daily flow of 15.6 MGD and delta-T of 3°F), the heat load to Cape Cod Bay is decreased by 99.7% to 46.8 mmBTU/day. The limits proposed by Entergy in its comments on the Draft Permit (maximum daily flow of 19.4 MGD and delta-T of 10°F) still result in a 98.6% decrease (to 194 mmBTU/day) in the heat load to Cape Cod Bay.

The post-shutdown Draft Permit temperature limits at Outfall 010 were based on communications with staff at PNPS about the anticipated cooling requirements of the spent fuel pool. Upon further analysis of the likely post-shutdown cooling needs, and considering the relatively high uncertainty of post-shutdown operations, Entergy has requested new thermal limits that are slightly less stringent than the Draft Permit's proposed limits, but which are still far more stringent than the current permit and Draft Permit's pre-shutdown limits, which were based on a § 316(a) variance and determined to be sufficiently protective of the balanced indigenous population. Entergy's proposed limits will still achieve a heat load reduction greater than 98%. Because the cooling requirements represent a critical nuclear safety element, and given Entergy's professed uncertainty of the actual cooling requirements of the spent fuel pool, Part I.A.3 of the Final Permit establishes a maximum daily temperature limit of 90°F, an average monthly temperature of 80°F, and maximum delta-T of 10°F at Outfall 010. These limits, which still represent a substantial decrease in the overall heat load to Cape Cod Bay, will ensure protection of the balanced, indigenous population.

6.0 The Draft Permit's Proposed Changes To PNPS's Effluent Discharge Concentration Limits For Chlorine And Boron Lack Technical Support, Interfere With NRC Mandates, And Must Be Revised

With respect to PNPS's pre- and post-shutdown operations, the Draft Permit proposes limits on the allowable concentrations of certain contaminants – in particular chlorine and boron – in effluent discharged via Outfalls 001 (circulating water), 010 (service water), 011 (internal outfall for demineralizer reject water, station heating and service water systems), and 014 (various process and wastewaters from the waste neutralization sump). As detailed below, the pre- and post-shutdown limits imposed with respect to the use of chlorine in circulating water and/or service water are technically unsupported, have the potential to create inconsistency with NRC nuclear-safety mandates, and therefore must be revised. With respect to boron, the limits imposed by the Draft Permit appear to be manageable, but the Draft Permit's characterization of the relevant discharges for Outfalls 011 and 014 must be clarified to be consistent with the Water Flow Diagram provided in the Fact Sheet, and the monitoring requirements specified in the Draft Permit for boron must be revised to make them internally consistent with the sampling requirements specified in footnote 6 to Parts I.C.4 and I.C.5 of the Draft Permit.

6.1 Legal Framework

In general, NPDES permit limits are based on applicable technology- and/or water-quality based requirements.[284] More specifically, with respect to technology-based effluent limitations, EPA has promulgated national effluent guideline limitations ("ELGs") applicable to various industrial categories, which establish such limits for various pollutant discharges from individual facilities within the relevant industrial category.[285] In the absence of an applicable ELG, technology-based limits are established case-by-case on the basis of EPA's best professional judgment, considering the factors identified in EPA's regulations as being relevant.[286] In addition to technology-based limits, more stringent water-quality-based limits also may be imposed to the extent necessary to ensure that the receiving waterbody will meet applicable water quality standards, including the MWQS, which are allowed to be more stringent than the national water quality standards that EPA has set under the CWA.[287] Finally, the "antibacksliding" provisions of the CWA provide that a NPDES permit generally may not be renewed, reissued or modified with limitations or conditions less stringent than those contained in the previous permit unless certain conditions are met.[288]

284 *See* 33 U.S.C. § 1311(b); 40 C.F.R. § 125.3.
285 *See* 40 C.F.R. §§ 122.43(a) & (b), 122.44(a)(1).
286 *See* 40 C.F.R. § 125.3(c)(3), (d).
287 *See* 33 U.S.C. § 1311(b)(1)(C).
288 *See* 33 U.S.C. §§ 1313(d)(4), 1342(o); 40 C.F.R. § 122.44(*l*).

Response to Comments 6.0 and 6.1:

Comment 6.0 generally summarizes Entergy's more detailed comments in Comment 6.2 that the effluent limits for chlorine (i.e., total residual oxidants in seawater) in the permit are technically unsupported and potentially inconsistent with NRC requirements. The Agencies respond to these comments in Responses to Comments 6.2.1 and 6.2.2. In Comment 6.0, Entergy also comments that the boron limits in the permit "appear to be manageable" but summarizes what Entergy views as inconsistencies with other information or requirements in the permit. The Agencies respond in detail to these comments in Response to Comment 6.3.

Finally, Comment 6.1 briefly explains how permit effluent limits may be either technology-based or water quality-based and the general process for deriving them. The comment also mentions the provisions at CWA §§ 402(o) and 303(d) and in federal regulations at 40 C.F.R. § 122.44(*l*) related to anti-backsliding. The Agencies generally agree with the characterizations in Comment 6.1. Technology-based treatment requirements represent the minimum level of control that must be imposed under CWA §§ 301(b) and 402. The Act and its implementing regulations establish criteria and standards for their imposition in permits, including the application of EPA promulgated Effluent Limitation Guidelines (ELGs) by category or subcategory. In the absence of ELGs, the permit writer is authorized under CWA § 402(a)(1)(B) to establish effluent limitations on a case-by-case basis using best professional judgment (BPJ). The CWA and implementing regulations further require that permit limits and conditions based on water quality considerations be established when less stringent technology-based requirements would interfere with the attainment or maintenance of water quality standards in the receiving water, including designated uses. *See* CWA § 301(b)(1)(C); 40 C.F.R. §§ 122.44(d)(1), 122.44(d)(5), 125.94(i).

The Act's anti-backsliding requirements prohibit a permit from being renewed, reissued or modified to include less stringent limitations or conditions than those contained in a previous permit except in compliance with one of the specified exceptions to those requirements. *See* CWA §§ 402(o), 303(d)(4); 40 C.F.R. § 122.44(*l*). Anti-backsliding provisions apply to effluent limits based on technology, water quality, and/or state certification requirements.

6.2 Chlorine

The Draft Permit's limitations with respect to chlorine in PNPS's pre-shutdown circulating water discharge and post-shutdown service water discharge require revision, as explained below. These limitations are particularly inappropriate considering the role that chlorination plays in nuclear operations, particularly with respect to the service water system. As explained above, the service water system at PNPS, as at all nuclear power plants, is a vital system necessary to ensure nuclear and radiological safety, and remains so even after the facility shuts down and begins the decommissioning process.[289] Because of its nuclear-safety function, ensuring that the service water system and all of its components are kept properly maintained and functioning is likewise of critical importance. To that end, "[t]he service water system is continuously chlorinated in order to control nuisance biological organisms, such as mollusks, barnacles, algae and other organisms, in the service water system,"[290] and continuous chlorination to prevent such biofouling is necessary as long as the service water system continues to withdraw seawater on a regular basis.[291] Historically, such chlorination has been allowed, including under PNPS's current 1994 Amended NPDES Permit, provided that the concentration of chlorine in the service water discharge (represented in the permit as "Total Residual Oxidants" or "TRO") does not exceed an average monthly limit of 0.5 mg/L or a daily maximum of 1.0 mg/L, which then would be diluted by the larger circulating water discharge to a concentration no higher than 0.1 mg/L prior to being discharged to Cape Cod Bay.[292] The service water system also is equipped with diffusers designed to ensure that these limits are not exceeded.[293]

289 *See supra* Section II.B.
290 *See* FSEIS at 2-9.
291 *See* NRC Generic Letter No. 89-13 (July 18, 1989), Enclosure 1, at 1 ("The service water system should be continuously … chlorinated … whenever the potential for a macroscopic biological fouling species exists….").
292 1994 Amended NPDES Permit, Part I, at 2, 10.
293 *See* FSEIS at 2-9.

6.2.1 Pre-Shutdown Limits

Circulating Water

With respect to pre-shutdown chlorine limits for circulating water, the Draft Permit proposes reducing the TRO limits[294] for PNPS's pre-shutdown circulating water usage to a daily maximum of 13 μg/L and an average monthly limit of 7.5 μg/L, on the basis that, "[t]o EPA's knowledge, there has not been any prior hydrodynamic modeling conducted that would provide an estimate of dilution for the discharge from the discharge canal" sufficient to assure that the current TRO limit of 0.1 mg/L is supported.[295]

Entergy respectfully requests that its current permit limit – *i.e.*, a daily and average monthly maximum of 0.1 mg/L – be retained for at least the next two years, *i.e.*, through 2018, as this level of chlorination has been demonstrated to be adequate, in PNPS's operational experience, to control biofouling. The following information supports the continued retention of these TRO limits.

Under the Steam Electric Power Generating ELGs that are applicable to PNPS's pre-shutdown operations, the technology-based TRO limit for an electric-generating facility such as PNPS is 0.2 mg/L.[296] PNPS's current TRO limits for pre-shutdown circulating water usage are half of that, and therefore already more stringent than the applicable technology-based limit.[297] With respect to water-quality based limits, the narrative criteria and designated uses of Cape Cod Bay provide, respectively, that in Cape Cod Bay the concentration of chlorine must not "interfere with the propagation of fish or shellfish, or adversely affect populations of non-mobile or sessile benthic organisms,"[298] must not be "toxic to humans, aquatic life or wildlife,"[299] and must not otherwise compromise the designated use of Cape Cod Bay as "excellent habitat for fish, other aquatic life and wildlife, including their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation."[300] For the reasons detailed above in the "Environmental Context" Section, there is no basis to believe that PNPS's current TRO limits do not already assure compliance with these standards, as continuous investigation and monitoring of the aquatic community of Cape Cod Bay have detected no demonstrable impact on RIS from PNPS's more than four decades of operation, during which time the current TRO limits have continued in place.[301] Further, EPA's and DEP's prior approval of PNPS's current TRO limits necessarily reflects a determination that compliance with those limits are sufficient to comply with MWQS, including narrative criteria and designated uses. Any change of position by the agencies with respect to that determination must therefore be explained, otherwise it constitutes arbitrary and capricious agency action.[302]

The current TRO limits also satisfy the MWQS's numeric water quality criteria for chlorine. As noted above, the MWQS adopt EPA's National Recommended Water Quality Criteria for Aquatic Life,[303] which provide for an acute limit in marine waters of no more than 0.013 mg/L and a chronic limit in marine waters of no more than 0.0075 mg/L.[304] Using the same methodology as EPA and DEP recently used in the renewal of Canal Generating Station's NPDES/MCWA permit, PNPS's existing TRO limit of 0.1 mg/L is "more stringent than any limit that would be derived based on the State of Massachusetts' acute water-quality standard for chlorine in marine water and the dilution provided by the receiving water."[305] As explained in the Canal permit's fact sheet, the necessary stringency of a TRO limit of 0.1 mg/L is supported if the receiving waterbody (here, Cape Cod Bay) can be assured to provide a minimum dilution factor of at least 7.7 (0.1 mg/L divided by 0.013 mg/L).[306] In order for the circulating water effluent of PNPS to be diluted by a factor of 7.7, approximately 5,336 cubic feet per second ("cfs") of dilution flow is needed in Cape Cod Bay near the discharge point, given the circulating water discharge volume of 447 MGD, or 693 cfs (693 cfs * 7.7 = 5,336 cfs).[307]

Volumetric flows in Cape Cod Bay near the discharge point were studied in connection with winter flounder larval transport studies that are relied on by the AEI Report, discussed above in the "Environmental Context" section.[308] In those studies, the volumetric flow across a transect of Cape Cod Bay along the coast near PNPS was estimated, over periods of approximately one month, for the purpose of estimating the transport rate of larvae potentially susceptible to entrainment by the Station.[309] These studies estimated volumetric flows in Cape Cod Bay across the transect defined by the study area that range from 1,141 m^3/s (approximately 40,294 cfs), which appears to be an outlier, to 86,141 m^3/s (over 3 million cfs); the average of all the estimates is 50,636.8 m^3/s (approximately 1.8 million cfs).[310] Even if the dilution flow available to PNPS's circulating water discharge in Cape Cod Bay were only 0.3 percent of the average flows as estimated by these studies, it would still be more than enough to assure achievement of the requisite level of dilution necessary for compliance with the acute marine chlorine standard.[311] Moreover, as was the case for Canal Generating Station, retention of the 2-hour per day limit on chlorination of PNPS's circulating water system during the pre-shutdown period, consistent with the applicable Steam Electric ELGs, is sufficient to ensure that there will be no chronic chlorine exposure to aquatic life, rendering the chronic marine chlorine standard also satisfied.[312]

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[294] TRO is used as the sampling parameter for PNPS's effluent limitations on chlorine, rather than total residual chlorine ("TRC"), because PNPS withdraws and discharges seawater, which naturally contains bromide compounds. *See* 40 C.F.R. § 423.11(a).

[295] *See* Draft Permit, Part I.A.1, at 3; Fact Sheet at 22-23.

[296] *See* 40 C.F.R. § 423.13(b)(1).

[297] *See* 1994 Amended NPDES Permit, Part I, at 2.

[298] 314 Code Mass. Regs. § 4.05(5)(b).

[299] *Id.* § 4.05(5)(e).

[300] *Id.* § 4.05(4)(a).

[301] *See supra*, "Environmental Context."

[302] *See Fox Television Stations, Inc.*, 556 U.S. at 515; *Alliance to Protect Nantucket Sound, Inc. v. Energy Facilities Siting Bd.*, 448 Mass. 45, 56 (2006) (recognizing that "[a] party to a proceeding before a regulatory agency … has a right to expect and obtain reasoned consistency in the agency's decisions" (citation omitted)).

[303] *See* 314 Code Mass. Regs. § 4.05(5)(e).

[304] *See* EPA, *National Recommended Water Quality Criteria – Aquatic Life Criteria Table*, https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table (last visited July 23, 2016).

[305] *See* EPA, Fact Sheet, Draft National Pollutant Discharge Elimination System (NPDES) Permit to Discharge to Waters of the United States, NPDES Permit No. MA0004928 ("Canal Fact Sheet"), at 15.

[306] *Id.* at 16.

[307] *See id.*

[308] *See* AEI Report at 11; Entergy Nuclear Generation Company ("ENGC"), *Study of Winter Flounder Larval Transport in Coastal Cape Cod Bay and Entrainment at Pilgrim Nuclear Power Station* (Spring 2004) ("ENGC (2004)"); ENGC, *Study of Winter Flounder Larval Transport in Coastal Cape Cod Bay and Entrainment at Pilgrim Nuclear Power Station* (Dec. 2002) ("ENGC (2002)").

[309] *See* ENGC (2004), at 2-3 to -5, 4-1 to -3; ENGC (2002), at 2-1 to -6, 4-1 to -9.

[310] ENGC (2004), at 4-3 (Table 4-1); ENGC (2002), at 4-6 (Table 4-1).

[311] *See* Canal Fact Sheet at 16 (supporting acute marine chlorine limit using similar analysis).

[312] *Id.* at 16-17.

Service Water

The current permit allows the service water system to be chlorinated continuously, provided that TRO concentration does not exceed a daily maximum of 1.00 mg/L or a monthly average of 0.5 mg/L prior to mixing with any other streams.[313] The propriety of these limits, which the Draft Permit has retained, is fully supported.[314]

With respect to technology-based limitations, the current daily TRO limit for service water of 1.0 mg/L is nominally higher than the 0.2 mg/L daily maximum limit provided for under the ELGs, and the duration of chlorination exceeds the ELG limit of up to 2 hours per day.[315] As the current permit recognizes however, the TRO concentration of PNPS's service water discharge typically meets or is more stringent than the ELG daily maximum limit due to dilution flow provided by the much larger circulating water discharge during PNPS's normal electricity-generating operations: in order to ensure dilution of TRO from 1.0 mg/L to 0.1 mg/L, a minimum dilution factor of 10 is needed, and given that circulating water discharge flow volume of 447 MGD is more than 23 times that of the maximum service water discharge volume of 19.4 MGD (assuming all five pumps operating), that level of dilution is assured provided that circulating water is flowing. The only circumstances in which the necessary level of dilution may not be assured is during reactor shutdowns, when circulating water flow is absent. As the NRC has provided, however, chlorination of the service water system remains necessary during those times for nuclear-safety reasons, which EPA and DEP lack authority to countermand.[316]

With respect to water-quality based limits, the same reasons detailed above support the retention of PNPS's current TRO limits for service water as they do for circulating water. EPA and DEP's prior determination that achievement of these limits (including the maximum limit prior to release into Cape Cod Bay of 0.1 mg/L for all discharges) suffices to ensure compliance with the MWQS, combined with the demonstrated absence of environmental harm, establishes that narrative water quality criteria and designated uses of Cape Cod Bay are protected. Further, with respect to numeric criteria, the minimum amount of dilution flow needed to assure a dilution factor of at least 7.7 for the combined maximum circulating and service water discharge volumes of 466.4 MGD is 866.6 cfs, still less than 2 percent of average Cape Cod Bay flows past the station as estimated by prior studies.[317] Thus, the existence of the requisite amount of dilution flow in Cape Cod Bay for the combined discharge is reasonably assured and retention of the current permit's TRO limits for service water prior to shutdown is supported.

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[313] *See* 1994 Amended NPDES Permit, Part I, at 2.
[314] *See* Fact Sheet at 35.
[315] 40 C.F.R. § 423.13(b).
[316] *See* NRC Generic Letter No. 89-13 (July 18, 1989), Enclosure 1, at 1; *English*, 496 U.S. at 84-85.
[317] *See supra*, Section IV.B.1.a.

Response to Comment 6.2.1:

Since PNPS ceased electricity-generating operations on May 31, 2019, all pre-shutdown limits, including the maximum daily and average monthly total residual oxidants (TRO) limits at Outfall 001, have been eliminated from the Final Permit. Because the permit conditions and limits at issue in the comment are not included in the Final Permit, EPA has not addressed these comments on the Draft Permit, except where a comment above is also relevant to the post-shutdown limits addressed in Response to Comment 6.2.2, below.

6.2.2 Post-Shutdown Limits

Circulating Water

The Draft Permit proposes prohibiting chlorination of the circulating water system after PNPS shuts down.[318] Entergy does not object to this change, as it expects continued chlorination of this system will not be necessary during the post-shutdown period, when one pump will be used only on an intermittent basis for providing radiological waste dilution water.[319] Thus, there will be no chlorine discharge associated with Outfall 001 post-shutdown.

Service Water

With respect to the post-shutdown period, the Draft Permit proposes a significant reduction in the allowable concentration of chlorine in PNPS's service water discharge, limiting TRO to an average monthly concentration limit of only 7.5 μg/L and a daily maximum concentration of only 13 μg/L.[320] Under PNPS's current permit, the service water system may be continuously chlorinated such that TRO does not exceed a daily maximum limit of 1.0 mg/L and an average monthly limit of 0.5 mg/L prior to mixing with any other streams.[321] During PNPS's electricity-generating operations, these streams would include the dominant circulating water discharge, which would be sufficient to dilute the concentration of all TRO being discharged to Cape Cod Bay to a concentration at or below 0.1 mg/L, as detailed above.[322] The Fact Sheet's explanation for the Draft Permit's proposed reduction is that the termination of most circulating water discharge via Outfall 001 may mean that compliance with the current permit limits is no longer assured, and so the Fact Sheet welcomes the submission of additional information that would support a different effluent limit.[323]

Entergy respectfully requests that EPA revise the final Permit's TRO limitations for PNPS's post-shutdown service water discharges to reflect a monthly average of 0.25 mg/L and a daily maximum of 0.5 mg/L, prior to discharge to Cape Cod Bay. PNPS can comply with these limits, even in the absence of circulating water, for example, by alternating the chlorination of service water pumps while using other pumps to provide dilution flow: *e.g.*, two pumps may be chlorinated to a maximum of 1.0 mg/L, the current TRO limit, while two other pumps provide a dilution factor of 2, diluting the total discharge from all four pumps to 0.5 mg/L. The propriety of the 0.5 mg/L daily maximum and 0.25 mg/L average monthly TRO limitations is supported by the following information.

First, with respect to applicable technology-based limits, and contrary to EPA's analysis in the Fact Sheet, the Steam Electric ELGs no longer apply during the post-shutdown period of PNPS.[324] During that period, PNPS will no longer be "a generating unit … whose generation of electricity results primarily from a process utilizing … nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium," as PNPS will no longer generate electricity by any process or using any fuel, so the Steam Electric ELGs will be facially inapplicable.[325] Indeed, EPA's promulgation of the Steam Electric ELGs implicitly recognizes that units that have shut down are not properly made subject to them, as EPA specifically excluded data pertaining to such units from its consideration in formulating the ELGs, on the ground that such data was not representative of the relevant types of facilities.[326] Because the Steam Electric ELGs do not properly apply to PNPS after it has shut down, and in the absence of any other category of ELGs that are applicable, EPA must set technology-based effluent limitations for PNPS's post-shutdown period using its best professional judgment.[327] Given the nuclear-safety-related function of service water cooling and EPA and DEP's lack of authority to limit that function, discussed above, continuous chlorination will continue to be required.[328]

With respect to water-quality based limits, the TRO limits that Entergy requests represent a substantial reduction in total chlorine loading from the level that, as discussed above, EPA and DEP already have approved as being sufficient to assure compliance with applicable narrative and numeric criteria and designated uses of Cape Cod Bay, and that has been shown to have had no negative impact on Cape Cod Bay's aquatic community over the past 40+ years of PNPS's operations.[329]

More specifically, EPA and DEP previously have determined that, even accounting for the volume and timing of PNPS's chlorination of its circulating and service water discharge, the TRO limit reflected in the current permit – *i.e.*, a daily maximum and average monthly concentration, prior to discharge to Cape Cod Bay, of no more than 0.1 mg/L – satisfies the MWQS. Under that limit, and given the volume and chlorination treatment of PNPS's circulating and service water discharges, the total amount of chlorine that is released to Cape Cod Bay is approximately 21,500 g per day, calculated as follows, assuming daily maximum flows:

<u>Circulating Water (chlorinated for 2 hours per day)</u>

(311,000 gpm / 0.264 L/min) * 120 min/day = 141,363,636.4 L of flow per day
141,363,636.4 L * (0.1 mg/L / 1,000 mg/g) = 14,136.4 g Cl released per day

<u>Service Water (continuously chlorinated)</u>

(13,500 gpm / 0.264 L/min) * 60 min/hr * 24 hr/day = 73,636,363.6 L of flow per day
73,636,363.6 L * (0.1 mg/L / 1,000 mg/g) = 7,363.6 g Cl released per day

<u>Total Current Daily Release of Cl: 21,500 g</u>

Accounting for the reduction in chlorination post-shutdown due to discontinued chlorination of circulating water, the total amount of chlorine released to Cape Cod Bay under the TRO limits that Entergy proposes for its service water discharge will be substantially reduced – *i.e.*, reduced to a level *below* that which EPA and DEP have previously blessed as compliant with water quality standards. For example, assuming those limits are achieved using the four-pump alternating dilution plan suggested above, the amount of chlorine discharged to Cape Cod Bay from the post-shutdown use of service water would be less than 5,900 g on a daily basis, as follows:

(10,800 gpm / 0.264 L/min) * 60 min/hr * 24 hr/day = 58,909,090.9 L of flow per day
58,909,090.9 L * (0.5 mg/L / 1,000 mg/g) = 5,890.9 g Cl released per day

Thus, under the TRO limits that Entergy has suggested for post-shutdown service water, total pollutant loading for chlorine would be less than 30 percent of the amount of pollutant loading for chlorine that exists under PNPS's current operations, which, again, EPA and DEP have already determined are in compliance with water quality standards.

Setting these limitations in the final Permit would not violate statutory or regulatory prohibitions against backsliding. Under Section 303(d)(4)(B) of the CWA, an effluent limitation may be revised to be less stringent than that reflected in a prior permit if the quality of the receiving waters is in attainment with water quality standards – as Cape Cod Bay is with respect to chlorine[330] – and the proposed limitation is both consistent with the state's antidegradation policy and continues to assure compliance with applicable water quality standards.[331] Independently, Section 402(o) of the CWA prohibits backsliding only in cases where the new effluent limitation is "less stringent than the comparable effluent limitations established" in the previous permit, and even in such cases allows backsliding where, *inter alia*, "material and substantial alterations or additions to the permitted facility … justify the application of a less stringent effluent limitation."[332]

Viewed under any of these frameworks, the TRO limitations for post-shutdown service water discharges that Entergy requests here meet these standards. The revised TRO limits that Entergy proposes are not "less stringent" than the current permit limits, because the current permit limits are not in fact "comparable" within the meaning of Section 402(o) due to the substantial differences in the volumes of the effluents being discharged under each, which more than makes up for the difference in the allowable concentration of TRO.[333] Further, because the TRO limits that Entergy proposes result in a net reduction of chlorine being discharged to Cape Cod Bay, it necessarily assures continued attainment of federal and Massachusetts water quality standards, and results in no "increased" discharge that might trigger Massachusetts's antidegradation regulations,[334] with the result that Section 303(d)(4)(B) of the CWA also is satisfied.[335]

In short, there is an adequate factual and legal basis for EPA and DEP to set the post-shutdown TRO limits for service water usage at a daily maximum of 0.5 mg/L and an average monthly maximum of 0.25 mg/L. Entergy respectfully requests that these limits be incorporated into Part I.B.3 of the final Permit. In all events, we stress again that chlorination of the nuclear-safety-related service water system must, and therefore will, be ultimately governed by nuclear-safety needs, irrespective of NPDES/MCWA permit limits.

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318 *See* Draft Permit, Part I.B.1.a, at 11.
319 *See supra*, Section II.A.
320 *See* Draft Permit, Part I.B.3, at 14.
321 *See* 1994 Amended NPDES Permit, Part I, at 2.
322 *See id.*
323 Fact Sheet at 23.
324 *See* Fact Sheet at 14-15; 40 C.F.R. Part 423.
325 40 C.F.R. § 423.10.
326 *See* 80 Fed. Reg. 67,838, 67, 870 (Nov. 3, 2015).
327 *See* 40 C.F.R. § 125.3(c)(3).
328 *See supra*, Sections II.B and IV.A.1.b.
329 *See supra*, Sections IV.A.1.a. and IV.A.1.b.
330 *See* DEP, *Massachusetts Year 2014 Integrated List of Waters: Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act* (December 2015) (listing no impairment of any waterbody with respect to chlorine); Letter from Kenneth Moraff, EPA, to Martin Suuberg, DEP (Feb. 23, 2016), at 1 ("[B]y this letter, EPA hereby approves Massachusetts' 2014 Section 303(d) list.").
331 33 U.S.C. § 1313(d)(4)(B).
332 *Id.* § 1342(o)(1), (2)(A); *see also* 40 C.F.R. § 122.44(*l*)(2), (2)(i)(A) (providing for anti-backsliding prohibitions comparable to Section 402(o)'s).
333 *See, e.g.*, *Cmtys. for a Better Envt. v. State Water Res. Control Bd.*, 132 Cal. App. 4th 1313, 1331 (Cal. App. 1st Dist. 2005) (holding, consistent with determination by EPA, that new limit which provides for "no net loading" of dioxin did not violate anti-backsliding prohibitions).

[334] *See* 314 Code Mass. Regs. § 4.04.
[335] *See* 33 U.S.C. § 1313(d)(4)(B).

Response to Comment 6.2.2:

Entergy comments on the post-shutdown limitations on chlorine, reported as total residual oxidants, in the Draft Permit at both Outfalls 001 and 010. At Outfall 001, Entergy accepts the proposed prohibition on chlorination of the circulating water system after PNPS shuts down and expects continued chlorination of this system will not be necessary during the post-shutdown period. EPA acknowledges this comment and confirms that the Final Permit retains the prohibition on chlorination of the circulating water.

Turning to the post-shutdown limitations for TRO at Outfall 010, the Draft Permit proposed end-of-pipe, water quality-based limits (average monthly concentration limit of 7.5 μg/L and a daily maximum concentration of 13 μg/L). These limits would represent a substantial reduction from the current permit and the proposed, pre-shutdown Draft Permit limits. The Fact Sheet (at 35-36) explains that, during operation, the current TRO limits of 0.5 mg/L average monthly and 1.0 mg/L maximum daily met water quality standards at the discharge because the flow from Outfall 010 combined with 447 MGD cooling water flow from Outfall 001 prior to discharge. *See* Draft Permit at Part I.A. Post-shutdown, the cooling water flow from Outfall 001 has been largely terminated, and as a result, the source of dilution water that contributed to PNPS to achieving an estimated concentration of 0.04 mg/L at the monitoring point for Outfall 001 has disappeared. EPA proposed end-of-pipe, water quality-based TRO limits but noted that such limits would typically consider the available dilution in the receiving water—in this case, Cape Cod Bay. Fact Sheet at 39. EPA also noted that it was unaware of any prior hydrodynamic modeling providing an estimate of available dilution in Cape Cod Bay, but that it would consider less stringent limits in the Final Permit based on acceptable dilution model of Cape Cod Bay in the vicinity of the discharge. *Id*. At the same time, EPA does not dispute that chlorination of salt service water is necessary to ensure nuclear safety by managing biofouling in the system supplying cooling water for the spent fuel pool.

In its comment, Entergy requests that the Final Permit include TRO limits at Outfall 010 at a daily maximum of 0.5 mg/L and an average monthly maximum of 0.25 mg/L. In a letter to EPA and MassDEP dated May 20, 2019 (AR-687), Entergy restated the nuclear safety implications of the service water flow and need for continuous chlorination of this flow to control nuisance biological organisms such as mollusks, barnacles, algae, and other organisms. In the letter, Entergy requests that the current permit's TRO average monthly limit of 0.5 mg/L and maximum daily limit of 1.0 mg/L be retained in the Final Permit for approximately two-and-a-half years following shutdown (until December 31, 2021).

Entergy first comments that, with respect to applicable technology-based limits, the Steam Electric ELGs no longer apply during the post-shutdown period of PNPS. Discharges resulting from the operation of a generating unit by an establishment whose generation of electricity is the predominant source of revenue or principal reason for operation and whose generation of electricity results primarily from a process utilizing fossil-type fuel, fuel derived from fossil fuel, or nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium are subject to the Steam Electric ELGs. 40 C.F.R. § 423.10. Since

PNPS stopped operating on May 31, 2019 and no longer generates electricity, EPA agrees that the Steam Electric ELGs do not apply. Having said that, EPA may establish technology-based limits based on best professional judgement and may look to the Steam Electric ELGs as guidance for such limits given that many of the post-shutdown discharges are similar to those associated with the operation of a steam electric generating facility. In the case of the Draft Permit's TRO limitations, however, the proposed, post-shutdown limits are water quality-based, not technology-based. The Draft Permit does not establish new, technology-based limitations on the frequency or duration of chlorination at Outfall 010. At the same time, EPA must also consider the water quality resulting from the post-shutdown discharge of continuously chlorinated effluent from Outfall 010.

Entergy comments that the Draft Permit proposes "a reduction in total chlorine loading from the level that, as discussed above, EPA and DEP already have approved as being sufficient to assure compliance with applicable narrative and numeric criteria and designated uses of Cape Cod Bay." First, the TRO limits are and have always been expressed as a concentration, not as a load.[78] Concentration based limits are appropriate where applicable standards and limitations are expressed as concentrations. *See* 40 C.F.R. § 122.45(f)(ii). EPA and MassDEP were satisfied that the 1991 Permit limits (and the pre-shutdown Draft Permit limits) at Outfall 010 would meet the water quality standards in Cape Cod Bay based on 1) the available dilution of the flow from Outfall 010 (at 19.4 MGD) after combining with the flow from Outfall 001 (at 447 MGD)[79] and 2) the existence of a limit of 0.1 mg/L at Outfall 001 downstream of where the two wastestreams combine. As both conditions have changed - PNPS no longer continuously operates the circulating water pumps and the Draft Permit did not establish a post-shutdown TRO limit at Outfall 001 – the basis for any prior approval of the limits has also changed.

Entergy also suggests that the proposed reduction in the TRO limits is not necessary because the discharge of TRO "has been shown to have had no negative impact on Cape Cod Bay's aquatic community over the past 40+ years of PNPS's operations." Water quality-based limitations are necessary to control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the permitting authority determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. *See* 40 C.F.R.

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[78] Entergy's comment includes an analysis of the reduction in chlorine load and suggests that the total post-shutdown load will only be 30% of the pre-shutdown load. As EPA explained, the water quality standard is based on exposure to a concentration of chlorine, not a load. PNPS could discharge only 1 pound of chlorine in a single day, but if it is discharged at a concentration that exceeds the acute water quality standard than there is potential for the discharge to cause toxicity, regardless of the total load. In addition, Entergy's calculations are incorrect. The daily total pre-shutdown load at Outfall 010 should be calculated using the permitted limit of 1.0 mg/L, not 0.1 mg/L (which applies downstream of where 001 and 010 combine), which results in a total load of 73,636 g/day (162 lbs/day). The post-shutdown value of 5,890.9 is calculated based on a limit of 0.1 mg/L, not 0.5 mg/L as indicated. In fact, under Entergy's proposal to continue the current TRO limits and increase the flow to 13,500 gpm, the resulting decrease in load would equal the loss of 14,136 g/day (31 lbs/day) from eliminating the chlorination of the CW pumps, which is a 16% reduction.

[79] The Fact Sheet (at 33) states that, when PNPS was operating, "[t]he SSW system is not chlorinated during refueling outages because the CW [circulating water] pumps are shut down and there is not adequate dilution to allow continuous release of effluent water with detectable residual chlorine from the SSW system into Cape Cod Bay" providing further support for concerns about the dilution of residual chlorine in the effluent without the available dilution from the CW pumps.

§ 122.44(d)(1)(i). The basis for establishing water quality-based limitations in a permit is not the presence of a negative impact on the aquatic community but the potential that the discharge would cause or contribute to an excursion of the water quality standard. Regardless of whether there has been any demonstrated negative impact on the aquatic community, EPA and MassDEP must determine that the discharge of TRO from Outfall 010, without the dilution previously supplied from the circulating water pumps but considering available dilution in the receiving water, will meet the water quality standard. *See id*. §§ 122.4(d), 122.44(d)(1)(ii).

The Fact Sheet (at 36) indicated that the Agencies would consider establishing less stringent TRO limits in the Final Permit if hydrodynamic modeling demonstrated adequate dilution for the post-shutdown discharge. Entergy did not provide a new dilution study for the Final Permit, nor did Entergy demonstrate in Comment 6.2.2 that there is adequate dilution for the post-shutdown discharge. A targeted dilution study is particularly important because the discharge from 010 at the limits requested in the comment and those requested in the 2019 letter will usually no longer be diluted in the discharge canal by the discharge from Outfall 001, as compared to pre-shutdown conditions. Even though the numeric limits have not changed, the potential to cause or contribute to an excursion of water quality standards may have changed because the 1991 limits at Outfall 010 are based on dilution of the SSW effluent in the circulating water effluent from Outfall 001.

Although Entergy did not comment specifically on dilution as it relates to the requested, post-shutdown TRO limits, Entergy did present an assessment of available dilution in Cape Cod Bay in Comment 6.2.1, above, which could apply here. That assessment is based on net volumetric flows from the larval transport modeling completed in 2000 through 2004. *See* AR-100, AR-424, AR-448. Entergy identifies that a minimum dilution factor of at least 7.7 is necessary to dilute the circulating water effluent to meet the acute water quality standard (0.1 mg/L divided by 0.013 mg/L). Following this example, post-shutdown, a maximum daily TRO limit of 1.0 mg/L would require a dilution factor of 77 to meet the acute chlorine criterion of 0.013 mg/L and a dilution factor of 67 is necessary to meet the chronic criterion of 0.0075 mg/L at an average monthly TRO limit of 0.5 mg/L. A dilution factor of 38 would be required to meet the acute criterion at a maximum daily TRO limit of 0.5 mg/L and 33 to meet the chronic criterion at an average monthly limit of 0.25 mg/L. At an average monthly flow limit of 15.6 MGD (24 cfs) and maximum daily flow limit of 19.4 MGD (30 cfs) for Outfall 010, minimum flows in Cape Cod Bay must be in the range of 790-2,310 cfs to ensure sufficient dilution for TRO in the effluent.

According to Entergy, the larval transport studies demonstrate that “a fraction of the dilution flow available to PNPS’s discharge in Cape Cod Bay is more than enough to assure achievement of the requisite level of dilution necessary for compliance with the water quality standards during pre-shutdown conditions.” Comment 6.2.1; *see also* AR-424, AR-448. However, as each of the studies notes, the larval transport analysis, which estimates flow across a transect extending 5 nautical miles from the shore, was intended to measure the total volumetric flowrate of water along the Plymouth coast and the amount of winter flounder larvae passing PNPS in offshore Cape Cod Bay waters. *See* AR-100 at 1-1; AR-448 at 221. The larval transport models were not intended to estimate available dilution of the effluent upon discharge. Net volumetric flow over a total area that extends 5 nautical miles (30,380 feet) into Cape Cod Bay over depths ranging from about 27 feet to about 132 feet is not an appropriate study for calculating dilution. Entergy comments that, if the dilution flow available at the discharge canal is a small percentage of the volumetric flows estimated by these studies, it would still be more than enough to assure achievement of the requisite level of dilution necessary for compliance with water quality standards. However, Entergy never provides an estimate of the area of this assumed mixing zone. Because the overall study area is so large, even a small percentage could extend hundreds or even thousands of feet into the Bay, depending on the depth and the flow. Without a more precise estimate of the area of initial dilution, or a hydrodynamic study applicable to the water quality-based limits at issue, the Agencies are not persuaded to accept Entergy's proposed limits.

At the same time, the end-of-pipe, water quality-based limits for Outfall 010 do not account for any dilution, even though dilution was a consideration when establishing the current limits. The 1991 Fact Sheet (at 4) states "continuous chlorination of the service water system is allowed provided that the TRO limitation of 0.1 mg/L is not exceeded at the point of discharge into Cape Cod Bay" and "[t]he TRO concentration at the point of discharge into Cape Cod Bay should not exceed the State requirement of 0.1 mg/L during the continuous chlorination of the service water system." AR-9. The 2015 Fact Sheet (at 35) also explains that the continuous chlorination of the SSW system and the proposed pre-shutdown TRO limits (which are consistent with the 1991 limits and the limits requested in Entergy's May 2019 letter), are based, in part, on the dilution of the circulating water pumps and the effluent limitation of 0.1 mg/L at Outfall 001.

PNPS no longer operates the circulating water pumps on a consistent basis because the Facility no longer operates as a generating station. The Final Permit limits operation of the circulating water pumps to no more than 48 hours in a single calendar month. This limitation results in a significant decrease in water withdrawals and corresponding reduction in impingement and entrainment mortality. This flow reduction is warranted to minimize adverse environmental impact on the aquatic community in Cape Cod Bay consistent with the requirements of § 316(b) of the CWA. *See* Response to Comment III.2.0. In other words, to minimize impingement and entrainment mortality, the Final Permit limits operation of the circulating water pumps consistent with the post-shutdown operating needs of PNPS. At the same time, by no longer operating the circulating water pumps except for limited periods of time, PNPS has also lost the source of dilution water that ensured that continuous chlorination of the SSW pumps did not cause or contribute to an excursion of water quality standards in Cape Cod Bay. It is possible that dilution at the discharge into Cape Cod Bay is sufficient to enable PNPS to meet water quality standards at, or within a short distance of, the end of the discharge canal. However, Entergy has not provided an acceptable hydrodynamic study that demonstrates the extent of the initial zone of dilution. Finally, in its May 2019 letter (AR-687), Entergy re-emphasizes the critical role of the SSW system for nuclear safety and requests that the ability to use continuous chlorination be retained to meet NRC mandates related to service water systems and biofouling. EPA recognizes that chlorination is a key component to manage biofouling in the SSW system and ensure a consistent supply of cooling water for the spent fuel pool.

Under the current permit, MassDEP determined that a discharge of TRO at 0.1 mg/L will meet water quality standards upon mixing with the receiving water. The Final Permit establishes an average monthly TRO limit of 0.5 mg/L and maximum daily limit of 1.0 mg/L at Outfall 010. The Final Permit also establishes maximum daily and average monthly TRO limits of 0.1 mg/L at the compliance monitoring location at Outfall 001, consistent with the limit in the 1991 Permit (although applied now to the commingled discharges, including Outfall 010). A maximum daily TRO concentration of 0.1 mg/L in the discharge canal will ensure consistency with the allowable receiving water concentration of 0.01 mg/L established in MassDEP's *Implementation Policy for the Control of Toxic Pollutants in Surface Waters* (February 23, 1990) with an available dilution of 10:1 when mixed with the receiving water in Cape Cod Bay. The Agencies conclude this limit will ensure that the discharge does not cause or contribute to an excursion of water quality standards. The Permittee could, as it indicates in the comment, cycle chlorination of the pumps to minimize TRO concentrations or potentially dechlorinate a portion of the SSW discharge. Alternatively, the Permittee could conduct a dilution study to demonstrate in-stream chlorine concentrations at the point of discharge. If the Permittee conducts an acceptable dilution study demonstrating that water quality standards will be met within a short distance from the discharge canal and provides monitoring data to support its demonstration, the Agencies will consider modifying the permit.

6.3 Boron

With respect to boron, its importance to nuclear safety cannot be overstated – boron is employed as an emergency shutdown control on reactivity, in the event the control rod and related reactivity control systems are rendered inoperable or are otherwise dysfunctional. The system for which sodium pentaborate is employed must therefore be tested monthly, and that is where the sodium pentaborate solution is generated. As the Fact Sheet itself recognizes, boron in the form of sodium pentaborate is used at PNPS (and indeed most nuclear power plants) as a neutron poison to control (*i.e.*, reduce) the level of activity of the nuclear fuel.[336] Thus, the use of boration in PNPS's operations, and therefore the need to discharge borated effluent, is a vital component of ensuring nuclear and radiological safety at PNPS, and the conditions ultimately imposed by the NPDES renewal permit must not be allowed to compromise those functions. For this reason, and to be clear, limits on boron at any given time in emergency circumstances will be determined by the nuclear safety needs and must be accounted for in the Draft Permit.

With respect to the concentration limits applicable to boron, no technology-based limits are established by the Steam Electric ELGs,[337] and there are no numeric water-quality criteria at the federal or Massachusetts state levels for marine waters, although it has been noted that that the naturally occurring concentration of boron in seawater is 4.5 mg/L, which is presumed to have no effect on aquatic life.[338] The Draft Permit imposes an effluent concentration limit of no more than 5.6 mg/L, which the Fact Sheet describes as consistent with the limitation on boron discharges via the circulating water system (Outfall 001) that historically limited PNPS to an increment of 1.0 mg/L above the background ambient concentration of boron in seawater (typically 4.6 mg/L).[339] This incremental limitation is derived from Water Quality Guidelines issued for boron by the Canadian provincial government of British Columbia in 1992.[340] The Draft Permit also requires monthly reporting of background ambient concentrations of boron to ensure that the 1.0 mg/L incremental limit is maintained.[341]

Insofar as these boron limitations remain consistent with the historic, incremental limitation that PNPS not discharge boron at a concentration greater than 1.0 mg/L above the ambient level naturally found in Cape Cod Bay, Entergy expects that these limitations should be manageable, with the caveat that, again, the ultimate decision as to the level of boration at PNPS must, and therefore will, ultimately be dictated by nuclear-safety considerations.

The Draft Permit's descriptions in Part I.C.4 and Part I.C.5, however, of Outfalls 011 and 014, as they relate to PNPS's other discharges, are inaccurate and must be revised. Specifically, Part I.C.4 of the Draft Permit authorizes PNPS to "discharge station heating system water, closed cycle cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, drainage from the floor drains in the boiler room (station heating water), SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the demineralizer system through **Internal Outfall Serial Number 011** which is directed through the drain line associated with Outfall 005 and discharged to the discharge canal and ultimately to Cape Cod Bay."[342] Part I.C.5 of the Draft Permit states that PNPS is authorized to discharge water from the same sources "through **Outfall Serial Number 014** to the discharge canal and ultimately to Cape Cod Bay."[343]

Read together, these descriptions are inaccurate, potentially confusing, and inconsistent with the Water Flow Diagram included in the Fact Sheet, which was supplied by Entergy. To begin, the inclusion of "closed-cycle cooling water" as a source in both Part I.C.4 and I.C.5 is erroneous and thus should be deleted, as PNPS has no closed-cycle cooling system to generate such water. Further, and as reflected in the Water Flow Diagram, not all waters discharged via Outfall 011 are directed to storm drain Outfall 005 prior to being discharged into the Bay. Instead water from the standby liquid control, TBCCW, RBCCW, and other systems are gathered in a "waste neutralizing sump" before being directed to Outfall 011, and from there these radiologically contaminated waters are then directed to Outfall 014 prior to being discharged into Cape Cod Bay.[344] All other source waters discharged via Outfall 011, which are free of potential radiological contamination, are directed to storm drain Outfall 005 before being discharged to Cape Cod Bay.[345]

Accordingly, Entergy suggests the following revisions to the relevant language of Part I.C.4 and I.C.5 of the Draft Permit:

> **Part I.C.4**
>
> During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge station heating system water, ~~closed-cycle~~ cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, **reject water from the emergency standby liquid control (SLC) system,** drainage from the floor drains in the boiler room (station heating water), SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the demineralizer system * through **Internal Outfall Serial Number 011,** which **(with the exception of TBCCW, RBCCW, and SLC water from the waste neutralizing sump)** is directed through the drain line associated with Outfall 005 and discharged to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the permittee as specified below[.][346]

Part I.C.5

> During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge ~~station heating system water, closed-cycle~~ cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, ~~drainage from the floor drains in the boiler room (station heating water),~~ SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the emergency standby liquid control system* **from the waste neutralizing sump and Outfall 011** through **Outfall Serial Number 014** to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the permittee as specified below[.][347]

Finally, the monitoring requirements for boron specified in Part I.C.4 and I.C.5 of the Draft Permit are internally inconsistent and should be revised for clarification. Specifically, in both places, the Draft Permit specifies that monitoring for boron should be conducted via "grab" sampling once per month, but goes on in footnote 6 to provide that "the permittee shall provide the concentration of boron in the tank before release, and the *calculated* boron concentration in the discharge canal before mixing with Cape Cod Bay water," and that "boron concentration shall not exceed 1.0 mg/l above background, *by calculation*, in the discharge from the discharge canal."[348] Footnote 6 goes on to provide the method by which the permittee is "[t]o *calculate* the estimated concentration of boron in the discharge canal."[349]

According to footnote 6 to Part I.C.4 and I.C.5, therefore, the concentration of boron in the discharge canal that PNPS is required to report for purpose of its monitoring obligation is plainly intended to be derived by calculation, not measured via "grab" sampling, although sampling still will be required in order to demonstrate the ambient concentration of boron in seawater, as footnote 6 reflects.[350] To avoid confusion, and to align the reporting obligation as reflected in Part I.C.4 and I.C.5 of the Draft Permit with the obligations as described in more detail in footnote 6 thereto, Entergy recommends that the description of the "Sample Type" in each place be changed from "Grab" to "Grab/Calculated."

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336 *See* Fact Sheet at 41.
337 *See* 40 C.F.R. Part 423.
338 *See* EPA, *National Recommended Water Quality Criteria – Aquatic Life Criteria Table*, https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table (last visited July 23, 2016); EPA, *Quality Criteria for Water* (1986); 314 Code Mass. Regs. § 4.05(5)(e).
339 *See* Draft Permit at 24, 28; Fact Sheet at 42; 1994 Amended NPDES Permit at 5.
340 *See* Fact Sheet at 42.
341 *See* Draft Permit at 26 n.6.
342 *Id.*, Part I.C.4, at 24.
343 *Id.*, Part I.C.5, at 28.
344 *See* Fact Sheet, Fig. 4.
345 *Id.*
346 *Compare id. with* Draft Permit, Part I.C.4, at 24.
347 *Compare* Fact Sheet, Fig. 4, *with* Draft Permit, Part I.C.5, at 28.

348 Draft Permit, Part I.C.4, at 26 n.6 (emphases added). The Draft Footnote incorporates this footnote by reference in Part I.C.5 as well. *See id.*, Part I.C.5, at 28 ("See pages 25 to 27 for explanation of footnotes.").
349 Draft Permit, Part I.C.4, at 26 n.6 (emphasis added).
350 *See id.* ("In order to confirm that the background concentration of boron is approximately 4.6 mg/l, the permittee shall sample the ambient water at the intake for boron once per month during the same day that the batch discharge of boron occurs.").

Response to Comment 6.3:

In its comment, Entergy demonstrates that the use of boronated water is critical to ensure the safety of the nuclear process associated with electricity generation. According to Entergy, boron is "employed as an emergency shutdown control on reactivity, in the event the control rod and related reactivity control systems are rendered inoperable or are otherwise dysfunctional… is used at PNPS (and indeed most nuclear power plants) as a neutron poison to control (*i.e.*, reduce) the level of activity of the nuclear fuel…and is a vital component of ensuring nuclear and radiological safety at PNPS…" EPA notes that Entergy's description appears most relevant to the use of boron associated with operation of a nuclear power plant, rather than for post-shutdown activities. EPA recognizes that there may still be discharges containing boron at Outfalls 011 and 014 but expects that the use of boron for emergency circumstances is likely to be rare.

The Final Permit maintains a maximum daily boron limit of 5.6 mg/L consistent with the Draft Permit, which Entergy comments is manageable. The Final Permit includes the addition of periodic monitoring of ambient boron to confirm that the background level is consistent with the assumed level of up to 4.6 mg/l. Entergy comments on the inconsistency in the sample type for boron and the boron footnote in Parts I.C.4 and I.C.5 of the Draft Permit. As Entergy points out, effluent boron is calculated; the Final Permit at Part I.A.8 and I.A.9 corrects the sample type as "calculated." The ambient boron samples reported under Outfalls 011 and 014 will be taken as grab samples. The sample type for ambient monitoring in the Final Permit is listed as "grab."

Regarding the wastewaters that discharge to Outfalls 011 and 014, EPA has corrected the descriptions as suggested by the Permittee in the Final Permit. *See* Final Permit Parts I.A.8 and I.A.9, respectively.

7.0 The Definition Of "Toxic Pollutants" Should Be Clarified To Ensure That It Excludes Radioisotopes

The Draft Permit, in Part I.C.8, imposes various conditions with respect to discharges of "any toxic pollutant."[351] That term is defined in Part II of the Draft Permit to mean "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."[352] On its face, this definition does not exclude radioisotopes, and some of the elements listed as "toxic pollutants" pursuant to Section 307(a)(1) of the Clean Water Act potentially may exist as radioisotopes, *e.g.*, antimony.[353]

The Fact Sheet acknowledges, however, that consistent with the discussion above concerning NRC's exclusive role in regulating radiological safety matters,[354] the CWA does not authorize

EPA to regulate discharges of radioisotopes to the waters of the United States from NRC-regulated facilities.[355] Indeed, the Fact Sheet disclaims any such intent to regulate radioisotope discharges, stating that "the draft permit addresses only the chemical aspects of water quality and does not regulate radioactive materials encompassed within the [AEA's] definitions of source, byproduct, or special nuclear materials."[356] Consistent with this recognition, the term "toxic pollutant" should therefore be defined in the Draft Permit in a manner that excludes radioisotopes.

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351 *See* Draft Permit, Part I.C.8, at 30.
352 *Id.*, Part II.E.1, at 16; *see also* 40 C.F.R. § 401.15 (listing toxic pollutants).
353 *See* 40 C.F.R. § 401.15.
354 *See supra*, Part I.A.2.
355 *See* Fact Sheet at 37; *see also Train*, 426 U.S. at 25.
356 Fact Sheet at 37; *see also id.* at 44.

Response to Comment 7.0:

The permittee comments that "regulating radiological safety matters" is exclusively the role of NRC and that "the CWA does not authorize EPA to regulate discharges of radioisotopes to the waters of the United States from NRC-regulated facilities." The permittee asserts that the Final Permit should define the term "toxic pollutant" "in a manner that excludes radioisotopes."

The Draft Permit defines "toxic pollutant" as "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." Draft Permit Part II.E.1. This definition is consistent with EPA regulations, *see* 40 C.F.R. § 122.2, and with CWA § 307(a)(1), which provided an initial list of "pollutants" to be considered "toxic pollutants" under the CWA and authorized the EPA Administrator to add or remove "any pollutant" from that list, under certain conditions. 33 U.S.C. § 1317(a)(1). Section 307 further provides that "each toxic pollutant listed in accordance with paragraph (1) of this subsection shall be subject to effluent limitations resulting from the application of the best available technology economically achievable for the applicable category or class of point sources established in accordance with section 301(b)(2)(A) and 304(b)(2) of this Act. *Id.* § 1317(a)(2). The current list of toxic pollutants is provided in 40 C.F.R § 401.15.

As the commenter points out, "some of the elements listed as 'toxic pollutants' pursuant to [CWA § 307(a)(2)] potentially may exist as radioisotopes, *e.g.*, antimony." As noted above, however, EPA regulations provide in relevant part that "[*t*]*oxic pollutant* means any <u>pollutant</u> listed as toxic under section 307(a)(1)." 40 CFR § 122.2 (underlining added). The definition of "pollutant" at 40 C.F.R. § 122.2 in turn expressly includes "radioactive materials," "*except* those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)." (emphasis added). *See also* CWA § 502(6) (defining "pollutant" to include "radioactive materials"); *Train v. Colorado Pub. Interest Research Group*, 426 U.S. 1 (1976) (hereinafter, "*Train*") (interpreting the term "pollutant" at CWA § 502(6) consistent with the definition at 40 CFR § 122.2). In other words, the statutory and regulatory terms "pollutant" and "toxic pollutant" do not exclude all radioisotopes. As the Fact Sheet (at 37) explains:

> EPA and the NRC, in the past, have signed a Memorandum of Understanding (MOU) which specifies that EPA will be responsible for the water quality aspects of the discharge in concert with the State, and the NRC will be responsible for the levels of radioactivity in the discharge. Thus, the draft permit addresses only the chemical aspects of water quality and does not regulate radioactive materials encompassed within the Atomic Energy Act's definitions of source, byproduct, or special nuclear materials. *See Train v. Colorado Public Interest Research Group*, 426 U.S. 1, 25 (1976) (holding that "the 'pollutants' subject to regulation under the [CWA] do not include source, byproduct, and special nuclear material.") All NRC radioactive discharge requirements will continue to be in effect, as required, in 10 C.F.R. Part 20 and plant technical specifications.

EPA intends that the Final Permit regulate radioactive materials consistent with the definition of "pollutant" in the Act and regulations and with the U.S. Supreme Court's decision in *Train*—that is, to exclude radioactive materials encompassed within the Atomic Energy Act's definitions of source (Chapter 7), byproduct (Chapter 8), or special nuclear materials (Chapter 6). Therefore, to the extent that any of the radioisotopes to which the comment refers are identified as source, byproduct, or special nuclear materials, these parameters are not regulated under the CWA or the Final Permit. This definition is made clear in the Fact Sheet and again in this Response to Comment and is consistent with the regulatory definition of pollutant at 40 C.F.R. § 122.2, the Clean Water Act, and *Train*. As such, EPA sees no need to further clarify the definition of "pollutant" in the Final Permit.

In its comment, Entergy appears to seek a broader exclusion of the term "toxic pollutant" with respect to radioactive materials than that specified by the regulatory definitions because the definition of "toxic pollutants" under CWA § 307(a)(1) and listed in 40 C.F.R. § 401.15 may include elements that may exist as radioisotopes (*e.g.*, antimony). Because the definition of "pollutant" at 40 C.F.R. § 122.2, however, includes radioactive materials "*except* those regulated under the Atomic Energy Act of 1954, as amended" (emphasis added)—again, consistent with *Train*—to limit the definition to exclude *any* element that may exist as a radioisotope, other than those excluded under the MOU or at 40 C.F.R. § 122.2 would be overbroad, and the comment does not provide a rationale for going beyond the Supreme Court's interpretation of "pollutant." Consequently, EPA has not changed the definition of "toxic pollutant" in the Final Permit.

8.0 The Final Permit's Biological Monitoring Requirements Require Revision

8.1 The Draft Permit Should Not Require Continued Biological Monitoring After PNPS Has Shut Down

Attachment B to the Draft Permit, which details the biological monitoring requirements provided for in Part I.G thereof,[357] imposes a series of impingement and entrainment sampling obligations on PNPS, many of which simply carry forward already-existing obligations to the final years of PNPS's electricity-generating operations; others, however, impose new obligations that are unsupported. More specifically, Attachment B provides for continued impingement and entrainment sampling *even after* PNPS has shut down and terminated the vast majority of its historic water usage. Post-shutdown entrainment monitoring is proposed to be conducted on a twice-monthly basis, with 3 entrainment samples being collected during each sampling week, representing morning, afternoon and evening, respectively.[358] With respect to post-shutdown impingement sampling, Attachment B proposes once-weekly sampling during those weeks in which circulating (or more accurately, dilution) water is used, again with 3 samples being collected, each to represent morning, afternoon, and evening, respectively.[359]

To the extent that the Draft Permit seeks to impose biological monitoring requirements on PNPS even after it has ended the primary circulating water withdrawals that precipitated those monitoring requirements in the first place, those conditions are impermissible as a matter of law. It is well-established that NPDES permit conditions, to be valid, must be related to the "discharge of [some] pollutant" from a point source that requires NPDES authorization in the first instance.[360] Thus, courts have held that EPA "is powerless to impose permit conditions unrelated to the discharge itself."[361] With respect to Massachusetts law, DEP's authority to impose permit conditions is similarly limited: the agency is authorized to impose conditions that "provide for and assure compliance with all applicable requirements of the [G. L. c. 21, §§ 26-53] and the [Clean Water Act]," including "monitoring requirements *and other means of verifying the compliance of the discharge with a permit*."[362]

In short, once PNPS shuts down and discontinues the vast majority of its historic water usage, it no longer will be making more than negligible use of dilution water.[363] As such, there will be no environmental impact *related to its withdrawal and/or discharge* for which either EPA or DEP may require continued biological monitoring. That is especially true here given the fact that, as detailed above in the "Environmental Context" section and below in Part VII, more than 40 years of biological monitoring to date has failed to show any harm to the biota as a result of PNPS's operations in all that time. The requirements in Attachment B to the Draft Permit that PNPS undertake continued biological monitoring even after shutdown therefore must be deleted.

In addition, Entergy also proposes that, in the years prior to PNPS's anticipated shutdown date, the Draft Permit gradually reduce the frequency of monitoring year by year, as follows:

Year (Operating Status)	**Entrainment Sampling**	**Impingement Sampling**	**Area Swept/Bay Monitoring.**
2016	Current framework, *i.e.*, 3x/wk.	Current framework, *i.e.*, 3x/wk.	Current framework.
2017, unless shutdown*.	Reduction in current framework to 1x/wk.	Reduction in current framework to 1x/wk.	Discontinued.
2018, unless shutdown*.	Reduction in then current framework to 1x/mth.	Reduction in then current framework to 1x/mth.	Discontinued.

2019.	Discontinued.	Discontinued.	Discontinued.

*Upon shutdown, all I&E monitoring is discontinued.

EPA has authority to set (including by reducing) the appropriate level of I&E monitoring.[364] The gradual reduction in sampling during what are expected to be the last years of PNPS's predominant water withdrawals is supported by the fact that, as discussed above in the "Environmental Context" section and in Sections I.A.2.a and I.A.2.b of the "Discussion of Draft Permit Language" Section, PNPS's existing CWIS already complies with Section 316(b) standards for I&E applicable to existing facilities, and it has been demonstrated that no more than *de minimis* adverse environmental impacts attributable to I&E at PNPS have resulted to the Cape Cod Bay ecosystem. Given the demonstrated stability of the ecosystem, and the short amount of time remaining on PNPS's continuing use of circulating water, the benefits of continued I&E monitoring at the same level of intensity as it has historically been done are *de minimis*, and therefore outweighed by their likely costs.

357 *See* Draft Permit, Part I.G, at 33-34.
358 *See id.*, Attach. B, § 2.
359 *See id.* § 1.
360 *See* 33 U.S.C. §§ 1311(a), 1342(a).
361 *Nat. Res. Def. Council v. EPA*, 859 F.2d 156, 170 (D.C. Cir. 1988).
362 314 Code Mass. Regs. § 3.11(2)(a), (2)(a)(5) (emphasis added).
363 *See supra*, Part II.A.
364 *See* 40 C.F.R. § 125.94(c)(7), (g); § 125.96(a), (b), (f).

Response to Comment 8.1:

As discussed in the Introduction to this Response to Comments and in response to other comments, PNPS ceased electrical generating operations as of May 31, 2019. As such, the pre-shutdown conditions have been eliminated from the Final Permit, including those related to biological monitoring. The issues raised in the comment with respect to pre-shutdown monitoring requirements will not be addressed because they are not in the Final Permit and will not go into effect.

Entergy comments that biological monitoring should not be required during the post-shutdown period for several reasons. Entergy argues first that post-shutdown biological monitoring is impermissible because, in Entergy's view, EPA may only impose permit conditions "related to the 'discharge of [some] pollutant' from a point source that requires NPDES authorization in the first instance," (quoting CWA § 301(a) and citing CWA § 402(a)), and that "courts have held that EPA 'is powerless to impose permit conditions unrelated to the discharge itself,'" (quoting *NRDC. Inc. v. EPA*, 859 F.2d 156, 170 (D.C. Cir. 1988). Entergy essentially argues that its post-shutdown water withdrawals are not "related to the discharge" and that the preceding authorities, therefore, would prevent the Agencies from imposing any post-shutdown impingement and entrainment monitoring requirements. Entergy ignores its continued withdrawal of cooling water and discharge of heated effluent post-shutdown, however, and mischaracterizes both the Act and the court's holding in the cited case. It also ignores the 2014 § 316(b) regulations, which have been upheld by the federal judiciary as a reasonable interpretation of the CWA. *Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d 49 (2d Cir. 2018).

The Final Permit authorizes PNPS to use the cooling water intake structure to withdraw water using the circulating water pumps during 48 hours in a calendar month. The permit also authorizes PNPS to operate the five salt service water pumps continuously to ensure a sufficient volume of cooling water for the spent fuel pool. The salt service water pumps also withdraw from the cooling water intake structure. In short, PNPS continues to use a cooling water intake structure,[80] and section 316(b) of the CWA authorizes the EPA to regulate point sources that use cooling water intake structures and discharge pollutants.[81] EPA has recognized that this provision is unique among CWA provisions because it addresses the adverse environmental impact caused specifically by the intake of cooling water, in contrast to other provisions of the Act that regulate the discharge of pollutants into waters of the United States. *See, e.g.*, 79 Fed. Reg. 48,300, 48,313 (Aug. 15, 2014). EPA has historically used the NPDES permitting program to establish conditions to implement the requirements of section 316(b). Moreover, courts have approved of this practice, going so far as to hold that "section 402 implicitly requires permitting authorities to ensure compliance with section 316(b) as a permit condition."[82] *Riverkeeper, Inc. v. U.S. E.P.A.*, 475 F.3d 83, 123 (2d Cir. 2007) (emphasis added), *rev'd on other grounds sub nom. Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009); *U.S. Steel Corp., v. Train*, 556 F.2d 822, 850 (7th Cir. 1977), *overruled on other grounds by City of West Chicago, Ill. v. U.S. Nuclear Regulatory Comm'n*, 701 F.2d 632, 644 (7th Cir.1983). Section 402(a)(2) of the Act, in turn, authorizes a permitting authority to "prescribe conditions for [NPDES] permits to assure compliance with the requirements of [section 402(a)(1)], including conditions on data and

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[80] EPA regulations define a cooling water intake structure as "the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the United States." 40 C.F.R. § 125.92(f). (emphasis added).

[81] In addition, 40 C.F.R. § 125.91 provides that an existing facility is subject to EPA's 2014 CWA § 316(b) regulations if it is a point source; uses a CWIS with a cumulative DIF of greater than 2 MGD to withdraw water from waters of the United States; and uses 25% or more of that water on an AIF basis exclusively for cooling purposes. Entergy does not dispute that, even after shutdown, PNPS continues: to be a point source; to use a CWIS with a DIF greater than 2 MGD to withdraw water from waters of the United States; and to use more than 25% of the water withdrawn exclusively for cooling. And, as has been noted previously, *see* Response to Comment III.3.1.7, the Massachusetts SJC has held that that MassDEP has the authority under state law to regulate CWISs and that "[t]here is nothing improper" with the agency exercising that authority in permitting actions. *Entergy v. MassDEP*, 944 N.E.2d 1027, 1039 (Mass. 2011); *see also id.* at 1035 & n.14.

[82] *Natural Resources Defense Council v. EPA* does not hold otherwise. 859 F.2d 156, 169-71 (D.C. Cir. 1988). First, this case did not specifically consider CWA § 316(b), *see id.*, and therefore its focus on "discharge" is understandable, *see* 79 Fed. Reg. at 48,313. The portion of the case cited in the comment considered a challenge to regulations promulgated by EPA in furtherance of the agency's obligations under the National Environmental Policy Act ("NEPA") and whether NEPA or the CWA authorized EPA to establish "non-water quality permit conditions" in NPDES permits based on a NEPA review. *Nat. Res. Def. Council v. EPA*, 859 F.2d at 169. Thus, the case stands for the proposition that "NEPA does not expand an agency's substantive powers" and that conditions in NPDES permits must be based on authority granted to EPA under the CWA. *Id.* There is no indication in the opinion that the DC Circuit Court had occasion in that case to consider the "unique" authority granted to EPA pursuant to section 316(b). Moreover, the US Supreme Court has recognized EPA's authority under the CWA to regulate CWISs. *See, e.g.*, *Entergy Corp. v. Riverkeeper, Inc.*, 556 US 208 (2009). Thus, there is no reason to read the DC Circuit Court's statements in *Natural Resources Defense Council v. EPA* regarding "discharge" as narrowly as the comment suggests.

information collection, reporting and such other requirements as [the permitting authority] deems appropriate." (emphasis added). Thus, the comment that, under the CWA or state Clean Waters Act, the Agencies may not include entrainment or impingement monitoring requirements because they are "unrelated to the discharge" is simply incorrect. Furthermore, as the comment later concedes, EPA regulations explicitly authorize permitting authorities to establish monitoring requirements. 40 C.F.R. § 125.96. To the extent the comment asserts that post-shutdown monitoring is not authorized, because PNPS has decreased its cooling water usage,[83] we remind the commenter that "an intake structure that withdraws some amount of cooling water is a 'cooling water intake structure,'" and, therefore, still subject to regulation under the Act. *Cooling Water Intake Structure Coal. v. EPA*, 905 F.3d at 83. The comment appears to ignore PNPS' continuing withdrawal of cooling water for the spent fuel pool and the impingement and entrainment mortality that may be associated with this withdrawal. *See also* Responses to Comments III.4.1, III.4.2.

Finally, referencing other of its comments, Entergy argues that biological monitoring is unnecessary because, in Entergy's view, "more than 40 years of biological monitoring to date has failed to show any harm to the biota as a result of PNPS's operations in all that time." The Agencies respond to Entergy's referenced comments regarding adverse environmental impact elsewhere in this document. *See* Responses to Comments III.2.0, III.2.1. In any event, biological monitoring may be established to ensure compliance with the technology-based limitations established under § 316(b) and consistent with the 2014 Final Rule. The regulations do not require a demonstration of "harm to the biota" in order to establish biological monitoring requirements.

Having said that, in consideration of this and other comments on biological monitoring, the Agencies have re-examined the Draft Permit's biological monitoring requirements. Part I.C of the Final Permit establishes requirements to minimize impingement and entrainment at PNPS. In this case, following shutdown of PNPS effective as of May 31, 2019, Parts I.A.1, I.A.2, and I.C require the Permittee to meet flow limits that will achieve a flow reduction of greater than 92% as compared to the current permit. This flow reduction is commensurate with operation of closed-cycle cooling had the Facility continued to operate. In addition, the Permittee must maintain an actual through-screen velocity of no greater than 0.5 fps, except when operating the circulating water pumps. When operating the circulating pumps, which occurs for a limited time on a monthly basis, the Permittee must continuously rotate the existing traveling screens and return impinged fish to the receiving water via Outfall 012.

The Draft Permit (Attachment B) required impingement monitoring three times per week when the Facility was operating over three, non-consecutive 8-hour periods. Following shutdown, the proposed monitoring frequency was reduced to once per week and limited to only those weeks in which PNPS operates one of the circulating water pumps. The Draft Permit (Attachment B) required entrainment monitoring weekly from March through October and twice per month from November through February. Following shutdown, entrainment monitoring was reduced to twice per month. In its comments, Entergy explained that it anticipates operating a circulating water pump infrequently (but up to 48 hours per month) and that the frequency and duration of

[83] According to the comment, "once PNPS shuts down and discontinues the vast majority of its historic water usage, it no longer will be making more than negligible use of dilution water."

operation is currently unknown. Thus, it is possible that PNPS may not need to operate the circulating water pumps for eight consecutive hours. Ultimately, the goal is to minimize the operation of the circulating water pumps; it is counter-intuitive then, to operate a pump solely for monitoring purposes. The Agencies have determined that part of the BTA to minimize impingement mortality (in addition to meeting a through-screen velocity no greater than 0.5 fps when operating only the SSW pumps) includes limiting operation of the circulating water pumps to no more than 48 hours in a calendar month and continuously rotating the screens when a circulating water pump is in operation. The Final Permit requires impingement monitoring of the traveling screens once per month when operating a circulating pump. See Part I.C.6 and Attachment B of the Final Permit. The Draft Permit required weekly post-shutdown impingement monitoring; however, after considering Entergy's comments, the Agencies have determined that monthly monitoring is a sufficient frequency based on the anticipated operation of the screens and the permit limits. Given the uncertainty in how PNPS will operate the pumps over the calendar month, the Final Permit requires one 8-hour collection per month *to the extent practicable* and requires the Permittee to provide an explanation in the Annual Biological Monitoring Report when impingement sampling was fewer than 8 hours in a single month. In other words, the Agencies do not intend for the Permittee to operate a circulating water pump solely to meet the 8-hour monitoring period requirement if it does not otherwise need to operate a pump for that long to meet its operational needs. In addition, EPA typically recommends that impingement monitoring captures three time periods: morning, afternoon, and night and in fact, the Draft Permit did require monitoring over three time periods. The Final Permit requires that, to the extent practicable, impingement monitoring be conducted such that a morning, afternoon, and night sample are collected over three consecutive months. The Permittee must provide an explanation in the Annual Biological Monitoring Report when collection over three time periods in three months is not practicable, however. The Final Permit also includes a new requirement that the traveling screens be visually inspected daily and retains the Draft Permit's conditions for continuous operation of the traveling screens and reporting in the event of an unusual impingement event. *See* Part I.A.20 of the Final Permit. Finally, the Final Permit allows the Permittee to request elimination or a reduction in frequency of impingement monitoring after a minimum of two years.

Monitoring requirements for impingement mortality in compliance with the 2014 Final Rule are established at 40 C.F.R. §§ 125.94(c) and 125.96(a). Monitoring requirements for entrainment are determined on a site-specific basis to meet the requirements established for minimizing entrainment at 40 C.F.R. § 125.94(d). *See* 40 C.F.R. § 125.96(b). Additional monitoring requirements may be required under certain conditions, pursuant to 40 C.F.R. § 125.96(c). To demonstrate compliance with the flow reduction requirements to minimize entrainment, the Permittee must monitor flow daily at each pump and report the average monthly and maximum daily flows for each monitoring period. See Final Permit Parts I.A.1 and I.A.2. The flow reductions reflected in the Final Permit compared to the 1991 permit are similar to closed-cycle cooling, and entrainment performance commensurate with a closed-cycle recirculating system can be determined by reducing a baseline level of entrainment (E_B) by the percentage of flow reduced through the use of a closed-cycle cooling system. 79 Fed. Reg. at 48,378. To demonstrate compliance with the actual through-screen velocity, the Permittee must monitor the through-screen velocity at the intake screens daily. In lieu of monitoring actual through-screen velocity, the Permittee may calculate the maximum through-screen velocity using water flow, depth, and open screen area. *See* Part I.C.2 of the Final Permit. *See also* 40 C.F.R. § 125.94(c)(3). Facilities complying with an actual through-screen velocity of 0.5 fps in compliance with the BTA standard for impingement mortality under 40 C.F.R. § 125.94(c)(3) are not subject to biological compliance monitoring for impingement unless otherwise specified by the permitting authority. *See* 79 Fed. Reg. at 48,373. *See also* 2014 Final Rule Response to Comments at 271 ("biological compliance monitoring is no longer required for pre-approved and other approvable technologies in 40 CFR 125.94(c)(1) through (5) of today's rule beyond that required for the permit application, and monitoring may be greatly reduced for facilities choosing other compliance alternatives"), 277.

PNPS shutdown operations as of May 31, 2019 and, as a result, the pre-shutdown biological monitoring requirements have been eliminated from the Final Permit. The effective BTA requirements upon issuance of the Final Permit include reducing cooling water intake structure withdrawals by 92% compared to pre-shutdown volumes (for entrainment) and, for the majority of time, maintaining an actual through-screen velocity at the existing traveling screens of 0.5 fps or less (for impingement mortality). Under the Final Rule, the actual through-screen velocity requirement requires no biological compliance monitoring; rather, compliance is demonstrated by monitoring or calculating the actual through-screen velocity. However, during the limited period when a circulating water pump is operating (up to 48 hours per month), the through-screen velocity at the CWIS will exceed 0.5 fps. During this period, the Permittee must continuously rotate the traveling screens and return fish to the receiving water via Outfall 012. The Final Permit establishes monthly impingement monitoring requirements when a circulating water pump is operating and the screens are continuously rotating. The Final Rule requires the permitting authority to establish appropriate monitoring requirements for entrainment. *See* 40 C.F.R. § 125.96(b). PNPS must monitor flow continuously and report the average monthly and maximum daily flows at Outfalls 001 and 010, which will ensure compliance with the requirement to achieve the 92% reduction in flow. As the comment states, there is an extensive record of entrainment data for PNPS's CWIS dating back to 1980. The baseline entrainment density under the pre-shutdown flow regime is well documented. PNPS has reduced its flow commensurate with closed-cycle cooling. Because the Agencies believe that the existing record of entrainment data (including data through 2018) is sufficient to characterize the representative entrainment densities at the CWIS, entrainment at the reduced flows can be calculated using the existing record of entrainment and the actual flow at PNPS without additional biological monitoring. For these reasons, the Final Permit includes only limited biological monitoring to demonstrate compliance with the post-shutdown impingement mortality BTA requirements related to continuous operation of the traveling screens.

8.2 The Draft Permit Should Not Require Entrainment Sampling To Be Conducted In The Intake Bays

Attachment B provides that, irrespective of whether sampling occurs before or after PNPS shuts down, "[e]ntrainment samples shall be collected from a representative location within the intake structure if feasible."[365] Requiring sampling to be conducted from within the intake bay is unprecedented for this facility, which currently and historically has conducted such sampling "by suspending a 60-centimeter … diameter plankton net (with flowmeter) in the discharge canal approximately 30 meters … from the headwall."[366] That is for good reason, as sampling in the intake bay itself poses numerous logistical challenges. Neither the Fact Sheet nor any of its Attachments provides any reason why sampling within the intake bay should now be required. Entergy submits that the requirement that entrainment sampling be conducted in the intake bays themselves be deleted, and that such sampling be permitted to be conducted in the discharge canal (as Attachment B itself contemplates in the event that intake-bay sampling "is not feasible," which is the case here).[367]

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365 Draft Permit, Attach. B, § 2.
366 FSEIS at 4-14.
367 *See* Draft Permit, Attach. B, § 2.

Response to Comment 8.2:

Entergy requests that, if entrainment sampling is required, sampling should be conducted from the discharge canal, rather than from within the intake structure, as the Draft Permit requires. According to Entergy, sampling at the intake bays poses "numerous logistical challenges," although the comment fails to elaborate or provide any examples of the "numerous" challenges or otherwise explain why sampling within the intake structure would not be achievable. Other facilities have been required or have elected to sample from the intake bay or from the condenser side of the pumps, and it is not clear to the Agencies from the comment why PNPS in particular would have challenges that other facilities do not. *See, e.g.*, AR-728, AR-729. Nevertheless, after reviewing the monitoring requirements in the Final Permit, the Agencies have eliminated post-shutdown entrainment monitoring, and thus the requirement to sample from the intake bay, from the Final Permit. *See* Response to Comment III.8.1.

8.3 The Draft Permit's Definition Of "Unusual Impingement Events" Is Over Inclusive

Part I.D.12 of the Draft Permit proposes changes to the condition of PNPS's current 1994 Amended NPDES Permit that requires PNPS to account for "Unusual Impingement Events" ("UIEs").[368] Specifically, Part I.D.12 of the Draft Permit proposes defining UIEs to mean "the impingement of twenty (20) or more total fish of all species impinged per hour … includ[ing] fish in the traveling screens and the intake bays."[369] Upon learning of a UIE, Part I.D.12 of the Draft Permit requires PNPS to notify DEP and EPA of the event within 12 hours, and to follow up within 5 business days by providing a written report detailing (1) the number, species and size ranges of fishes impinged, including measurement to the nearest centimeter of the total length of a "representative sample of 25% of fish specimens from each species, up to a maximum of 50 total fish specimens"; (2) the date and time of occurrence; (3) PNPS personnel's "opinion … as to the reason the incident occurred"; and (4) "remedial action that [PNPS] recommends to reduce or eliminate this type of incident in the future."[370]

These conditions are problematic in multiple respects and require revision. First, the definition of UIEs as being every impingement event where 20 or more fish are impinged within an hour is over inclusive. Such events are not at all "unusual" at PNPS, since most of the fish species that have been found impinged at the facility travel in large schools. Instead, if UIEs should be defined by a numerical threshold – they currently are not in the 1994 Amended NPDES Permit, presumably leaving it to the best professional judgment of PNPS personnel[371] – Entergy suggests that the threshold be defined as the impingement of 1,000 or more total fish over the course of the continuous impingement event. That definition is consistent with historical data, which show that such events have tended to occur only infrequently – on average less than once per year over PNPS's 40+-year operating history, and in many years, not all.[372]

Second, the condition requiring PNPS to develop a remediation plan for UIEs is inappropriate insofar as it imposes that obligation even with respect to UIEs for which PNPS's operations are not responsible. As EPA has recognized, Section 316(b) is not concerned with minimizing the "impingement" of dead or "naturally moribund" fish (*i.e.*, fish that already are close to death for reasons unrelated to the facility's operations), and such impacts are therefore excluded from the Section 316(b) analysis.[373] There is every reason to believe that most if not all of the historic UIEs at PNPS are of dead or "naturally moribund" fish.

It is well documented and established in scientific literature that many large impingement events at power plants are due to natural causes and have nothing to do with the operation of the power plants' cooling systems. Specifically, multiple studies have confirmed that large impingement events, particularly those involving clupeid fish, are a common occurrence at many power plants during the colder months, and have identified "cold shock," as a function of out-of-season migration, as the culprit.[374] "Cold shock" is the "acute decrease in ambient temperature that has the potential to cause a rapid reduction in body temperature, resulting in a cascade of physiological and behavioural responses," and may be caused by, among other things, "rapid changes in seasonal temperatures."[375] The "physiological and behavioural responses" that cold shock induces in fish may include reduced swimming ability that tends to "compromise foraging and impede predator evasion,"[376] rendering fish that sustain cold shock essentially moribund, and thus far more likely to be impinged as a result, although the fish likely would have succumbed to predators or to starvation in any event.[377]

The timing and makeup of PNPS's historic large impingement events suggest that most of them likely were due to cold shock, or perhaps secondary consequences of predation. Notably, as summarized in Attachment D to the Fact Sheet, more than half of these events were dominated by the impingement of clupeids, predominantly Atlantic menhaden.[378] Clupeids, including menhaden and alewife in particular, have been shown to be particularly susceptible to natural mortality and subsequent impingement by cooling water intake systems, due not only to cold shock, but also (at least in the case of menhaden) to anoxia caused by crowding as a result of "large schools being chased into small confined embayments by predators such as bluefish and striped bass."[379] Also consistent with cold shock as the explanation is the fact that, with few exceptions, nearly all of these large impingement events occurred in the autumn months of September through November, times when unexpectedly large shifts in ambient temperatures giving rise to cold shock might reasonably be expected to occur.[380]

Both of these facts suggest that cold shock, not PNPS's cooling system, has been behind the majority of historic large impingement events at PNPS since it began operating, and is likely to be responsible for additional large impingement events in the future. With respect to such events, "remedial action" is neither warranted nor possible, contrary to the requirement imposed by Part I.D.12.d.[381] Entergy therefore proposes that the Part I.D.12.d of the Draft Permit be revised so as to provide that investigation and remedial action should be undertaken only in the event that impingement is not a function of natural events, such as cold shock, but instead related to PNPS's operations.

Entergy also proposes, in lieu of the new requirement under Part I.D.12.a that PNPS personnel must measure the length of as many as 50 impinged fish – a change the Fact Sheet makes no attempt to explain – that the requirement of the current permit that "[t]he kinds, sizes, and approximate number of fish involved in the incident" be recorded be retained instead.[382] Such report should also be allowed to be made based on visual observation, if properly documented and recorded.

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368 *Compare* Draft Permit at 31 *with* 1994 Amended NPDES Permit at 13.
369 Draft Permit, Part I.D.12, at 31.
370 *Id.*
371 *See* 1994 Amended NPDES Permit, Part I, at 13.
372 *See* Fact Sheet, Attach. D, at 21-22 & Table 2; *see also* NAI, Marine Ecology Studies: Pilgrim Nuclear Power Station, January – December 2014 (2015).
373 *See, e.g.*, 40 C.F.R. §§ 125.92(o), 125.94(a)-(c) (setting standards with which existing facilities must comply to minimize "impingement mortality," which is defined to mean "death *as a result of impingement*" (emphasis added)); EPA, Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule (May 19, 2014), at 11-4 (excluding studies that reported only instantaneous impingement mortality, in part because they "might reflect already injured, nearly dead, or already dead fish ('naturally moribund') that were impinged by the screen").
374 *See, e.g.*, B.A. Fost, *Physiological & Behavioral Indicators of Shad Susceptibility to Impingement at Water Intakes* (Univ. of Tenn. 2006), at 33 (concluding that threadfin and gizzard shad that suffer from cold shock are rendered moribund and therefore more susceptible to impingement); *see generally* EPRI, *The Role of Temperature and Nutritional Status in Impingement of Clupeid Fish Species* (Mar. 2008); EPRI, *Bioindicators of Performance and Impingement Susceptibility of Gizzard and Threadfin Shad* (July 2011).
375 M.R. Donaldson, *et al.*, *Cold Shock and Fish*, 73 J. Fish. Biol. 1491, 1492 (2008).
376 *Id.* at 1508.
377 *See* Fost, *supra* note 283, at 33 ("It is assumed that moribund fish would not recover and die regardless of impingement," because they are "more susceptible than healthy [fish] to natural predation").
378 *See* Fact Sheet, Attach. D, at 21-22, Table 2.
379 EPRI 2008, at 2-10 (also noting cold shock as a potential cause of natural mass-mortality in clupeids, including menhaden).
380 *See* Fact Sheet, Attach. D, at 21-22, Table 2.
381 *See* Draft Permit, Part I.D.12, at 31.

Response to Comment 8.3

Entergy comments that the Draft Permit's proposed unusual impingement event requirements are problematic in multiple respects and require revision. According to Entergy, the threshold of 20 fish/hour is overbroad and the condition "requiring PNPS to develop a remediation plan" is inappropriate.

Energy suggests that the definition of UIEs in Part I.D.12.d of the Draft Permit as being an event where 20 or more fish are impinged within an hour is over inclusive and requests that the threshold be defined as the impingement of 1,000 or more total fish over the course of the continuous impingement event, which is "consistent with historical data." EPA reviewed unusual impingement event requirements in other permits and consistently found thresholds equivalent to or even less than that proposed for PNPS in the Draft Permit. *See*, for example, MA0040304

University of Massachusetts Boston, MA0004898 GenOn Kendall Cogeneration Station, and MA0028193 Wheelabrator Saugus. In addition, a threshold of 20 fish per hour is not entirely inconsistent with historical data, although Entergy does not report hourly rates for unusual events under the 1991 Permit. As an example, an impingement event in December 2014 reported an impingement rate of 33 fish per hour. See Fact Sheet Attachment D at 20 and AR-684. Among the unusual impingement events reported between 1973 and 2010 (Table 2 in Attachment D of the Fact Sheet), the calculated hourly impingement rate ranges from 11 fish per hour to 1,486 fish per hour with an average of 210 fish per hour. Finally, in its EIS for NRC relicensing (AR-322 at 2-10), Entergy described when the traveling screens are operated, including "[w]hen there is an indication that fish are being impinged at a rate exceeding 20 fish per hour, at which time the traveling screens are turned continuously until the impingement rate drops below 20 fish per hour for two consecutive sampling events."

At the same time, PNPS has ceased electricity-generating operations and, as a result, maintains an actual through-screen velocity of no greater than 0.5 fps more than 90% of the time on a monthly basis. This should ensure that most fish are able to avoid impingement. 79 Fed. Reg. 48,336-7. For the limited periods when PNPS operates a circulating water pump—thereby increasing the through-screen velocity above 0.5 fps—the Final Permit requires continuous rotation of the traveling screens. In other permits, unusual impingement events trigger a requirement to continuously rotate the traveling screen until the hourly impingement rate drops below a set threshold. See, for example, MA0040304 University of Massachusetts Boston and MA0028193 Wheelabrator Saugus. PNPS is already required to continuously rotate the screens regardless of an unusual event when operating a circulating water pump. When the circulating pumps are not operating, and the through-screen velocity is no greater than 0.5 fps, PNPS will likely rotate the screens as it currently does (routinely and in response to a pressure differential). See AR-489. Under these conditions, where the screens do not rotate on an hourly basis, an hourly impingement rate may not be the most representative measure of impingement. The number of fish impinged during a single 12-hour shift may be more representative of screen inspection and rotation when the circulating water pumps are off and is consistent with unusual impingement event requirements at other CWISs. See, for example, MA0028193 Wheelabrator Saugus. In this case, an unusual impingement event would require the Permittee to continuously rotate the screens until the impingement rate declines and which, according to the EIS (AR-322), PNPS already does as a routine measure. At the same time, the PNPS would already be operating with one of the most effective technologies to minimize impingement mortality (a through-screen velocity no greater than 0.5 fps). The Agencies have changed Part I.A.20 of the Final Permit to define an unusual impingement event as more than 250 fish in a single 12-hour period (which is slightly more than 20 per hour and consistent with historical data) *or* more than 1,000 fish in a single impingement event and require the Permittee to continuously rotate the screens until the hourly impingement rate is less than 5 per hour. The Final Permit's definition of UIE is slightly different than the Draft Permit but now triggers an action that is likely to reduce impingement mortality (continuous rotation of traveling screens).

Entergy also comments that requiring PNPS to develop a remediation plan for UIEs is inappropriate and that there is every reason to believe that the historic UIEs at PNPS are mostly of dead or "naturally moribund" fish. First, the Draft Permit does not require a "remediation plan" as the comment suggests but rather requires only that the Permittee report a recommended remedial action to reduce or eliminate this type of unusual impingement event. Second, this reporting requirement is not new. The 1991 Permit at Part I.A.8.a(5) required the permittee to report "the remedial action the company will take to prevent a reoccurrence of the incident," and applied to "[a]ny incidence . . . of unusual number of fish impinged on the intake traveling screens" (and also to "fish mortality associated with the thermal plume"). The Final Permit includes requirements for operation of the CWIS consistent with the BTA to minimize impingement mortality. It is not clear what additional action the Permittee would take to further minimize impingement during a UIE other than to continuously rotate the traveling screens. Part I.A.20 of the Final Permit eliminates the requirement to recommend a remedial action, though it does not prevent the Permittee from providing one should it be appropriate and retains the requirement to report the suspected reason the incident occurred.

Finally, Entergy requests that, in lieu of the new requirement under Part I.D.12.a that PNPS personnel measure the length of as many as 50 impinged fish, the Final Permit retain the 1991 Permit requirement to report "[t]he kinds, sizes, and approximate number of fish involved in the incident," which could be made based on visual observation. The requirement to count, identify, and measure fish during an unusual impingement event is commonly included in NPDES permits with UIE requirements. Entergy offers no justification for eliminating this requirement and has not explained why it could not be achieved at PNPS where similar requirements are routinely implemented at other facilities. The 1991 Permit requirement essentially requires the same information (species, size ranges, and approximate number of organisms) but is not as precise and will potentially result in data that are less reliable. At most, the proposed condition in the Draft Permit requires the Permittee to measure a portion of the impinged fish (up to 50 per species). Part I.A.20.a of the Final Permit retains the requirement to count and measure impinged fish during a UIE.

9.0 Irrespective Of Whether PNPS Shuts Down In 2019, Its Operations Will Not Have Significant Impacts On Listed Species Or Essential Fish Habitat

The Fact Sheet, in its discussion of the potential impacts of PNPS's CWIS on threatened and endangered species ("listed" species) and essential fish habitat ("EFH"), states several times that Entergy expects to terminate electricity generation at PNPS as of June 1, 2019.[383] In addition, as specified below, the Fact Sheet includes language that could be understood as predicating EPA's determination that continued operation of PNPS's CWIS will have no significant adverse impacts on listed species or EFH on PNPS's expected shutdown. Entergy respectively submits that the Fact Sheet should make clear that EPA's conclusion that renewal of PNPS's NPDES permit is appropriate is based on *status quo* operation, and is not contingent on the plant's shutdown in 2019.

The Fact Sheet and its attachments provide a thorough analysis of the potential impacts from operation of PNPS's CWIS on listed species and EFH, both during continued operations and after shutdown.[384] With respect to listed species, the Fact Sheet presents a robust summary of information for each of eight listed species[385] identified by the National Marine Fisheries Service ("NMFS") as potentially inhabiting the area of Cape Cod Bay affected by PNPS operations (the "action area"), including on a seasonal basis. The Fact Sheet also incorporates the conclusions previously reached by NMFS in its 2012 Endangered Species Act ("ESA") consultation with NRC.[386] In that consultation, which was completed before Entergy announced its intention to cease electric-generation at PNPS, NMFS conducted a comprehensive review of potential direct and indirect impacts of PNPS's continued operation on listed species during the 20-year license renewal term.

382 *See* Draft Permit, Part I.D.12, at 31; 1994 Amended NPDES Permit, Part I, at 13.
383 *See*, *e.g.*, Fact Sheet at 55, 63, 64, 65, 68-70.
384 *See id.* at 54-71 and Attachs. B, C and D.
385 Specifically, Atlantic Sturgeon, North Atlantic Right Whale, Humpback Whale, Fin Whale, Kemps Ridley Sea Turtle, Leatherback Sea Turtle, Loggerhead Sea Turtle, and Green Sea Turtle.
386 *See id.* at 65 (citing Letter from Daniel S. Morris, NMFS, to Andrew S. Imboden, NRC (May 17, 2012) ("2012 ESA Consultation letter")).

Response to Comment 9.0:

The comment suggests that the mention of the proposed shutdown date, June 1, 2019, in the Fact Sheet sections describing the impacts of the Draft Permit on essential fish habitat and on threatened and endangered species, as well as designated critical habitat, could "be understood as predicating EPA's determination that continued operation of PNPS's CWIS will have no significant adverse impacts on listed species or EFH on PNPS's expected shutdown. Entergy requests that EPA clarify here that its conclusion as it pertains to the potential impacts of continued operation on EFH and ESA species is appropriate is based on *status quo* operation, and is not contingent on the plant's shutdown in 2019."

In Section 12 of the Fact Sheet, EPA concluded that the conditions and limitations in the Draft Permit will adequately protect all aquatic life, including those with designated EFH in Cape Cod Bay, and that further mitigation is not warranted. EPA clearly described its justification for this reasoning in the Fact Sheet (at 70), including that permit limits are as stringent as or more stringent than the current permit, that numeric limits for pH, oil and grease, total residual oxidants, tolyltriazole, sodium nitrate, and total suspended solids are consistent with surface water quality standards, and that the thermal plume is relatively small compared to the size of the receiving water and dissipates rapidly.

EPA also considered that the substantial reduction in the intake of cooling water and the discharge of heated water as a result of the shutdown would protect EFH for managed species in Cape Cod Bay. *See* Fact Sheet at 70-71. In other words, EPA concluded that EFH species would be adequately protected based on the limitations and conditions of the Draft Permit, which includes limitations and conditions on the CWIS that represent the BTA for PNPS: a 92% reduction in water withdrawals and a through-screen velocity no greater than 0.5 fps (except for when operating a circulating water pump no more than 48 hours per month).

PNPS shutdown on May 31, 2019 and can meet conditions that are representative of the BTA for the protection of aquatic species, including those with designated EFH. EPA did not require PNPS to install or operate any additional technologies to reduce impingement or entrainment on the basis that, because the useful life of the plant is limited, no available technologies would be operational prior to the shutdown. Many of the species with designated EFH are impinged and entrained by the CWIS at PNPS, including many of the species discussed in Response to Comment III.2.1. However, EPA's consideration of the post-shutdown conditions precluded the need for a more thorough examination of potential available technologies to minimize impingement and entrainment of EFH species because the BTA requirements that PNPS can meet upon shutting down are more stringent and more effective than many of the alternatives that EPA was considering prior to Entergy's announcement of the shutdown. For example, EPA did not assess whether the existing traveling screens and once-through cooling system at its current intake volume would be protective of EFH over the long-term without additional mitigation because this is not what is required by the Final Permit. The fact is, PNPS has shutdown, and the shutdown, as it relates to the remaining useful life of the plant, was a primary consideration in setting effluent and intake requirements for PNPS. EPA cannot, at this point, make a definitive statement that the continued operation of PNPS would have adequately protected EFH species because it did not undertake this analysis on the basis that the Facility was shutting down. This is not to say that EFH species would *not* be protected, only that EPA did not assess the impacts of continued operation.

In Section 11 of the Fact Sheet, EPA found that the proposed action as authorized by the Draft Permit will not adversely affect ESA listed species or their critical habitat. This finding is consistent with the National Marine Fisheries Service's (NMFS) conclusion during the ESA consultation completed for the 2012 relicensing of PNPS. See AR-465. NMFS' assessment was based on the current operating conditions at PNPS. In its correspondence with NMFS for the issuance of the Draft Permit, EPA found that because the Draft Permit is as stringent as, or in some cases more stringent than, the permit conditions upon which NMFS' 2012 finding of "not likely to adversely affect," the issuance of the Draft Permit does not trigger re-initiation of the ESA Section 7 consultation. *See* AR-698. NMFS concurred with EPA's assessment. *See* AR-694. Thus, EPA's assessment that the proposed action (the reissuance of the NPDES permit) may affect, but is not likely to adversely affect, ESA listed species and designated critical habitat in the action area is consistent with NMFS' same finding for the operation of the Facility under the current permit and operating conditions.

9.1 NMFS's Findings Confirm PNPS's Operations Do Not Affect Listed Species Or Essential Fish Habitat

NMFS's review found that PNPS's thermal discharge is unlikely to adversely impact listed species or their prey, due to its limited size relative to Cape Cod Bay, its rapid dissipation, and the ease with which it is avoided.[387] NMFS also found that, because early life stages of listed species are either not present or too large to be entrained, and sub-adult and adults are likely strong enough swimmers to avoid becoming impinged, impingement or entrainment of any Atlantic sturgeon, whales, or sea turtles is extremely unlikely to occur.[388] After reviewing the best available scientific evidence on the potential direct impacts of PNPS's impingement and entrainment and discharge of thermal effluent (and other pollutants) on the eight listed species, as well as the potential indirect impacts on those species' prey, NMFS concluded:

> based on information from NRC, Entergy, and other sources, all effects to listed species will be insignificant or discountable. Therefore, the *continued operation* of PNPS under the terms of a renewed operating license is not likely to adversely affect any listed species under NMFS jurisdiction.[389]

Importantly, NMFS's review included an assessment of the potential for migratory sea turtles to remain unseasonably long in the Action Area due to the presence of the thermal discharge, thereby becoming vulnerable to "cold stunning" in the fall.[390] Based on its review, NMFS concluded:"[g]iven the transient nature of the thermal plume, its presence at the surface, and the small size of the area that would have temperatures that would support sea turtles, it is extremely unlikely that sea turtles would seek out and use the thermal plume for refuge from falling temperatures in the Bay" and therefore "extremely unlikely that the discharge of heated effluent increases the vulnerability of sea turtles in the action area to cold stunning."[391] With respect to whales, NMFS also found that, although Cape Cod Bay is designated as right whale critical habitat, PNPS's thermal effluent is no longer detectable within that habitat, and other discharged pollutants are no longer distinguishable from background, such that "*continued operation* of PNPS will have no effect on right whale critical habitat."[392] Thus, NMFS's conclusion that PNPS's CWIS is "not likely to adversely affect" listed species is premised on PNPS's *continued operation* (*i.e.*, generation of electricity) throughout the 20-year license renewal period; it is not contingent on the cessation of electric-generation in 2019 or in any other year prior to the expiration of the license renewal term.

The Fact Sheet states that, "consistent with the conclusion NMFS reached in 2012," renewal of PNPS's NPDES permit "is not likely to adversely affect . . . any species listed as threatened or endangered by NMFS or any designated critical habitat."[393] However, in contrast to NMFS's conclusion, the Fact Sheet includes statements that could be interpreted as making EPA's determination contingent upon the expected cessation of electric-generation in 2019. In particular, the Fact Sheet states that "[i]t is EPA's opinion that the operation of this facility, *as governed by this permit action*, is not likely to adversely affect the listed species or any of their critical habitat . . . ."[394] The Fact Sheet also states that "[b]ecause the draft permit includes effluent limitations and conditions that are *as stringent as or more stringent than* the conditions assessed in the 2102 consultation, the effects of the draft permit on threatened and endangered species and critical habitat, as described above, have already been considered and EPA has determined that re-initiation of consultation is not necessary at this time."[395]

Because the Draft Permit currently includes a mandatory shutdown provision, the phrase "*as governed by this permit action*" could be interpreted as conditioning EPA's "not likely to adversely affect" determination on PNPS's shutdown. Likewise, because the Fact Sheet includes effluent limitations and conditions that apply post-shutdown, the reference to permit effluent limitations and conditions that are "*more stringent than*" the conditions assessed by NMFS could be taken as premising EPA's determination that "re-initiation of consultation is not necessary" on PNPS's expected termination of electric-generation in 2019. Neither of these interpretations is correct.

As explained above, NMFS's conclusion that PNPS's CWIS is "not likely to adversely affect" listed species assumed PNPS's continued operation for the 20-year duration of its renewed operating permit. Therefore, any interpretation of EPA's determinations as being contingent on cessation of electric-generation would be directly *contrary* to NMFS's conclusion. Entergy therefore requests that EPA revise the Fact Sheet to make it clear that, consistent with NMFS's conclusion, its determination that PNPS's continued operation is "not likely to adversely affect" listed species is not contingent upon the expected cessation of electric-generation.

With respect to EFH, the Fact Sheet states that

> EPA and MassDEP have concluded that the *current permit limits* will assure the protection and propagation of the balanced, indigenous population and that there are likely to be no adverse effects from the thermal plume on benthic flora, benthic fauna, and pelagic fish, including species for which EFH has been designated.[396]

This conclusion is supported by EPA's and DEP's comprehensive analysis of PNPS's *existing* thermal discharge limits in Section 7 of the Fact Sheet and in Attachments B and C. As explained in the Fact Sheet "[t]he thermal plume from [PNPS] is relatively small compared to the receiving water and dissipates rapidly. *Over 40 years of biological monitoring data demonstrate that the variance-based limits will assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife*."[397]

However, similar to its conclusions regarding impacts to listed species, EPA includes two rationales among its reasons for this conclusion that would appear to premise this determination on PNPS's shutdown:

> Following termination of electrical generation at PNPS, the facility will cease discharges of non-contact cooling water from the main condenser, which will drastically reduce the maximum effluent temperature and rise in temperature compared to the existing conditions.
>
> The draft permit establishes requirements related to the CWIS that reduce cooling water withdrawals from Cape Cod Bay by 96%, prohibit cooling water withdrawals for the main condenser, and require the facility to achieve a through-screen velocity no greater than 0.5 fps. These conditions become effective upon terminating electrical generation at the plant and no later the June 1, 2019 and are expected to reduce impingement and entrainment of all aquatic life by 96%. These conditions will also significantly reduce the temperature differential and extent of the thermal plume.[398]

As explained above in the Environmental Context Section and reflected in the Fact Sheet, the best available evidence demonstrates that current discharge limits have assured, and will in the future continue to assure, the "protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife."[399] Therefore, Entergy requests that the Fact Sheet be revised to make clear that, even if the more stringent thermal discharge limits associated with the expected shutdown do not come into play, PNPS operations would continue to "adequately protect all aquatic life, including those with designated EFH in Cape Cod Bay."[400]

With respect to operations beyond shutdown, the Fact Sheet correctly notes that any impacts on listed species (and EFH) from PNPS's operations would only be further reduced.[401] Importantly, while both EPA and NMFS acknowledge in their analyses that minimal impacts to listed species may occur beyond shutdown, neither agency found the need for an incidental take permit.

387 *See* 2012 ESA Consultation Letter at 15-24.
388 *See id.* at 7-9.
389 *Id.* at 30 (emphasis added).
390 *Id.* at 20-21.
391 *Id.*
392 *Id*. at 30 (emphasis added).
393 Fact Sheet at 65.
394 *Id*. (emphasis added).
395 *Id*. (emphasis added).396 *Id*. at 70.
397 *Id*.
398 *Id*. at 70-71.
399 *Id*. at 70.
400 *See id.* at 71.
401 *Id*. at 64, 70-71.

Response to Comment 9.1:

In its comment, Energy suggests that "any interpretation" of EPA's determinations as being contingent on cessation of electric-generation would be directly *contrary* to NOAA Fisheries' conclusion that the CWIS is "not likely to adversely affect" listed species from its consultation with the NRC on renewal of PNPS's operating permit in 2012. As in the comment above, Entergy requests that EPA revise the Fact Sheet to make it clear that, consistent with NMFS's conclusion, its determination that PNPS's continued operation is "not likely to adversely affect" listed species is not contingent upon the expected cessation of electric-generation. In addition, Entergy requests that EPA revise the Fact Sheet to make clear that PNPS operations, even without the more stringent thermal discharge limits associated with the expected shutdown, will continue to adequately protect all aquatic life, including those with designated EFH in Cape Cod Bay. The Fact Sheet will not be re-issued and will not be revised. This Response to Comment document, prepared by EPA, serves as a record of how the Final Permit addresses any issues raised with the Fact Sheet.

EPA found that the proposed action as authorized by the Draft Permit will not adversely affect ESA listed species or their critical habitat. See Fact Sheet at 54-65. As the comment indicates, this finding is consistent with NOAA Fisheries' conclusion during the 2012 relicensing of PNPS and was based on the current operating conditions at PNPS at the time of re-licensing. See AR-465. In its correspondence with NOAA Fisheries for this permit, EPA found that because the Draft Permit conditions are as stringent as, or in some cases more stringent than, the permit conditions upon which NMFS' 2012 finding of "not likely to adversely affect," the issuance of the Draft Permit does not trigger re-initiation of the ESA Section 7 consultation. *See* AR-698. NMFS concurred with EPA's assessment. *See* AR-694. Thus, EPA's assessment that the proposed action (the reissuance of the NPDES permit) may affect, but is not likely to adversely affect, ESA listed species and designated critical habitat in the action area is consistent with NMFS' same finding for the operation of the Facility under the current permit and operating conditions while PNPS was generating electricity. PNPS has ceased operations on May 31, 2019, resulting in a substantial decrease in the seawater intake and heated effluent, and a reduction in the impacts from thermal impacts, impingement, and entrainment. Although EPA's finding, and

NOAA Fisheries' concurrence were not contingent upon the shutdown, the post-shutdown impacts on listed species are also not likely to adversely affect listed species.

With respect to EFH species, Entergy maintains that best available evidence demonstrates that the discharge limits of the current permit have assured, and will in the future continue to assure the protection and propagation of a balanced, indigenous community of shellfish, fish, and wildlife. As the Fact Sheet (at 70) states, "the thermal plume from PNPS is relatively small compared to the receiving water and dissipates rapidly." EPA agrees that, as stated in the Fact Sheet, the variance-based thermal limits in the current permit and reflected in the pre-shutdown Draft Permit limits would protect the balanced, indigenous population (BIP), including those species with designated EFH in Cape Cod Bay and listed in the Fact Sheet at 66-7.

The Fact Sheet (at 70) provides two additional reasons why EFH will be protected that, according to Entergy, wrongly premise the determination on PNPS's shutdown, including that the Facility will cease discharges of non-contact cooling water from the main condenser, which will reduce the maximum effluent temperature and rise in temperature compared to the existing conditions, and the requirements related to the CWIS that reduce cooling water withdrawals from Cape Cod Bay by 96%, prohibit cooling water withdrawals for the main condenser, and require the facility to achieve a through-screen velocity no greater than 0.5 fps. The Final Permit eliminates the language about the main condenser in response to Entergy's comments. EPA and MassDEP clearly concluded that the existing, pre-shutdown variance-based thermal limits, which were consistent with the current permit, are protective of the BIP and of EFH species. Having said that, the post-shutdown thermal limits in the Final Permit, which reflect a substantial decrease in the volume and magnitude of heated effluent as of June 1, 2019, offer even more protection of the BIP and of species with designated EFH.

Entergy's other comment is that EPA appears to premise its conclusions about the impacts of the CWIS on the Draft Permit's requirements associated with the shutdown. See Fact Sheet at 70. As explained in Response to Comment III.9.0, above, PNPS shutdown on May 31, 2019. EPA did not require PNPS to install or operate any additional technologies to reduce impingement or entrainment on the basis that, because the useful life of the plant is limited, no available technologies would be operational prior to the shutdown. Many of the species with designated EFH are impinged and entrained by the CWIS at PNPS, including many of the species discussed in Response to Comment III.2.1. However, EPA's consideration of the post-shutdown conditions precluded the need for a more thorough examination of potential available technologies to minimize impingement and entrainment of EFH species because the BTA requirements that PNPS can meet upon shutting down are more stringent and more effective than many of the alternatives that EPA was considering prior to Entergy's announcement of the shutdown. The fact is, the remaining useful life of the plant (i.e., the proposed shutdown), while not required, was a primary consideration in setting effluent and intake requirements for PNPS. EPA cannot, at this point, make a definitive statement that the continued operation of PNPS would have adequately protected EFH species because it did not undertake this analysis on the basis that the Facility was shutting down. This is not to say that EFH species would *not* be protected, only that EPA did not assess the impacts of continued operation.

9.2 Additional Evidence Confirms The Lack Of Any Credible Evidence That PNPS's Operations Have Had Or May Be Expected To Have An Effect On Cape Cod Bay's Aquatic Ecosystem, Including With Respect To Endangered Species

In 2012, in the context of proceedings before NRC, Dr. Michael Scherer, a leading fisheries biologist who has managed aspects of PNPS's biological monitoring programs since 1973 and supervised or otherwise participated in the aquatic studies conducted as part of that program since 1974, provided sworn testimony.[402] Dr. Scherer's analysis further confirms that "the continued operation of PNPS [would] have no discernible effects on [species protected under the federal Endangered Species Act, or 'ESA']," or on non-listed species including river herring and winter flounder.[403] Specifically, Dr. Scherer evaluated eleven (11) listed species, including shortnose sturgeon and Atlantic sturgeon, four different species of sea turtles and five different species of whales.[404] With respect to sturgeon, shortnose sturgeon "generally do not migrate beyond the estuary associated with their natal river," and the nearest such river to PNPS is 62 miles away, with the result that shortnose sturgeon are unlikely ever to encounter PNPS's CWIS.[405] While Atlantic sturgeon are potentially present in Cape Cod Bay, they would likely be present only in their adult life stages, whose size makes them not susceptible to entrainment and whose swimming abilities make them not susceptible to impingement.[406] Confirming this analysis, historic entrainment and impingement data from PNPS reflect that no Atlantic sturgeon or sturgeon remains have ever been observed to be entrained, impinged, or seen by dive teams charged with clearing the trash racks at PNPS.[407]

With respect to sea turtles, prevailing currents in Cape Cod Bay are such that loggerhead, green, and leatherback turtles are unlikely to encounter PNPS's CWIS, and no remains from these species or the Kemps Ridley turtle have ever been found impinged on the trash racks of PNPS's CWIS.[408] As for the five endangered whale species – North Atlantic right whales, humpback whales, fin whales, sei whales and sperm whales – the only potential impacts from PNPS's CWIS are indirect impacts to these species' foraging of other aquatic species, and such impacts are likely to be trivial. Four of the whale species (all except for the sperm whale) feed in dense areas populated by small, planktonic organisms, which tend to be located in the northeast and southern portion of Cape Cod Bay away from PNPS's CWIS, or small schooling fish – neither of which is entrained or impinged at PNPS in numbers great enough to have any noticeable impact on the amount of forage available to these species.[409] With respect to sperm whales, data reported by the National Oceanographic and Atmospheric Administration ("NOAA") indicate that this species is rarely cited in Cape Cod Bay, and the species it forages tend to be deep-water species or those with swimming abilities that render them not susceptible to impingement or entrainment.[410]

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[402] Scherer ALSB Aff. ¶¶ 3-4.
[403] *Id.* ¶ 5.
[404] *Id.* ¶ 17.
[405] *Id.* ¶ 20.
[406] *Id.* ¶¶ 27-28.
[407] *See* 2014 Update at 17-18.
[408] Scherer ASLB Aff. ¶¶ 29-47.
[409] *Id.* ¶¶ 49-67.

[410] *Id.* ¶¶ 68-70.

Response to Comment 9.2

In its comment, Entergy appears to reiterate the testimony for the NRC Relicensing of its biologist, Dr. Micheal Scherer. There is no comment on how this testimony relates to the Draft Permit or any request for a change to the Final Permit based on this comment. EPA addressed comments on ESA species in Responses to Comments I.5.4 and III.9.1. Both USFWS and NMFS have determined that the operation of PNPS in compliance with the Final Permit is not likely to adversely affect federally listed species or designated critical habitat in the action area. See AR-694, AR-700.

10.0 Certain Requirements For Electrical Vaults Are Unsupported.

As detailed below, a number of new permit requirements related to stormwater discharges are unwarranted because they are duplicative of other monitoring and reporting requirements, and/or do not reflect PNPS's NRC-regulated cable inspection program and prior representative electrical vault sampling. These proposed requirements for stormwater monitoring appear to be premised on the notion that cables can be submerged to an extent, degree and frequency that results in breaking of wire coatings, allowing stormwater to come into contact with wires. In fact, this is incorrect because PNPS's electrical vault cabling is subject to an NRC-regulated program that ensures cables are not degrading.[411] The effectiveness of the NRC-regulated program is demonstrated by the lack of non-naturally occurring pollutants in representative sampling of stormwater from electrical vaults.[412] For these reasons, and those provided below, Entergy requests that certain stormwater effluent limitations and sampling be removed from the final Permit.

[411] *See infra*, Part VIII.A.3.
[412] *See infra*, Part VIII.A.4.

10.1 Background

10.1.1 Description of PNPS's Electrical Vaults

The twenty-five (25) electric vaults located at PNPS have been there since the facility was initially constructed. They are single-component, concrete systems with iron lids, and therefore designed to be protective of cabling and watertight.[413] Given their configuration, groundwater intrusion from and into the bottom of the vaults would not be expected, and has not been observed in the past. By way of confirmation of this, iron staining is visible at the top and along the sides of slide 11 referenced in footnote 413, showing the intrusion of stormwater via the lids and lid margin into the vaults. Nine (9), or over 1/3, of the vaults are equipped with automatic dewatering pumps.[414]

[413] *See* Goodwin Procter, Discussion Regarding PNPS Manholes, p.11 (May 13, 2015) (presented to EPA on May 13, 2015 and provided to DEP on July 20, 2016) (provided herewith) (providing photograph of one of PNPS's electrical vaults).

[414] *See* Correspondence from Elise N. Zoli, Goodwin Procter, LLP to George Papadopoulos, EPA (June 30, 2015).

10.1.2 History of Communications With EPA On Electrical Vaults

Within the last two years, Entergy has responded to EPA's questions on stormwater discharges from PNPS's electrical vaults. In February 2015, Entergy provided EPA with a letter clarifying the historic record and current framework for managing stormwater discharges at the site.[415] Most recently, in response to EPA's March 24, 2015 Section 308 information request, Entergy provided EPA with: (1) detailed information on its NRC-regulated program for monitoring electrical vaults, and (2) water quality sampling results from representative electrical vaults.[416] Together, these submissions have established that PNPS's stormwater vaults are appropriately monitored and that effluent discharges from these vaults do not cause or contribute to a violation of water quality standards or otherwise violate applicable discharge limits.

10.1.3 NRC Effectively Regulates Electrical Vault Cabling

NRC directly regulates PNPS's electrical vault cabling in a manner designed to ensure that this equipment is maintained in a condition that ensures functionality, including for nuclear safety purposes. To do so, vault cabling submergence is not authorized, but rather effectively managed under NRC regulation, and PNPS's NRC-mandated protocols. Specifically, 10 C.F.R §§ 50.65 and 50.49, and associated NRC directives, require affirmative written maintenance and monitoring procedures to protect against conditions that could result in degradation.

In 2007, NRC issued a generic letter requesting industry-wide review of cabling management and monitoring to avoid conditions that compromise functionality of those systems (*e.g.*, avoiding various failures, such as arcing and shorting equated to submergence).[417] In 2010, NRC issued an information letter setting industry-wide expectations for how the fleet will manage and monitor cables pursuant to NRC regulations, including its expectation that licensees, including PNPS, will:

- Perform a site-wide review of existing cabling sufficient to identify conditions that could reasonably contribute to cabling degradation, chiefly submergence;
- Take prompt corrective action to correct any such conditions, including through the removal of water via installation of sump pumps;
- Test cables to verify that degradation has not occurred; and
- Establish a monitoring program sufficient to ensure against recurrence, despite corrective action, of identified conditions and to identify new conditions.[418]

Compliance with NRC mandates is verified through annual NRC inspections of representative cabling installations, which have resulted in no adverse findings.[419] For these reasons, no submergence, and no submergence-related pollutants, are reasonably expected. This is known to EPA, because (as described below) EPA directed PNPS to perform representative sampling, which identified no relevant pollutants.

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[415] *See* Correspondence from Elise N. Zoli, Goodwin Procter, LLP to George Papadopoulos, EPA (Feb. 11, 2015).
[416] *See* Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy, 3 (Mar. 24, 2015); Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy (June 9, 2015); Correspondence from Elise N. Zoli, Goodwin

Procter, LLP to George Papadopoulos, EPA (June 30, 2015).
417 *See* NRC, Generic Letter 2007-01 (Feb. 7, 2007) (requesting information on "inspection, testing and monitoring programs to detect the degradation of inaccessible or underground power cables").
418 *See* NRC, Information Notice 2010-26 (Dec. 2, 2010).
419 *See, e.g.*, NRC, Pilgrim Nuclear Power Station - Integrated Inspection Report (2012); NRC, Pilgrim Nuclear Power Station - Integrated Inspection Report (2013); NRC, Pilgrim Nuclear Power Station - Integrated Inspection Report (2014); NRC, Pilgrim Nuclear Power Station - Integrated Inspection Report (2015). The integrated inspection reports are available at http://adamswebsearch.nrc.gov/webSearch2/view?AccessionNumber=ML152 24A489.

10.1.4 Recent EPA-Requested Sampling Shows No Exceedances

In its March 24, 2015 Section 308 Information Request, EPA requested the following information from Entergy in order to obtain a "representative" characterization of stormwater discharged from electrical vaults:

- "collect one sample of water from at least (7) seven different electrical vaults on the [PNPS] property and have it analyzed for [twenty-six (26)] parameters" at a specified Minimum Level of Detection ("MLD"); and
- "provide a map showing the general location of all electrical vaults that can accumulate stormwater, specifying which specific electrical vaults were sampled as well as the location of the four (4) existing NPDES-permitted stormwater outfalls, designated serial numbers 004, 005, 006, and 007."[420]

To ensure representative sampling, the seven vaults sampled, which represent just under 30% of the twenty-five vaults on the property, were to "vary in their contents, size and location [and] …be among the deepest and among those that have the greatest amount of electrical wiring and associated equipment."[421] The twenty-six parameters selected for monitoring were based on a subset of the monitoring requirements for EPA's remediation general permit that EPA determined could potentially be present at PNPS.[422]

From June 9 to 12, 2015, water samples were collected from seven electrical vaults at PNPS, specifically CP-1, CP-4, MH-2, MH-4, MH-5, MH-L and MH-Q, including a field duplicate from MH-Q.[423] In the calendar week prior to testing approximately 0.9 inches of rain fell in Plymouth, Massachusetts, which was specifically retained after the storm event to facilitate submergence testing that ordinarily would not be authorized, *e.g.*, MH-Q was immediately pumped after sampling.

The sampling and analytical results demonstrate that these vaults contain only naturally occurring contaminants. Specifically, for all samples taken, only three (3) of the twenty-six (26) parameters, all metals unrelated to wire insulation – iron, zinc and copper − were detected without qualification at or above the Minimum Level of Detection ("ML").[424] Iron, zinc and copper are naturally occurring metals that are known to occur in Massachusetts's soils at the following natural background concentrations: iron − 20,000 mg/kg; zinc −100 mg/kg; and copper − 40 mg/kg.[425] The concentrations detected in PNPS's electrical vaults are far below these natural background concentrations. The detection of iron and zinc in all samples collected further indicates that these detections likely are a result of natural background concentrations. Accordingly, the presence of iron, zinc and copper in the electrical vault samples is consistent with the collection of stormwater ubiquitous in manholes.

The remaining twenty-three (23) parameters appropriately should be considered to be absent from the samples because they were observed below the method detection limit ("MDL") and/or ML, and therefore, as EPA acknowledges, are unreliable and not true detections.[426]

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[420] *See* Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy, 3 (Mar. 24, 2015); Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy (June 9, 2015).

[421] Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy, 3 (Mar. 24, 2015).

[422] *See* Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy, 3 (Mar. 24, 2015); Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy (June 9, 2015).

[423] *See* ERM, *Summary of Manhole Sampling Activities* (June 30, 2015) ("ERM Report").

[424] In addition to the iron, zinc and copper, sampling detected total phenols in the MH-2 sample above the ML; however, that detection was qualified because the sample fell outside acceptable matrix spike/matrix spike duplicate (MS/MSD) recovery limits, which is an element of the laboratory quality control program. If the matrix spike recovery does not fall within the method acceptance criteria, it indicates the sample matrix is interfering with the analysis. Matrix interference typically is associated with complications caused by constituents in the sample itself. For this reason, the detection of total phenol in MH-2 above the ML should not be considered an accurate detection. *See* ERM Report at 2.

[425] Massachusetts Department of Environmental Protection, Technical Update: Background levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil (May 23, 2002), *available at*: http://www.mass.gov/eea/docs/dep/cleanup/laws/backtu.pdf.

[426] An MDL is the "the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero." 40 C.F.R. Part 136 Appendix B. EPA has determined the MDL for various analytical tests and reported them in the Massachusetts Remediation General Permit, Permit No. MAG910000, Appendix VI. An ML "is the lowest level at which the analytical system gives a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence." Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy (June 9, 2015); *see also* 40 C.F.R. Part 136 Appendix B; Remediation General Permit under the National Pollutant Discharge Elimination System (NPDES) for Discharges in Massachusetts, Massachusetts General Permit, Permit No. MAG910000, Appendix VI at 7, notes (Aug. 26, 2010). EPA's Section 308 information request specified the ML to be used for each of the twenty-six (26) parameters. *See* Correspondence from Ken Moraff, EPA to David E. Noyes, Entergy (June 9, 2015) (setting ML for each testing parameter).

Response to Comment 10.1:

As the commenter notes, EPA and Entergy have worked together to characterize the stormwater discharges from PNPS's electrical vaults since late 2014. *See* AR-501, AR-506, AR-507. PNPS has identified 25 electrical vaults from which accumulated stormwater may be pumped to one of the authorized stormwater outfalls (004, 005, 006, and 007). Nine of these vaults are equipped with automated pumps that are activated when the stormwater in the vault reaches a pre-determined level. Fact Sheet at 30. In February 2015, Entergy sent EPA a letter describing its historic and current framework for managing stormwater discharges at the site. *See* AR-496. In March 2015, EPA sent an information request, pursuant to CWA Section 308, requiring sampling of a representative subset of the electrical vaults for a suite of parameters. *See* AR-501. In the information request, EPA stated that sampling was necessary because the water in the vaults comes "into contact with electrical wires and associated equipment" and, therefore, could contain pollutants not representative of other stormwater discharges at the site. *Id.* at 2. At Entergy's request, EPA amended its request in June 2015, including revising the suite of parameters required. *See* AR-506. Entergy provided the results of the sampling of 7 electrical vaults in June 2015. *See* AR-507. Based on these results, the Draft Permit included certain vault-related monitoring requirements. In addition, the Draft Permit includes non-numeric, technology-based limits, including best management practices, aimed to minimize pollutant discharges resulting from the discharge of stormwater associated with industrial activity.

Entergy comments that PNPS's stormwater vaults are already appropriately monitored through its NRC-regulated program for monitoring electrical vaults and that the water quality sampling results from the seven electrical vaults demonstrate that effluent discharges from these vaults do not cause or contribute to a violation of water quality standards or otherwise violate applicable discharge limits.

Turning first to the NRC-regulated inspection program, Entergy did not provide any support for its argument that this inspection program adequately monitors the stormwater discharges from the vaults to ensure that there will be no discharge of pollutants that would cause or contribute to an excursion of the water quality standards. The NRC-regulated inspection program requires that the NRC licensee monitor the performance or condition of structures, systems, or components in a manner sufficient to provide reasonable assurance that these structures, systems, and components are capable of fulfilling their intended functions. 10 C.F.R. § 50.65(a)(1). In other words, the monitoring program is designed to ensure that all components, including electrical wiring, are functioning. This may include monitoring to ensure components are not submerged in water for an amount of time that would compromise their integrity, but there is no indication in the comment that it requires sampling the vaults for the pollutants listed in the 2015 308 letter (or for other pollutant parameters) or that it prohibits submergence. Entergy comments that "vault cabling submergence is not authorized, but rather effectively managed under NRC regulation," and that "no submergence, and no submergence-related pollutants, are reasonably expected." Stormwater infiltration and submergence are known to occur at PNPS,[84] and nine of the vaults are fitted with automated pumps to ensure that stormwater that does collect in the vaults does not interfere with the integrity of the cables. NRC regulations do not prohibit submergence; rather, they require that submergence be included as one of the components of the monitoring program to ensure the integrity and function of the electric equipment. Entergy's own comment states that one of the corrective actions required to effectively manage cables is "the removal of water via installation of sump pumps." Thus, Entergy has confirmed that, in compliance with NRC regulations, there may be periodic discharges of stormwater from the electrical vaults to the stormwater outfalls. The stormwater that collects in the vaults is likely exposed to different pollutants than stormwater otherwise discharged from the authorized outfalls, including electrical cables whether or not those cables are degraded. Moreover, it is not clear that the NRC-regulated inspection program even continued to apply to PNPS once it submitted certification to NRC of its determination to permanently cease power operations. *See* 10 CFR § 50.49(a). The discharges have not been routinely monitored to date, and the monitoring required in the Final Permit will

[84] The comment concedes that "the intrusion of stormwater . . . into the vaults" occurs. *See also* Letter from Elise Zoli, Goodwin Procter, to George Papadopoulos, EPA Region 1, at Exhibit A (June 30, 2015) (noting that "several manholes receive rainwater and are pumped to permitted storm water drains"). Moreover, as noted in the comment, only 9 of the 25 vaults are reportedly equipped with automatic pumps. *See also id.* at Exhibit B; Fact Sheet at 30; NRC Inspection Report attached to Letter from Donald E. Jackson, NRC, to Robert Smith, Entergy (July 28, 2011) (documenting an NRC inspection that found "that Entergy allowed non-safety related medium voltage cables to remain submerged in water for extended periods of time").

ensure that the pollutants discharged from these vaults are sufficiently characterized. To-date, Entergy has provided the Agencies with pollutant monitoring results for only 7 of the 25 vaults. In short, the comment fails to support the claim that the monitoring requirements of the NPDES permit "are duplicative of other monitoring and reporting requirements, and/or do not reflect PNPS's NRC-regulated cable inspection program."

Entergy also comments that the water quality sampling results from representative electrical vaults demonstrate that effluent discharges from these vaults do not cause or contribute to a violation of water quality standards or otherwise violate applicable discharge limits. Entergy's assertion is based on a single sampling event that occurred in June 2015 from 7 of the 25 total electrical vaults that discharge stormwater. The single sampling event of 7 of the vaults observed detectable levels of several metals as well as detectable levels of PCBs, phenols, cyanide, and phthalates. Lead concentrations in five of the seven vault samples from 2015 exceeded the chronic marine water quality criterion for aquatic life; copper concentrations in three of the seven samples exceeded the acute and chronic criteria; and zinc concentrations in three of seven samples exceeded the chronic and acute criteria. As the Fact Sheet (at 31) explains, a one-time sampling requirement for all of the electrical vaults that were not sampled in 2015, analyzed for the same suite of parameters, is warranted to characterize these discharges based on the fact that the vaults are located throughout the property and due to the presence of several pollutants in the initial sampling events. The comment does not support the claim that the monitoring requirements of the NPDES Permit "do not reflect" prior sampling.

The purpose of effluent characterization is to determine whether a discharge causes, has the reasonable potential ("RP") to cause, or contributes to an excursion of numeric or narrative water quality criteria. The objective is to project receiving water concentrations based on existing effluent quality to determine whether or not an excursion above ambient criteria occurs or has the reasonable potential to occur. EPA has not at this point concluded that any of these discharges violate WQS, in part because of the limited data available to assess the variability of the effluent (*e.g.*, only one sample from seven vaults was collected). In addition, the dilution associated with stormwater discharges from the vaults has not been quantified but could be substantial. The vaults may be pumped regardless of flow in the stormwater outfalls (*i.e.*, during dry weather); however, the discharges from Outfalls 004 and 005 would still combine with flows in the discharge canal (*e.g.*, diluted by cooling water from Outfall 010) and the discharges from Outfalls 006 and 007 would be diluted when combining with the receiving water in the intake embayment. The monitoring requirements in the Final Permit are based on the results of the initial monitoring of the seven vaults and reasonable to continue to assess the levels of pollutants present and allow a more statistically significant analysis to be conducted to determine whether there is potential to violate WQS.

Notably, the Permittee has not provided any reasonable potential analysis to support its claim that the discharges from the vaults will not cause or contribute to a violation of water quality standards or otherwise violate applicable discharge limits. Instead, Entergy claims that sampling and analysis of the seven sampled vaults demonstrate that discharges contain "only" naturally occurring contaminants such as iron, zinc, and copper, and references, in support of its statement, the natural background concentrations of these metals in soil. While iron, zinc, and copper are naturally occurring, the presence of these metals in soils does not prove that the presence of these contaminants in the stormwater that accumulates in the vaults is from natural background sources. In addition, PCBs are not naturally occurring and, while cyanide can be naturally occuring, the comment does not explain why the levels of cyanide observed in the effluent would be expected to be naturally occurring.

Part 6.2.1.2 of EPA's 2015 Multi-Sector General Permit (MSGP) for stormwater associated with industrial activity considers the presence of natural background pollutant levels with regards to benchmark monitoring. Benchmark monitoring is performed to determine the overall effectiveness of the control measures on site and to assist permittees' in determining when additional corrective actions may be needed to minimize pollutants in stormwater. A permittee may determine that exceedance of a benchmark is attributable solely to the presence of that pollutant in the natural background. In the MSGP, monitoring for the natural background pollutant is not required provided that (1) the average concentration of the benchmark monitoring result is less than or equal to the concentration of that pollutant in the natural background and (2) the permittee documents (in its SWPPP) the rationale for concluding that benchmark exceedances are attributable solely to natural background pollutant levels, including any data previously collected by the permittee or others that describe the levels of natural background pollutants in the stormwater discharge. Entergy has provided only a reference to levels of metals in the soils in Massachusetts. Stormwater at PNPS, either from the vaults or discharged from the stormwater outfalls, has not been analyzed enough to demonstrate the natural background levels of zinc, iron, and copper in the discharge. The Final Permit requires quarterly monitoring to enable statistical analyses of RP to exceed the water quality criteria for iron, lead, copper, and zinc (taking into account both the variability in the effluent and available dilution) but may also enable the Permittee to characterize the natural background levels of metals in the discharge.

Entergy comments that parameters other than copper, zinc, and iron (i.e., the remaining 23 parameters analyzed in 2015) "should be considered to be absent from the samples because they were observed below the method detection limit ('MDL') and/or ML, and therefore, as EPA acknowledges, are unreliable and not true detections." First, Entergy appears to have confused method detection limit (MDL) with the EPA required Minimum Level of Detection (MLD) listed in Table 2 of its Report. AR-507. The MLD in Table 2 is the minimum level (ML), which is the lowest level at which the laboratory analytical testing method provides a detectable concentration of the target analyte in a sample. *See* EPA Region 1's Remediation General Permit (RGP) (MAG910000), Appendix VI (at 1). The RGP (Appendix VI at 1) also defines "detection limit" as the lowest concentration that can be reliably measured within specified limits of precision and accuracy for a specific laboratory analytical method during routine laboratory operating conditions (i.e., the level above which a value is reported for an analyte, and the level below which an analyte is reported as non-detect.). This is not the same as the MDL, which, as Entergy points out, in footnote 426, is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. *See also* 40 C.F.R. Part 136 Appendix B. Contrary to Entergy's assertion in the comment, EPA does not acknowledge in the RGP or in the other documents cited in the comment that samples observed below the ML are "unreliable and not true detections" or that parameters observed below the ML are assumed to be absent. In fact, the RGP specifically defines a detection level which can be less than the ML and defines the MDL as identifying with 99% confidence that the true concentration is greater than zero. The Draft Permit includes quarterly monitoring requirements for total phenols, total PCBs, total phthalates, total cadmium, and total lead because each was detected above the MDL in a least one of the vaults during the 2015 sampling, which suggests to EPA that the parameter may be present, rather than indicates that the parameter is absent. The Final Permit does not require quarterly monitoring for at least 15 additional parameters that were consistently observed below the MDL. See rationale for excluding certain parameters from additional monitoring in Response to Comment I.3.6.

Finally, Entergy comments that groundwater intrusion would not be expected and has not been observed in the vaults. In its initial characterization of the vaults, EPA stated "it is unknown, but possible, that some of these vaults may be deep enough so as to possibly contain some groundwater through infiltration of the vaults themselves as well as salt spray." AR-501 at 2. However, the Fact Sheet (at 30) discusses only the stormwater discharges from these vaults. Regardless of whether groundwater could infiltrate any of these vaults, it is clear that stormwater accumulates in the vaults and periodically needs to be pumped out either manually or with automated pumps to an authorized stormwater outfall. As a result, stormwater from the vaults is discharged via the stormwater outfalls to the intake bay or discharge canal and then to Cape Cod Bay.

10.2 Certain Of The Draft Permit's Effluent Limitations And Sampling Requirements For Electrical Vaults Are Unsupported

10.2.1 Part I.C.3 Monitoring And Reporting Requirements

Part I.C.3 of the Draft Permit requires monitoring and reporting of, *inter alia*, phenol, PCBs, phthalates, cadmium and lead from five electrical vaults on the PNPS site.[427] PNPS's representative electrical vault sampling results for phenol, PCBs, cadmium and lead were below the ML and in most instances the MDL.[428] For this reason, these results do not and cannot support monitoring and reporting requirements for these pollutants.[429] Further, phenols, phthalates, PCBs, and cadmium are not expected to occur at the PNPS site because of prohibitions on submergence of cabling. Finally, the permit writer has provided no explanation for selecting these pollutants for increased monitoring making the selection arbitrary and capricious. Entergy, therefore, requests that Part I.C.3 be revised to remove monitoring and reporting of total phenol, PCBs, total phthalates, total cadmium and total lead.

427 Draft Permit, Part I.C.3, at 22-23.
428 *See* ERM Report at Table 2.
429 *See supra*, Part VIII.A.4.

10.2.2 Stormwater Pollution Prevention Plan ("SWPPP") Ongoing Monitoring

Part I.H.5 of the Draft Permit requires that "[a]ll areas with industrial materials or activities exposed to stormwater and all structural controls used to comply with effluent limits in this permit, [] be inspected, at least once per month, **including all electrical vaults that are required to be routinely pumped out to a stormwater outfall**," and that samples "shall be collected within the first sixty (60) minutes of discharge from a storm event" and examined for "color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of pollution."[430] The monthly sampling of electrical vaults in the SWPPP are unnecessary in light of stormwater sampling required in Parts I.C.1 through I.C.3 of the Draft Permit. Parts I.C.1 and I.C.2 of the permit require monthly sampling from stormwater outfalls during a storm event for flow rate, TSS, oil and grease and pH.[431] Part I.C.3 requires quarterly sampling of electrical vaults that EPA "consider[s] representative of the discharges"[432] from electrical vaults, and further mandates that samples be "representative of water that has collected . . . and discharged to a permitted outfall."[433] EPA has provided no basis for requiring additional sampling of stormwater in the SWPPP.

Further, monthly monitoring within the first sixty (60) minutes of a storm event is impractical and potentially dangerous, given site conditions and personnel requirements. There are 25 electrical vaults at the PNPS facility and inspection of all of them within the first (60) minutes of a storm event is impractical. Collecting samples from all 25 would present serious feasibility challenges. Entering these vaults during a storm event also is potentially dangerous, because it is difficult to access the confined space during storms. Entergy previously communicated these same concerns with respect to sampling stormwater outfalls, and EPA acknowledged them by altering the stormwater effluent monitoring requirements in Parts I.C.1 and I.C.2 of the Draft Permit.[434]

Finally, based on Entergy's prior extensive submissions to EPA,[435] the 60-minute stormwater inspection and sampling requirement is unnecessary and unsupported. As the Fact Sheet acknowledges, PNPS already undertakes NRC-regulated regular inspections of electrical vaults which ensure that cables are not degrading such that they would contaminate stormwater.[436] The Fact Sheet and Draft Permit provide no explanation for why this inspection regime, already in place, is supposedly inadequate. Indeed, sampling results from electrical vaults confirmed the absence of non-naturally occurring pollutants at detectable levels (*i.e.*, above the ML and/or MDL).[437] In light of these quantitative results and the NRC-regulated inspection program, EPA has provided no basis for requiring monthly qualitative sampling for "color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, or other indicators of pollution."[438]

For all of these reasons, Entergy requests that the requirement to inspect and sample all electrical vaults within sixty (60) minutes of a storm event be removed from the permit.

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[430] Draft Permit, Part I.H.5, at 35.
[431] *See id.*, Part I.C.1 and I.C.2, at 18-21.
[432] Fact Sheet at 30.
[433] Draft Permit, Part I.C.3, at 23 n.2.
[434] *See* Fact Sheet at 29 ("The permittee has noted that some required stormwater sampling over the last few years was not conducted due to the difficulty in accessing stormwater outfalls . . . . Therefore, the draft permit allows for sampling to be conducted in a manhole hydraulically connected to a particular stormwater outfall, *if feasible and in particular if more easily accessible than the actual outfall during a storm event*." (emphasis added)).
[435] *See supra*, Part VIII.A.2.
[436] *See supra*, Part VIII.A.3.
[437] *See supra*, Part VIII.A.4.
[438] Draft Permit, Part I.H.5, at 36.

10.2.3 Cumulative Additional Sampling Of Stormwater Vaults Is Unsupported And Unnecessary

Part I.J of the Draft Permit requires that PNPS "shall conduct a one-time sampling for all of the electrical vaults which were not sampled pursuant to EPA's March 24, 2015 CWA Section 308(a) letter."[439] The Draft Permit, in other words, requires PNPS to conduct sampling for the vaults that EPA staff indicated just last year need not be sampled, and requires the results of that sampling be submitted within 180 days of the effective permit date, for the same 26 pollutant parameters previously sampled.

In the Fact Sheet, EPA states that "a characterization of water collected in all of the vaults is warranted because these vaults are located throughout the property and the initial sampling showed the presence of several pollutants."[440] The explanation in the Fact Sheet is not supported. First, EPA has already determined that the prior sampling was representative of all 25 electrical vaults. As EPA explains in the Fact Sheet, the five electrical vaults selected, for quarterly monitoring are "considered representative of the discharges from the twenty five (25) electrical vaults."[441] Four (4) of these five (5) vaults were previously sampled for all 26 parameters.[442]

Second, as explained above, with the exception of naturally occurring zinc, iron and copper, pollutants were not observed above the ML and/or MDL in the sampled electrical vaults, which mean that those observations are not accurate or meaningful.[443] For this reason, EPA is incorrect when it states that the "initial sampling showed the presence of several pollutants."[444] In sum, the requirement to sample every electrical vault is inadequately supported, indeed contradicted, by the Fact Sheet's own discussion of the sampling results and instead has the aura of punitive action.

For these reasons, Entergy requests that Part I.J of the Draft Permit be removed from the final Permit.

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439 *See id.*, Part I.J, at 37.
440 Fact Sheet at 31.
441 *Id.* at 30.
442 *Compare* Draft Permit, Part I.C.3, at 22 *with* ERM Report, Table 1.
443 *See supra*, Part VIII.A.4.
444 Fact Sheet at 31.

Response to Comment 10.2

Entergy comments that several of the Draft Permit's limitations and conditions for sampling and inspecting the electrical vaults are unsupported. Entergy requests that the Final Permit eliminate or revise provisions at Part I.C.3 (electrical vault sampling), Part I.H.5 (visual inspections of electrical vault stormwater discharges), and Part I.J (one-time sampling of additional vaults). EPA addresses each of these points below, but we first clarify that there is no "right to pollute" the nation's waters. A person may only discharge a pollutant within the meaning of the CWA in adherence with a valid NPDES permit issued by the EPA or delegated state or if the discharge is otherwise authorized by the statute.[85] The permitting authority in such a case must ensure that the permit authorizing such a discharge does so in a manner consistent with the requirements of the Act. Discharges from the electrical vaults have never been fully assessed to determine the pollutants that the facility actually discharges from these vaults via its stormwater outfalls. As described above, the only sampling results ever provided to the Agencies are from a one-time event in 2015 wherein the Permittee sampled water in just 7 of the 25 vaults that the Permittee pumps to its NPDES permitted outfalls. The NRC-regulated inspection program may include monitoring to ensure components—including electrical wiring—are not submerged in water for an amount of time that would compromise their integrity, but it does not prohibit submergence. Moreover, Entergy's comments do not provide or otherwise point to any pollutant data it has collected pursuant to the NRC inspection program. In other words, the Permittee asks the Agencies to remove the vault monitoring requirements from the permit based mainly on the results of one sampling event that examined less than one-third of the sources that the facility pumps to its outfalls to Cape Cod Bay and that revealed detectable amounts of certain pollutants in the sampled sources. It is entirely reasonable for the permit to include monitoring requirements to enable the Agencies to assess whether and how the continued discharge of the contents of these vaults, most of which have never been characterized, may occur in a manner consistent with the requirements of the Act and state law.

According to Entergy, the 2015 sampling results from the electrical vaults do not support the quarterly monitoring requirements for total phenol, PCBs, total phthalates, total cadmium and total lead in Part I.C.3 of the Draft Permit. The Fact Sheet explains that the parameters selected for sampling in Part I.C.3 of the Draft Permit were those that were detected in a least one of the vaults during the single 2015 sampling event. As the Jones River Watershed Association pointed out in Comment I.3.6, in addition to these parameters, antimony, cyanide, nickel, and hexavalent chromium were also detected in the samples but no monitoring was included in the Draft Permit. The Final Permit includes monitoring for all parameters detected in at least one of the vaults during the single sampling event. *See* Response to Comment I.3.6. Entergy argues that quarterly monitoring for phenol, PCBs, total phthalates, total cadmium and total lead should not be required because this single sampling event—of less than one-third of the electrical vaults from which the Permittee discharges pollutants to Cape Cod Bay—detected these parameters below the ML and *in most instances* the MDL. Entergy appears to argue that a parameter detected below the ML should be presumed to be absent, even from vaults that Entergy did not sample. EPA disagrees and has addressed Entergy's comments about ML and MDL in Response to Comment III.10.1. Each of these parameters was detected above the MDL (that is, with 99% accuracy that the true concentration is greater than zero) in at least one vault during what was, again, a single sampling event of less than one-third of the electrical vaults. Entergy's only support for its statement that these parameters are absent is based on its interpretation of the definition of ML and MDL, which is not consistent with EPA's interpretation in other permits. *See* EPA's Remediation General Permit (MAG910000), Appendix IV. The potential for the presence of these parameters, as reflected in the one known sampling of these vaults, warrants additional sampling.

[85] The comment does not argue that the discharge of stormwater from the electrical vaults does not require a NPDES permit.

Entergy also comments that phenols, phthalates, PCBs, and cadmium (but evidently not lead)[86] are not expected to occur in the vaults because of prohibitions on submergence of cabling. To the extent that the NRC-regulated monitoring programs could be interpreted as "prohibiting" the submergence of cabling—an interpretation that Entergy has not adequately supported—the facility nonetheless discharges stormwater that accumulates in the electrical vaults to the receiving water through stormwater outfalls 004, 005, 006, and 007. *See* Response to Comment III.10.1. Entergy does not explain why the presence of these particular parameters would be eliminated from the discharge if cables are not submerged nor does it adequately support its statements that cables cannot be submerged. In any event, the initial vault characterization monitoring detected these parameters.

Entergy requests that the requirement at Part I.H.5 of the Draft Permit to inspect and sample all electrical vaults within sixty minutes of a storm event should be removed. Entergy comments that such additional sampling is unnecessary in light of stormwater sampling required in Parts I.C.1 through I.C.3 of the Draft Permit, that there is no basis for requiring additional sampling of stormwater in the SWPPP, and that monthly monitoring within the first sixty minutes of a storm event is impractical and potentially dangerous, given site conditions and personnel requirements. Entergy appears to extend the requirement for visual assessment of stormwater to the electrical vaults where the Agencies intended for this provision to apply only to the stormwater outfalls. Part I.H.5 of the Draft Permit (at 35) states:

> All areas with industrial materials or activities exposed to stormwater and all structural controls used to comply with effluent limits in this permit shall be inspected at least once per month, including all electrical vaults that are required to be routinely pumped out to a stormwater outfall, by qualified personnel with one or more members of the stormwater pollution prevention team. Inspections shall begin during the 1st full calendar month after the effective date of this permit. Each inspection must include a visual assessment of stormwater samples (*from Outfalls 004, 005, 006 and 007 as required by the permit*), which shall be collected within the first 60 (6) minutes of discharge from a storm event…(emphasis added)

The Agencies clarify that the collection of stormwater samples for visual assessment under the permit applies only to the permitted stormwater outfalls (004, 005, 006, and 007). To the extent that the comments above pertain to the feasibility and/or justification for requiring additional sampling of the electrical vaults under Part I.H.5 of the Draft Permit, neither the Draft nor the Final Permit require collection of a stormwater sample during the first 60 minutes of a storm from the electrical vaults.

Regarding the requirement to conduct a visual assessment of samples from the four stormwater outfalls (004, 005, 006, and 007), the basis for including the visual assessment is EPA's 2015 Multi-Sector General Permit (MSGP) for stormwater discharges associated with industrial activity. The 2015 MSGP (at Part 3.2) requires quarterly visual assessment of stormwater discharges, including inspection for color, odor, clarity, floating solids, settled solids, suspended

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[86] As noted in Response to Comment III.10.1, lead concentrations in five of the seven vault samples from 2015 exceeded the chronic marine water quality criterion for aquatic life.

solids, foam, oil sheen, and other obvious indicators or stormwater pollutions. The results of each visual assessment should be recorded and documentation maintained in the Stormwater Pollution Prevention Plan (SWPPP). The visual inspection can be performed on the same grab sample collected for compliance with the limitations and monitoring requirements under Parts I.A.5 and I.A.6 of the Final Permit (formerly Parts I.C.1 and I.C.2 of the Draft Permit). The visual inspection is a requirement of the MSGP and supports the additional monitoring that is completed for the stormwater outfalls.

As further support for its request to remove from the permit the requirement to inspect and sample all electrical vaults within 60 minutes of a storm event, Entergy maintains, as in Comment III.10.1, that the NRC-regulated inspection program will "ensure that cables are not degrading such that they would contaminate stormwater." This requirement of the permit has been clarified, as discussed above, and only requires inspection of the electrical vaults, not collection of additional samples. In any event, EPA has no reason to disagree that regular inspections of the vaults to ensure the integrity of the electrical equipment will lessen the potential for degraded equipment to be exposed to stormwater for long periods of time. EPA maintains, however, that whether or not the equipment is degraded, the vaults will continue to discharge stormwater, and there is potential that these vaults contribute different pollutants than other stormwater discharged via the permitted stormwater outfalls. *See also* Response to Comment III.10.1. Additional monitoring of these discharges is warranted to adequately characterize discharges that, to date, have been subject to a single sampling event from a subset of just 7 of 25 vaults. To the extent that the NRC-regulated monitoring program fulfills the monitoring requirements of Part I.H.5 of the Draft Permit (now Part I.D.2.c of the Final Permit), the Permittee need not complete a second inspection in a single month. In addition, in order to be more consistent with the MSGP, the Final Permit has changed the frequency of the visual inspection requirement for the electrical vaults to quarterly from monthly.

Finally, Entergy requests that Part I.J of the Draft Permit, requiring one-time sampling of all electrical vaults not sampled in 2015, be removed from the Final Permit. According to Entergy, EPA already determined that the prior sampling was representative of all 25 electrical vaults. Entergy also argues "EPA is incorrect when it states that the 'initial sampling showed the presence of several pollutants'" because, according to Entergy, detected pollutants are either "naturally occurring" (e.g., zinc, iron and copper) or detections are "not accurate or meaningful" because concentrations observed were below the ML and/or MDL in the sampled electrical vaults. EPA has already addressed Entergy's comments about the presence of pollutants in the discharge from the electrical vaults in Response to Comment III.10.1, above. The Permittee has not demonstrated that the concentrations of zinc, iron, and copper in the stormwater samples from the vaults are consistent with natural background levels. In addition, Entergy misrepresents detections at the ML and MDL. Observations of pollutants above the MDL (even when below the ML) indicate with 99% accuracy that the true concentration of the constituent in the effluent is greater than zero. Detection of parameters above the MDL in a single sample from 7 vaults warrant additional monitoring.

Entergy comments that monitoring of the additional vaults that were not sampled in 2015 is unnecessary because "EPA has already determined that the prior sampling was representative of all 25 electrical vaults." The Fact Sheet (at 30) explains that the Draft Permit requires routine, quarterly sampling for a select list of parameters at a subset of 5 vaults. These five vaults were chosen because they are spread throughout the property and therefore representative of the *locations* of the various vaults for the purposes of this routine monitoring. The Agencies did not indicate that the quarterly sampling of 5 vaults would satisfy an initial characterization of the effluent from the complete suite of vaults. To the contrary, EPA stated that "a characterization of water collected in all vaults is warranted because these vaults are located throughout the property and the initial sampling showed the presence of several pollutants." Fact Sheet at 31. Entergy comments that "EPA staff indicated just last year" that additional vaults need not be sampled but provides no reference for this statement. The Fact Sheet and the results from sampling of the initial 7 vaults that stormwater discharges from the electrical vaults have the potential to contain metals and other toxic pollutants. Routine, quarterly sampling from a subset of vaults is reasonable to continue to characterize levels of detected pollutants in the effluent without overly burdensome monitoring. One-time sampling of all vaults is warranted given that most of the vaults have never been sampled and those that have indicate variability in the pollutants detected and their concentrations among the vaults. Should results of the routine or one-time monitoring indicate that additional parameters should be sampled or that monitoring otherwise be revised, the Agencies may request/require additional sampling, modify the permit, or both.

10.3 There Is No Basis For Requiring Whole Effluent Toxicity Testing Given The Limits Of EPA's And DEP's Regulatory Authority With Respect To The Relevant Effluents And The Small Concentrations Of Contaminants Involved

Part I.C.4 of the Draft Permit and Attachment A thereto proposes requiring PNPS to undertake "whole effluent toxicity" ("WET") testing, twice each year, in accordance with specified testing protocols, with respect to two small aquatic species, the Inland Silverside and the Mysid Shrimp.[445] According to the Fact Sheet, the purpose of requiring WET testing is "to assess the effects of the combination of pollutants" found in PNPS's discharges via internal Outfalls 011 and 014, which comprise various process waters and other sources, including service water systems and demineralizer reject water, both NRC-regulated discharges.[446] Adding to the confusion, the identified pollutants of interest for purposes of the WET testing, as proposed in the Draft Permit, include ammonia, organic carbon, cadmium, lead, copper, zinc, and nickel.[447]

The Fact Sheet does not state, nor are we aware, of any conceivable basis for believing that these substances would be added to the process water streams that comprise the discharges via Outfalls 011 and 014. Some of these substances (*i.e.*, copper and zinc) appear to have been included in the proposed WET testing protocol only by virtue of the fact that they were detected in certain of the electrical vaults that were sampled.[448] As discussed above, however, the concentrations detected in these were all below naturally occurring background levels, so there is no apparent basis for supposing that toxic concentrations of these materials occur, alone or in combination.[449] The remaining pollutants were not even detected in the electrical vault sampling data, and we again know of no basis for believing that either would be added to the process waters associated with Outfalls 011 and 014 in any biologically significant amounts, and the Fact Sheet identifies none but instead confesses that EPA and DEP have only "limited data" as to the composition of the waste streams in question.[450] The Draft Permit's provisions for WET testing should therefore be deleted from the final Permit as being factually unsupported.

[445] *See* Draft Permit, Part I.C.4, at 25-27 & Attach. A.
[446] *See* Fact Sheet at 44.
[447] *See* Draft Permit, Part I.C.4, at 25.
[448] *See supra*, Section VIII.A.4 (electric vault sampling detected presence zinc and copper consistent with background levels, while other pollutants were below minimum level of detection and therefore could not be confirmed as being present at all).
[449] *See supra*, Section VIII.A.4.
[450] *See* Fact Sheet at 43.

10.3(A) Supplementation of WET Testing Comments

In reviewing its Initial Comments on the appropriateness and need for WET testing, we believe that we may have misapprehended EPA or DEP's rationale for such testing. As such, these Comments provide additional information relevant to Section VIII.C of Entergy's Initial Comments on the narrow question of the appropriateness of WET testing.[194] By way of further background, the WET testing is focused on two Outfalls, 011 and 014,[195] which are both related to service water support systems,[196] and the latter of which may contain radioisotopes that are monitored by NRC,[197] as well as subject to post-process, pre-discharge treatment, *e.g.*, filtration and for pH.[198] To the extent WET testing of these samples cannot differentiate the effects of radioisotopes, it cannot isolate a chemical consideration within EPA's or DEP's scope of authority, and instead encroaches on NRC's sole authority,[199] as well as raises questions about whether there are laboratories capable of receiving the exempt quantity of radioisotopes and performing WET testing.

This dynamic is exacerbated by the improper dilution metrics provided for in the WET testing plan contained within the Draft Permit. Below are the last three years' approximate discharge volumes from the 011 and 014 Outfalls, measured in gallons, *on an annual basis*:

	011	**014**
2013	0	74,733
2014	11,000	6,012
2015	12,400	20,040

Thus, the maximum current annual discharges from the combined Outfalls are 74,733 gallons or approximately 205 gallons per day. Actual flow through the system, solely as a function of service water, is a minimum of 7.9 MGD. In other words, the actual minimal dilution factor for the system – before contact with the environment – is more than 38,500 gallons for every single gallon of the maximum combined gallons discharged from Outfalls 011 and 014. Viewed in this light, the WET testing – which provides for a dilution of only 5x instead of at least 38,500x – has no correlation to actual concentrations experienced by the organisms in question within the discharge canal. Dilution in the environment is even greater. As such, Entergy respectfully requests that the final permit be revised to reflect a minimum dilution of 10,000x, representing an order of magnitude below expected minimal dilution within the discharge canal before mixing with Cape Cod Bay. This would provide for an appropriate degree of conservatism, as a matter of science and law.

[194] See Entergy Initial Comments at 74-75.
[195] *See* Draft Permit, Part I.C.4, at 24-27; Fact Sheet at 43.
[196] *See* Fact Sheet at 5, 36-37 & Fig. 4 (describing Outfall 014 as a "new outfall" that encompasses "[d]ischarges" from [the] waste neutralization sump [the] TBCCW [turbine building closed cycle cooling water] and RBCCW [reactor building closed cycle cooling water] systems, [and the] standby liquid control (SLC) system"). As Entergy noted in its Initial Comments and exemplary revisions to the Fact Sheet, the Fact Sheet's description of the source waters that feed Outfalls 011 and 014 contains material factual discrepancies, including insofar as the Fact Sheet describes those discharges as comprising "closed cycle cooling water." *See* Entergy Initial Comments at 1, 56. Entergy continues to suggest that a meeting with EPA and DEP to reconcile those discrepancies prior to issuance of the final NPDES/MCWA permit would be beneficial to all concerned. *See id.* at 1 n.2.
[197] *See* Fact Sheet at 37 ("The low level radioactive effluent associated with Outfalls 011 and 014 shall continue to meet all the Nuclear Regulatory Commission (NRC) requirements as specified in 10 C.F.R. Part 20. These limits are detailed in the PNPS Technical Specifications which define facility operational conditions…. [T]he draft permit addresses only the chemical aspects of water quality and does not regulate radioactive materials encompassed within the Atomic Energy Act's definitions of source, byproduct, or special nuclear materials…. All NRC radioactive discharge requirements will continue to be in effect, as required, in 10 C.F.R. Part 20 and plant technical specifications.").
[198] *See, e.g.*, FSEIS at 2-13 to -15 (describing operation of liquid radiological waste disposal systems at PNPS).
[199] *See Train*, 426 U.S. at 25.

Response to Comment 10.3

Entergy submitted Comment 10.3 on the Draft Permit's requirements for Whole Effluent Toxicity (WET) testing with its initial, timely comments. As discussed in the Introduction to this Responses to Comment, Entergy also submitted "supplemental comments" on October 31, 2016, primarily for the purpose of responding to timely comments submitted by others, rather than raising new issues on the Draft Permit. The October 2016 Supplemental Comments did, however, raise new issues about the WET requirements that warrant consideration, so as to avoid potential issues regarding dilution and radiological contamination, as explained more below. In this response, the Agencies address comments submitted with Entergy's initial submission (Comment 10.3) and its supplemental comments on WET from October 2016 (reproduced here as Comment 10.3A).

Entergy requests that the requirement to conduct twice yearly WET testing be removed from the Final Permit. EPA first clarifies that the Draft Permit proposed WET testing requirements at Part I.C.4, which only apply to the effluent from Outfalls 011 and 014 under footnote 7 of this Part. The electrical vaults were not considered when developing the requirements.

The Fact Sheet (at 43-4) explains that WET testing is required to identify, evaluate and address any potential water quality impacts from the effluent at Outfalls 011 and 014, which is likely to have a high degree of complexity given the various low volume wastewater sources that comingle in the discharge. *See* 40 C.F.R. § 423.11(b). Multiple waste streams combine prior to the discharging from Outfalls 011 and 014; some of these wastestreams contain pollutants such as boron, copper, oil & grease, as well as the corrosion inhibitors tolytriazole and sodium nitrite. All of these pollutants are subject to water quality standards or criteria. Since these corrosion inhibitors are used in the RBCCW and TBCCW systems, they can reasonably be expected to be present in some of the discharges to Outfalls 011 and 014. Although the facility has shut down, Entergy expects that it will continue to discharge from Outfalls 011 and 014. Entergy has not provided any comments that would suggest that the constituents of the discharge via this outfall have been substantially altered following shutdown that would warrant eliminating the requirement for twice yearly WET testing. Entergy's red-line strikeout version of the Fact Sheet, submitted with its comments, did not indicate any changes to the post-shutdown discharges at Outfalls 011 or 014. Finally, under §§ 301, 303, and 402 of the CWA, EPA and States may establish toxicity-based limitations to implement narrative water quality standards calling for "no toxics in toxic amounts." *See also* 40 C.F.R. § 122.44(d)(1). Massachusetts water quality standards state "All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life, or wildlife." 314 CMR 4.05(5)(e). EPA maintains that due to the combination of parameters that are present in these discharges and the uncertainties with any additive or synergistic effects of these parameters, WET testing is warranted.

In its initial comment, Entergy comments that there is no basis in the Fact Sheet for the requirement or for believing that pollutants, including ammonia, organic carbon, cadmium, lead, copper, zinc, and nickel, would be added to the process waters associated with Outfalls 011 and 014 in "any biologically significant amounts." Entergy initially supposes that the WET requirements were based on detection of some pollutants, including copper and zinc, in stormwater samples collected from the electrical vaults and argues that these levels were all below naturally occurring background levels. Protocols for WET testing for NPDES permits are consistent among all Region 1 facilities and developed in accordance with EPA guidance.[87] The WET protocols include chemical analysis of both the effluent and receiving water for the parameters included in Part I.C.4 of the Draft Permit: pH, salinity, TRC, TSS, Ammonia, TOC, and metals. In other words, the list of pollutants in Part I.C.4 comes from the standard marine acute toxicity protocol; the parameters were not selected as "pollutants of interest for purposes of the WET testing" as Entergy suggests. For the same reason, the inclusion of copper and zinc in the WET testing is based on the standard protocol and the electrical vault sampling results had no bearing on either the decision to establish WET testing for Outfalls 011 and 014 or the parameters included for analysis.

Entergy's supplemental comment from 2016 raises several new issues associated with WET testing: (1) that effluent from Outfall 014 may contain radioisotopes that could complicate the understanding of WET test results; (2) whether there are laboratories capable of receiving the exempt quantity of radioisotopes and performing WET testing; and (3) that the dilution of these wastestreams has not been appropriately considered. EPA acknowledges that the contribution of radioisotopes in the WET samples is likely to complicate the analysis and interpretation of results. There may be laboratories that can accept and dispose of radioisotopes, but contaminated samples will likely add considerable cost and complexity to the collection, transportation, and handling of these samples. The commenter identifies several challenges with analyzing and addressing WET testing at Outfall 014. Outfalls 011 and 014 are, however, substantially similar. Both are comprised of low volume wastes including station heating water, cooling water, drainage from floor drains and sumps, and reject water. In other words, the two outfalls are substantially similar, and, according to Entergy, the issues related to radiological contamination apply only to Outfall 014. To address these issues, the Final Permit WET requirements apply

[87] For example, the most recent version of the Marine Acute Toxicity WET Protocol is available at https://www3.epa.gov/region1/npdes/permits/generic/marinewateracutetoxtest-rev.pdf

only to the effluent from Outfall 011. Limiting WET testing to Outfall 011 will avoid the new issues raised about radiological contamination (i.e., new issues (1) and (2), above).

Finally, Entergy comments that the WET requirements do not account for dilution of the internal wastestreams. Entergy suggests that the maximum current annual discharge from the combined Outfalls is 74,733 gallons, which is equivalent to 205 gallons per day. At a discharge of 7.9 MGD from Outfall 010, Entergy asserts that the actual minimal dilution factor in the discharge canal is more than 1:38,500. First, discharges from Outfalls 011 and 014 are intermittent and, as such, calculating a daily discharge of 205 gpd and dilution of 1:38,500 is not representative of the actual discharge from these outfalls. *See* Fact Sheet Attachment A. Practically, PNPS likely discharges from Outfalls 011 and 014 on an intermittent basis at flows considerably higher than 205 gpd (e.g., the maximum daily permitted flow from Outfall 011 is 60,000 gallons), which would result in a lower dilution factor when combined with the effluent from Outfall 010. According to Entergy, "the WET testing – which provides for a dilution of only 5x instead of at least 38,500x – has no correlation to actual concentrations experienced by the organisms in question within the discharge canal." EPA generally collects effluent for WET testing representative of the combined discharges from a Facility. In this case, the combined discharge would include effluent from Outfall 010 (cooling water for the spent fuel pool). For this reason, WET requirements at Part I.C.4 of the Draft Permit have been moved to a compliance point within the discharge canal in the Final Permit. WET testing requirements are included under the compliance monitoring location at Part I.A.1 of the Final Permit. The Final Permit specifies that twice yearly sampling must be conducted on an outgoing tide during dry weather when Outfall 010 and Outfall 011 are discharging and when Outfall 014 is not discharging. In this way, the WET samples will be representative of the combined discharges from Outfalls 011 and 010, but will not include any dilution from seawater intrusion in the discharge canal or stormwater and will not include radiological contamination from Outfall 014.

10.4 Non-Substantive Corrections Related To Stormwater Discharge Requirements.

Entergy also requests that the following non-substantive inconsistencies in Part I.C.3 of Draft Permit be corrected in the final Permit:

- The "Discharge Limitation" column should remove sub-columns "Average Monthly" and "Maximum Daily" to reflect the fact that monitoring is only to be conducted quarterly.[451]
- In footnote 2, the first sentence should be removed because it conflicts with footnote 1. Footnote 2 appropriately recognizes that "[s]ampling may be conducted in wet or dry weather and does not need to be at a time when the vault contents are being discharged," while footnote 1 would require the sampling to occur during a discharge.[452]

If Part I.J of the Draft Permit is not removed from the final Permit, then Entergy requests that Part I.J of the final Permit be corrected to reflect that seven (7) as opposed to six (6) electrical vaults were previously sampled.[453]

451 *See* Draft Permit, Part I.C.3, at 22.
452 *See id.*, Part I.C.3, at 23 n.1.
453 *See id.*, Part I.J, at 37.

Response to Comment 10.4:

Entergy repeats its request from Comment 10.2.4 to clarify and/or change specific language in Part I.C.3. EPA has made some of these changes to the Final Permit and explained its reason for accepting or rejecting Entergy's proposal below.

Entergy requests that EPA remove the sub-columns "Average Monthly" and "Maximum Daily" in Part I.C.3 of the Draft Permit to reflect the fact that monitoring is only to be conducted quarterly. Although stormwater sampling is required once per quarter, for the purposes of these effluent limits pages, the sampling results would be considered a daily maximum value, which in effect would be the value of the quarterly sample, as it would be the only sample during this period. The Final Permit retains these columns.

Entergy also requests that the first sentence of footnote 2 in Part I.C.3 of the Draft Permit be removed because it conflicts with footnote 1. According to Entergy, Footnote 2 states that "[s]ampling may be conducted in wet or dry weather and does not need to be at a time when the vault contents are being discharged" while Footnote 1 would require the sampling to occur during a discharge. Footnote 1 in Part I.C.3 of the Draft Permit (at 23) states "Manhole designations are provided by the permittee in the June 30, 2015 CWA Section 308(a) information request letter submittal to EPA." EPA fails to see how this footnote is in conflict with the sampling requirement in footnote 2.

Footnote 2 states "sampling shall be representative of the water that has collected in each electrical vault and prior to being pumped out and discharged to a permitted outfall. Sampling may be conducted in wet or dry weather and does not need to be at a time when the vault contents are being discharged to a stormwater outfall." In other words, sampling may occur during either wet or dry conditions and whether the vault is actively discharging to the permitted stormwater outfall, but the sample collected must be representative of the effluent from the vault prior to mixing with any stormwater in the permitted stormwater outfalls. The Final Permit retains the footnotes from the Draft Permit.

Finally, Entergy correctly states that seven (7) instead of six (6) electrical vaults were sampled in 2015 and requests that the Final Permit reflect this number. Part I.G (formerly I.J.) of the Final Permit identifies that 7 vaults were sampled are requires sampling of the remaining 18 vaults within 180 days of the effective date of the permit.

11.0 Authorization For The Discharge Of Untreated Sea Foam Suppression Water Should Not Be Eliminated.

As the Fact Sheet reflects, the Draft Permit has removed a prior authorization for the discharge of untreated sea foam suppression water from Outfall 008.[454] EPA bases the removal on statements made by Entergy employees that sea foam suppression had not been necessary during the current permit term and was not anticipated in the future.

While sea foam suppression may not be anticipated, however, the facility still must have the option of using sea foam suppression, if necessary. Excessive sea foam can blow onto electrical equipment at the facility leading to dangerous conditions, including arcing of electrical equipment – an occurrence that has been known to happen at PNPS historically.[455] For this reason, Entergy respectfully requests that the untreated sea foam suppression discharge authorization remain in the final NPDES permit.

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[454] *See* Fact Sheet at 33.

[455] *See, e.g.*, NRC, *Information Notice 93-95: Storm-Related Loss of Offsite Power Events Due to Salt Buildup on Switchyard Insulators* (Dec. 13, 1995), *available at:* http://www.nrc.gov/reading-rm/doc-collections/gencomm/info-notices/1993/in93095.html (hereinafter "NRC Information Notice") ("Since 1982, the Boston Edison Company Pilgrim station has also experienced several loss of offsite power events when *heavy ocean storms* deposited salt on the 345 kV switchyard causing the insulators to arc to ground.") (emphasis added); Enercon Services, Inc., *Enercon Response to Tetra Tech's Indian Point Closed-Cycle Cooling System Retrofit Evaluation Report,* prepared for Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC (Dec. 2013), p. 28-29 ("Periodic salt deposition *during storm events has* caused electrical arcing at several plants," including PNPS), Figure 7-1 (providing picture of arcing) (excerpt enclosed) (emphasis added); NRC & EPRI, *EP RI/NRCRES Fire PRA Methodology for Nuclear Power Facilities,* Final Report, NUREG/CR-6850 (Sept. 2005) (examining fires caused by, *inter alia*, arcing).

Response to Comment 11.0:

According to EPA's trip report that was dated January 24, 2013 for a January 17, 2013 site visit of the facility, it was noted that Outfall 008 "has not been used over the course of the current permit and will not be used in the future." Based on this statement, the EPA determined that Outfall 008 was no longer necessary and did not include it in the Draft Permit. See Fact Sheet at 33.

One of the changes in the 1992 permit modification was the addition of Outfall 008, which resulted from the permittee's request to use potable fresh water for sea foam suppression as necessary. The permit modification limited the use of this water to a flow of 0.73 MGD and required daily measurement of this flow, for the days when it would be used for this purpose.

However, since the facility terminated its generation of electricity as of May 31, 2019, the Facility no longer uses electrical equipment associated with the generation or transmission of electricity, with the exception of that required to maintain the plant after shutdown, the authorization to use sea foam suppression water is not necessary. This was confirmed by email from Joe Egan to George Papadopoulos on 8/16/19. Therefore, the Final Permit does not authorize use of sea foam suppression.

IV. COMMENTS SUBMITTED BY OTHERS

1.0 Procedural Comments on Draft Permit Issuance

1.1 General Comments on Permitting Process

Public Hearing Comment from Ms. Azarovitz: We are fully aware of the fact that the EPA has allowed the Entergy Corporation, without oversight or regard to the damage being done to the waters of Cape Cod Bay, is allowing Entergy to operate with an NPDES permit…A point not to be overlooked is that there were no inspections, there were not changes in the methods on intake and discharge, the on[c]e through cooling system, which causes great harm to our environment. This damage is documented by EPA itself as well as many other published studies. But obviously, not taken seriously in allowing this permit to lapse and to be rewritten in order for Pilgrim Nuclear Power Station to continue to do damage.

This damage includes impingement of larvae and other forms of microscopic life, destruction of thousands upon thousands of fish, including federally protected herring and alewife. Citizens who fish would have to pay a fine if one herring were taken from our waters.

What happened to the mandate of this agency? Decisions being made to reduce environmental risk based on the best available scientific information, working with federal laws protecting human health and the environment enforced fairly and effectively. Should our trust be gone in an agency that had such amazing beginnings such as the EPA has years ago. Is this another agency that can be influenced by corporate lobbying?

Written Comment Submitted by Ms. Azarovitz on 7/25/2016: Numerous state and federal laws such as the Clean Water Act, the Magnuson-Stevens Fisheries Conservation Act, the Endangered Species Act, and the Coastal Zone Management Act require Entergy to eliminate or at least mitigate Pilgrim's impacts on the Bay. These laws are not being enforced. The Massachusetts Department of Environmental Protection and the U.S. Environmental Protection Agency (EPA) are unable or unwilling to update Entergy's NPDES permit. It is unlikely that the cumulative impacts of Pilgrim's decades of marine destruction and pollution will be studied, even if the NPDES permit is renewed. For years, calls from the public for prompt action have been left unanswered.

Public Hearing Comment from Mr. Agnew (of Pilgrim Legislative Advisory Coalition): I believe the Clean Water Act is a law and that it was passed by Congress. And I don't believe that EPA has done much of anything to ensure that Entergy has been in compliance with the Clean Water Act for the last 21 years. The twenty year lapse offered Entergy no incentive whatsoever to upgrade even though much needed technology was available in order to reduce impacts to the environment. I question the timing of this new draft permit coming at a time when it had become apparent that Entergy was losing money and would soon be forced to shut down the plant.

The public did not benefit from the 20 years of inaction that continues unabated today. So, I've really got to wonder if you were paid off by Entergy or by the Nuclear Energy Institute, or perhaps by its bedmate, the Department of Energy. And like I say, I'm not just trying to make a sound bite. I just really can't understand why this would happen. It's my opinion that you have conspired, and a conspiracy is when two or more people plan to violate the law. And the Clean Water Act is a law, and I believe it's been violated. So, I believe that you, and those at the EPA who have come up with this inaction, have conspired to defraud the public and injure the Cape Cod Bay ecosystem.

Public Hearing Comment from Ms. Carpenter (of Cape Downwinders): I have been to NRC hearings. This is my first hearing with you (EPA). It seems that there's a tendency of all the government alphabet agencies to put the interests of the corporate aspect of this before the safety of the people. And that very much concerns me. The NRC, you know, anything that Entergy wants, they grant. And I'm hoping that the EPA will not just approve whatever Entergy wants, that you will literally go over everything and put the interests of the people, the citizens of Massachusetts first. Our health and safety depends on this.

Written Comments Submitted by Ms. Bassett: The plant's use and discharge of water permit expired 20 years ago. This is totally unacceptable. New technology and new information, and new standards have come in for 20 years without any updated as to how better to run this PNPS. How come the neglect? How come the delay?

Response to Comment 1.1:

The PNPS NPDES Permit is one of the most complicated permits that EPA Region 1 has reissued. EPA is required to issue NPDES Permits to conform with State and Federal Law. These permits must be consistent with Massachusetts Surface Water Quality Standards and Massachusetts Coastal Zone Management requirements. Permit conditions are applied to all dischargers, whether they are corporations, municipalities, or small companies. EPA did not conspire with the permittee to delay the reissuance of this Permit. Even though the Permit expired years ago, its conditions and effluent limitations will remain in force until the effective date of this reissued Permit.

As already noted, PNPS stopped generating electricity on May 31, 2019. The Final Permit establishes limitations and requirements, consistent with this shutdown of operations, that result in a 92 % reduction in cooling water intake and 98% reduction in heat load as compared to the full operation of the plant. In addition, the Final Permit establishes effluent limitations and monitoring requirements on discharges of miscellaneous "low-volume" type wastes, stormwater, and stormwater that accumulates in electrical vaults. In all, the Final Permit includes a suite of effluent limitations, non-numeric limitations, and monitoring requirements that represents a significant advancement from the 1991 Permit and that will ensure that the aquatic community and designated uses of Cape Cod Bay are protected.

EPA and MassDEP have been in communication with the permittee during this permitting process, mainly to gain a better understanding and clarification of facility operations and their associated discharges. There was no corporate lobbying during this process that influenced the outcome of this draft permit. EPA acknowledges that the public has questioned why this permit took so long to be reissued and the various reasons are enumerated in the response to comment I.2.1 above.

One commenter suggests that state and federal laws are not being enforced but does not explain either how the Draft Permit fails to enforce the referenced laws or specify any changes that should be required in the Final Permit based on this comment. Both the Draft and Final Permits were developed in collaboration with MassDEP and after consultation with other agencies, including NMFS, Massachusetts Coastal Zone Management (MassCZM), and NRC and reflects Federal and State WQS and complies with all applicable regulations for industrial discharges as well as for the cooling water intake structure (CWIS) and discharge of heated effluent. As noted earlier, the facility shut down as of May 31, 2019 and the volume of the seawater intake and discharge of heat is substantially less than when PNPS was operating. MassDEP has certified under § 401 of the CWA that the Final Permit is consistent with its surface water quality standards, and MassCZM has provided its consistency review concluding that the Final Permit complies with the Massachusetts Coastal Zone Management Program. See 40 C.F.R. § 122.49(d).

Enforcement of regulations to ensure public safety from operation of the plant and radiological releases is the responsibility of the NRC. EPA and MassDEP's responsibility is to establish permit limits and conditions pursuant to water quality standards, effluent limitation guidelines, and other requirements to ensure that discharges of pollutants from PNPS are protective of the public health and the environment of Cape Cod Bay. The Final Permit establishes limitations and requirements consistent with this shutdown of operations, which result in a 92% reduction in cooling water intake and 98% reduction in heat load as compared to the full operation of the plant. In addition, the Final Permit establishes effluent limitations and monitoring requirements on discharges of miscellaneous "low-volume" type wastes, stormwater, and stormwater that accumulates in electrical vaults. In all, the Final Permit includes a suite of effluent limitations, non-numeric limitations, and monitoring requirements that represents a significant advancement from the 1991 Permit and that will ensure that the aquatic community and designated uses of Cape Cod Bay are protected. Also see Responses to I.2.1, I.2.2, and IV.3.

1.2 Transfer of Permit

Written Comment from PilgrimWatch Letter Submitted 7/25/16; Written Comment from J. Nichols submitted 7/20/16: EPA should specify that the permit must not be transferred to another company without public review process. This should apply to any transfer, including for another use at the site.

Response to Comment 1.2

The commenters request that transfer of this permit be prohibited. EPA and MassDEP regulations recognize, however, that a permitted facility may change ownership during the term of a NPDES permit and, in such a case, provide for the transfer of a permit after notice to the permitting authority. 40 CFR §§ 122.41(*l*)(3) and 314 CMR 3.19(25). For instance, the automatic transfer of permits is authorized where the current permittee notifies the permitting authority at least 30 days in advance of the proposed transfer date and the notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage and liability between them. 40 C.F.R. § 122.61(b) and 314 CMR 3.19(25)(c). A permit may also be transferred to a new owner or operator through a minor modification of the permit after notice to the permitting authority. 40 C.F.R. § 122.62(b)(2). Neither an automatic transfer nor a transfer pursuant to a minor modification requires public participation. *See* 40 C.F.R. §§ 122.61, 122.62, 122.63. EPA does not see a reason at this time to prejudge a theoretical transfer of the permit, but rather, reserves the right, pursuant to NPDES regulations, to determine in the future whether and how any proposed transfer of the permit may proceed.

By letter of August 23, 2019, Entergy notified EPA that this NPDES Permit was transferred to Holtec Decommissioning International (Holtec). Entergy has satisfied the automatic transfer provision noted above. *See also* Response to Comment I.2.5.

1.3 PNPS Should Shut Down Immediately

Written Comment Submitted by Ms. Azarovitz on 7/25/2016: Given the failure to act by EPA and MassDEP and the massive scale of Entergy's environmental destruction and pollution, termination of Entergy's NPDES permit is the only option. Entergy's operation of the CWIS under the expired permit should be suspended until the citizens are guaranteed that no further environmental destruction will occur. This means that Pilgrim should stop operating until a current, valid, and updated NPDES permit is in place.

Public Hearing Comment from Ms. Vale (of Cape Downwinders); Written Comments submitted by Cape Downwinders on 7/25/16: We agree with the state of New Jersey in their similar efforts to protect Barnegat Bay with their call for shut down of Oyster Creek Nuclear Power Reactor. And this is a quote from the state of New Jersey "Close Oyster Creek Nuclear Power Plant. Shut down of the plant is the best technology available to ensure that Oyster Creek withdrawals from Barnegat Bay for cooling purposes and discharges from the plant do not damage the ecological health of the bay. Closure of the plant will have a significantly more beneficial environmental impact that requiring the installation of cooling towers, which, under the best case scenario, would take seven or more years to be installed, and unlike plant closure, would result in significantly greater water withdrawals and discharges." We agree with the state of New Jersey. The EPA has responsibility for the citizens and the environment.

There is now the opportunity with this review to issue a new permit to prevent ongoing damage for another three years. In order for the EPA to perform its statutory duty, Cape Downwinders calls for the immediate shut down of Pilgrim as the best technology available in order to protect Cape Cod Bay and the marine environment from any further damage by Entergy.

Written Comments from Ms. Frantin and Mr. Edwards Submitted on 7/25/16: We request that our EPA deny attempts by Pilgrim to extend its already 20 plus year overdue permit, end the EPA expansion (lowering) of water quality standards and increasing threats to our environment and health and by abrogation of duty and law allow the profits of filthy, dangerous, and outmoded energy corporations such as Entergy of Louisiana – even while green energy alternatives are available and are the only option to halt climate change – be put ahead of the health, safety, and welfare of the people of Massachusetts and the nation, that these awful and irrational actions be immediately stopped. We need responsible government and responsible agency members now more than ever. We hope you will abide by law, morality, and common sense.

If our safety & health of our environment and threats from climate change cannot be promised through existing permits, they should be revoked –not extended- and Pilgrim should be closed now. Think about your responsibility and power to deny this extension and to enforce all laws and requirements to shut Pilgrim, make it safe while it closes, clean up the site for future usage, make the corporation pay for it, and provide publicly funded programs training for green renewable energy jobs in our state.

Written Comment Submitted by Ms. Sands on 6/21/16: Since EPA is charged with protecting the environment it is hard to understand why Entergy is allowed to continue to operate this accident about to happen. We cannot wait until the planned closing date of 2019. Too much is at stake.

Public Hearing Comment from Dr. Muramoto (of APCC): There is no guarantee that the plant will close by 2019 other than Entergy's stated intention. The plant's license expires in 2032. So there is potential for more than a decade of operation without BTA.

Written Comment from Ms. Holt Submitted 7/16/16: I cannot fathom the rationale behind allowing the Pilgrim Nuclear Power Station to continue operating with a totally outdated once-through cooling system. Like the NRC, you seem to be basing permit renewal on the financial interest of the plant owner – that En[t]ergy shouldn't be forced to spend money on cooling towers and other safety upgrades when they will be shutting down altogether in three years. I thought that you were supposed to be protecting the environment. If Pilgrim is in any way compromising the water quality of Cape Cod Bay, it should have to shut down now. You should not be granting them even a day's leeway to continue releasing heated and contaminated water into our Bay.

Written Comment from Ms. Sharaga Submitted 7/16/16: I am very concerned about the level of pollution in Cape Cod Bay due to the antiquated practices of the Pilgrim Nuclear Power Plant. Pilgrim's NPDES permit should not allow the continued use of antiquated "once-through cooling system" technology. The new permit should require any power production activities that harm Cape Cod Bay to cease prior to any re-fueling in 2017, and focus entirely on controlling and monitoring pollution and marine impacts related to post-power production activities.

Written Comment from Mr. Nichols Submitted 7/20/16: Pilgrim's current permit allowing use of its outdated 'once-through cooling system' should be terminated. Stricter conditions and a strengthened NPDES permit should apply for the remaining years of operation and throughout decommissioning. The new permit should require power production to cease prior to any re-fueling, and emphasize regulation of site decommissioning and decontamination after power production. The new permit should become effective as soon as possible, no later than spring 2017. EPA must prevent not only ongoing pollutant discharges into Cape Cod Bay, but also the increased pollutant discharges expected because of climate change. Warming seas, sea level rise, storms, flooding, and increased precipitation are likely to cause further pollutant discharges into Cape Cod Bay and/or exacerbate the effects of thermal pollution and impingement/entrainment.

Response to Comment 1.3:

EPA received a series of comments requesting termination of PNPS's NPDES permit prior to the Facility's planned closure date of June 2019. As noted earlier, PNPS shut down, as declared, on May 31, 2019, prior to issuance of the Final Permit. The Final Permit reflects the post-shutdown intake and discharges at PNPS, which are substantially reduced in magnitude from the pre-shutdown conditions. The Agencies did not mandate closure under the NPDES permit and do not agree that closure itself is BTA. *See* Response to Comment III.3.1. Rather, the Final Permit reflects the post-shutdown operating conditions at PNPS (including maintaining sufficient non-contact cooling water flow for the spent fuel rods) and includes technology-based and water quality-based effluent limitations and conditions which ensure the protection of Cape Cod Bay. The Final Permit includes operating requirements consistent with implementation of the BTA, including flow limits that will result in a 92% reduction in flow with a commensurate reduction in the impacts to aquatic life. See Response to Comment I.4.2.

2.0 Impacts of Power Plant Operation on Cape Cod Bay

2.1 Environmental Impact

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA needs to stop the annual killing of billions of aquatic organisms by Pilgrim's cooling water withdrawals. This killing has indirect, ecosystem-level effects, including disruption of aquatic food webs, nutrient cycles, biodiversity, and other effects. Entergy incorrectly claims that this mortality is not of a magnitude to constitute an adverse environmental impact.

Written Comment Submitted by Representative Keating on 7/21/16; Public Hearing Comment from Mr. Jackman (representing Representative Keating): I respectfully encourage EPA to continue incorporating current data on climate change and ocean acidification in its review of PNPS. Given that the EPA is considering decades old data that may not reflect the most recent sea level rise and ocean temperature information, and that PNPS, under the variance proposed by the NPDES, will be discharging significantly heated water into Cape Cod Bay for three more years, I urge EPA to reconsider whether a closed cycle system would provide significant environmental benefits and contribute to safe guarding of Cape Cod Bay.

Written Comment Submitted by Ms. Beck on 6/21/16: PNPS has been operating on an expired water discharge system in which the plant draws in 500 million gallons of water daily and increases the temperature by 32 degrees which is highly radioactive heating is destroying our fish and marine life and is a travesty of criminal negligence. This nuclear plant failed to follow best practices. It has an outmoded cooling system and requires a recirculating one, not a single pass one.

Written Comment Submitted by Ms. Crumbler: Pilgrim has been operating with an expired water discharge permit for 20 years. Pilgrim draws in 500 million gallons of water daily, increases its temperature by 32 degrees, and discharges back into Cape Cod Bay. Your data indicates a rise in the bay temperature of 4 degrees between 1977 and 2012. The water which is sucked in brings with it large numbers of marine organisms. The cooling system is outmoded and outdated. Best practices require a recirculating system which is not a single pass system which is what they have. With the stated plant to close in three years they are not going to make the necessary changes. Our lives and property values are at stake. It is your job to ensure our safety.

Written Comment Submitted by Mr. Crumbler: The Pilgrim Plant has been operating with an expired water discharge permit for 20 years. The plant's discharge has raided the bay temperature around the plant by over 4 degrees. Given its discharge permit is 20 years expired, I urge EPA to follow through on its mandate to protect our environment and demand Entergy to either rebuild its cooling system to a recirculating one or shut down before 2019.

Written Comment Submitted by Mr. Barocas on 6/21/16: It has already been announced that closure of the facility will occur in 4 years. Right now we are concerned about unsafe running because it has been operating with an expired water discharge permit for over 20 years. Pilgrim draws in 500 million gallons of water daily. It then increases its temperature by 32 degrees and discharges it back into the bay. Cape Cod Bay has already seen an increase of 4 degrees between 1977 and 2012. In addition, an enormous amount of marine organisms are being sucked in each day. Please inspect Pilgrim and make sure that they follow best practices in order to protect our lives, our property, our health.

The Pilgrim Nuclear Facility has been operating with an expired water discharge permit for 20 years in defiance of your organization's regulations. The damage to our environment on Cape Cod continues. They are slated to close in 2019. It is reasonable to expect the modifications be made now to stop further damage.

Written Comment Submitted by Ms. Perry on 6/21/16: It is my understanding that the Pilgrim Nuclear Power Station has been operating for twenty years with an expired water discharge permit. The plant regularly raises the temperature of the bay and, with its daily intake of 500 million gallons of water, it also sucks in untold number of marine organisms. You are charged with ensuring that the nuclear power plants follow best practices. Best practices require a recirculating system, not a single pass system such as the one operating at Pilgrim. Please follow through on your mandate to protect the public, our waters, and our marine life by demanding that Entergy rebuild its cooling system to meet current standards.

Written Comment Submitted by Ms. Weegan on 6/21/16: Pilgrim Nuclear Power Station, a mere 23 miles from my town, has been operating with an expired water discharge permit for over 20 years. The EPA has the duty, is charged with the responsibility, to protect the environment of the United States. Why haven't you insisted that a new permit be obtained? The on-going discharge of heated water into Cape Cod Bay is putting marine life at risk and causing harm to our planet.

Written Comment Submitted by Ms. Carpenter on 7/25/16: Global warming is causing sea levels to rise and raising water temperatures around the globe including our bay. Pilgrim is an unnatural force now in play. If the EPA had been doing its job and using readily available data, En[t]ergy should have been required to abandon their once through cooling system decades ago.

With this outdated system, most of the energy produced by Pilgrim is discharged into the bay as heat causing a measurable rise, approximately thirty degrees, in water temperature. If the EPA has been doing its job, Energy would have been cited for violating the Clean Water Act for using this outdated technology.

Our bay is home to many species which have been impacted. The river herring, or alewife and bluebacks, once an important food source for the early settlers, have significantly decreased in numbers. I did not realize until the recent hearing that Entergy had a captive breeding program for flounder. There would be no need for such an undertaking if there were not a devastating impact on the native flounder. Additionally, the reactor acts as an oversized Cusinart pureeing all marine life sucked into the cooling system.

Written Comments from Ms. Frantin and Mr. Edwards Submitted on 7/25/16: EPA has allowed the owners of this monstrous plant to bypass laws put on the books to protect air, water, and the environment from exactly the pollution – toxins, radioactivity, cesium, tritium, and raised temperature of Cape Cod Bay that EPA has allowed to be used as Pilgrim's dump, mutilation and destruction of marine life, fish, and the commercial value of our area.

The amount of cancer producing radioactivity (highest cancer rate in Massachusetts, shame on every bureaucratic federal and state "health and safety watchdog" committee), the amount of death and destruction and mutilation of fish and marine life from life-giving plankton to the fish that provide livelihood to fishermen and the tourist industry that depends on clean, safe Cape Cod Bay fishing, bathing, etc., the needless environmental hazards produced by profit mongering Entergy and its deadly Pilgrim plant cannot stand.

We demand the EPA deny this extension and require "best technology' in all current facets of operation to be immediately put into practice at Pilgrim and if our safety cannot be ensured because of inadequate prior enforcement and lack of time to build and install the required safe storage, a safer closed system rather than the current pass-thru system that allows heat, toxins, mutilation of fish and plant life insanely used to cool an outdated, 50 year old flawed Fukushima design death-plant where even that design has been compromised to allow 3200 rods to be stored in containment built for 800.

Written Comment Submitted by Ms. Azarovitz on 7/25/16: Entergy's CWIS harms Cape Cod Bay in many ways including: killing tens of millions of fish and billions of planktonic organisms every year; dumping roughly 500 million gallons of hot water mixed with pollutants into the Bay each day, which disrupts and destroys ecosystem processes; most of the energy produced is wasted.

Written Comment Submitted by Dr. Garb on 6/10/16: Every day, Pilgrim sucks 500 million gallons of water from Cape Cod Bay into its reactor, heats it by approximately 32°F and discharges it back into the Bay. Your data document a rise in temperature of the Bay of 4°F from 1977 to 2012, which is significant and contributes to the global ocean warming that the world is trying hard to prevent. This has been shown to scour the ocean floor near the discharge from Pilgrim and has a deleterious effect on bivalve marine life. Every day, fish, fish roe and other organisms are sucked into the water intake and killed. The entrainment of seaweed in the intake screens has been described as a serious potential threat to the critical cooling and safe operation of the reactor.

Pilgrim is an outdated, poorly designed facility. Today, best practice would be a recirculating cooling system rather than Pilgrim's single pass system. It is a travesty that Pilgrim has been allowed to operate with an expired NPDES permit for 20 years. I urge you to either require Entergy to install a recirculating cooling system at Pilgrim or to close the reactor down immediately.

Public Hearing Comment from Ms. Azarovitz: Ultimately, there is thermal pollution which negatively impacts marine life by affecting metabolic rates, feeding behavior, reproduction and distribution of the organism as well as changing the physical habitat, its plant life as do the other factors resulting in climate change. And with this, only a third of Pilgrim's thermal energy is converted to electricity. The rest, the two-thirds remaining of that thermal energy is discharged into Cape Cod Bay.

If Pilgrim Nuclear Power Station were outfitted with a closed cycle cooling system, its operations would, through all of these years, have reduced damage to Cape Cod Bay.

Public Hearing Comment from Dr. Muramoto (of APCC): Entergy is costing tax payers millions of dollars by impacting regional fisheries and adding thermal pollution to Cape Cod Bay which is already experiencing warming due to climate change. The Draft Permit allows Entergy to continue shifting the cost of pollution to the tax payers. In short, APCC feels that the Draft NPDES Permit promotes additional degradation and violates federal and state Clean Water Acts. It should not be issued as a Final Permit.

Public Hearing Comment from Ms. Vale (of Cape Downwinders); Written Comments submitted by Cape Downwinders on 7/25/16: To be successful, there needs to be management and oversight of a serious regulation to achieve that goal. The EPA must enforce the law. Not to do so raises serious questions about accountability and responsibility. Entergy is in violation of the Clean Water Act by using outdated cooling technology. Is this why the EPA allowed 20 years to lapse before reviewing Entergy's permit to pollute and damage the Cape Cod Bay? To avoid implementing the law? Has EPA effectively stonewalled the Clean Water Act progress while Entergy exploits and damages the public's natural resources?

For over 44 years, the once through cooling water intake system at Pilgrim has clearly damaged our treasured Cape Cod Bay and the marine life that inhabits it.

Public Hearing Comment from Ms. Sheehan: This is a permit to pollute. And its allowed Entergy to use Cape Cod Bay as a free source of cooling water for over 40 years. And it's a dump for pollution, including radioactive materials that are discharged, that are not regulated under this permit, and they're allowed by NRC limits. In addition to the radioactive material that's discharged into the bay every day during operations, Pilgrim is leaking cesium, tritium, etc. into the groundwater, into the sole source aquifer. This is flowing into Cape Cod Bay. There has been inadequate, if any, monitoring of this. We know that Entergy has not been monitoring the stormwater discharges where a lot of this is flowing into.

Entergy has been allowed to massively destroy Cape Cod Bay. It has taken over a mile of shoreline. This shoreline and the bay belongs to everyone. It's not Entergy's to pollute and destroy. The permit should never have been issued as a once through cooling water system back in the 90's and it should be terminated immediately now. Please stop using Cape Cod Bay as a dump.

Public Hearing Comment from Ms. Dubois (of Jones River Watershed Association): The continuation of the once through cooling Pilgrim now has is a violation of law. It's our opinion that the re-licensing should not have occurred without the permit being reissued in 2012. It's our opinion, when Entergy purchased the facility in 1999 and 2000 and disbanded the Pilgrim Technical Committee that was basically responsible for monitoring that intake, and creating an adaptive management plan every six months so that the effect on Cape Cod Bay marine species would not occur to the degree that they have.

In fact, they [Entergy] were allowed to upgrade in 2004. That wasn't even mentioned in your permit. They were producing more power in 2004 than they were in 2000. In fact, they were producing more power through the 2000s than they every produced, because they were never very consistent.. it was a bigger impact on Cape Cod Bay.

It's wrong for you to think that 1970's studies, or you know, hit and miss applications or highly paid consultants are really giving you the truth about what's happening in Cape Cod Bay. If you have to have a nursery to create more flounder, to replace the flounder you've killed in Cape Cod Bay, that should be an indication that things aren't so good.

Our concern is sea level rising, groundwater is rising. That's going to affect your discharges. It's going to affect your discharges especially post 2019. But if you extend the permit…it extends this whole stockpiling of nuclear waste for an additional five years. They're going to have to have it in the spent fuel pool. They're going to have their FLEX strategy. They're going to postpone clean up and decommissioning on site, whatever that clean up and decommissioning in the PSDAR might say.

I want EPA to be ready to say to Entergy, time's up. Enough's enough. The impact on the bay is very serious. You want all that nuclear waste sitting on the shoreline bleeding all that crap into the bay? It's not okay. I want you to really step it up EPA. We want you to really look at the water quality standards. We want you to look at what DOE is doing. We want you to look at where the spent fuel is actually stored 150 feet from the bay. We want you to look at the cooling water and the integrated nature of all this that affects the discharges. And then the fact that they're going to shut off in 2019, then they're going to rubblize the site. You don't think that's going into the drains? You didn't really address that and you really need to.

Public Hearing Comment from Mr. Sollog: Cape Cod Bay is an invaluable resource. We can't lose it. You can't mistreat it any further. You should protect it. That's what you're charged with. And you're charged to protect that for the people, please, not for the companies. For the people.

Response to Comment 2.1:

EPA received a number comments about the environmental impact of the intake and discharges from PNPS on Cape Cod Bay, including requests for PNPS to install and operate closed-cycle cooling as the best technology available, comments about radioisotopes in the groundwater, and comments about the continued impacts that could occur during decommissioning.

The Agencies agree with the commenter that stated "Entergy incorrectly claims that this mortality is not of a magnitude to constitute an adverse environmental impact." The Fact Sheet (Attachment D at 13-30) summarizes the impacts from impingement mortality and entrainment at the cooling water intake structure and clearly identifies these as adverse environmental impacts. For example, the Fact Sheet states "PNPS is responsible for the loss of billions of eggs and larvae, and millions of fish and other aquatic organisms annually as a result to the operation of its CWIS. Consistent with the Final Rule, these losses represent an adverse environmental impact to Cape Cod Bay." Attachment D at 24. The Final Permit includes operational requirements (flow limits, limits on operation of certain pumps, requirements for operation of the traveling screens) that together constitute the BTA at PNPS. In particular, the flow limits will result in a 92% reduction and flow (and thus, entrainment) and enable PNPS to achieve a through-screen velocity that will minimize impingement mortality. These requirements are consistent with the best performing technologies in the industry to minimize adverse environmental impacts from cooling water intake structures.

EPA received a number of comments requesting that PNPS be required to install a recirculating system, such as closed-cycle cooling, as BTA and suggesting that a once-through cooling system is outdated and cannot be BTA. First, closed-cycle cooling is the best performing technology for minimizing impingement and entrainment and is likely the best technology available to address the discharge of heat from power plants. See Fact Sheet Attachment D at 38 and Fact Sheet at 46-7. At the same time, there is no statute or regulation that requires a facility to implement closed-cycle cooling as the only option to minimize adverse impacts of the discharge of pollutants.

CWA Section 316(a) allows that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the projection and propagation of a balanced, indigenous population of shellfish, fish , and wildlife in and on the body of water into which the discharge is to be made, the Administrator (or if appropriate, the State) may impose an effluent limitation under such sections for such plant, with respect to the thermal component of such discharge (taking into account the interaction of such thermal component with other pollutants), that will assure the projection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water. See also 40 C.F.R. § 125 Subpart H (especially § 125.73(a) "thermal discharge effluent limitations or standards established in permits may be less stringent than those required by applicable standards and limitations if the discharger demonstrates to the satisfaction of the director that such effluent limitations are more stringent than necessary to assure the protection and propagation of a balanced indigenous population of shellfish, fish and wildlife in an don the body of water into which the discharge is made"). CWA Section 316(b) requires that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. For existing facilities, such as PNPS, the implementing regulations for establishing effluent limitations and conditions for CWISs are found at 40 C.F.R. § 125 Subpart J. The fact that the Draft Permit did not require closed-cycle cooling as the BTA is not, at the outset, inconsistent with federal statute or regulations. There is no national standard that power plants operate a closed-cycle recirculating system as the best technology for either the discharge of heat or the intake of cooling water. In this way, the Draft Permit is not inconsistent with federal regulations and operation of a once-through cooling system is not a violation of the CWA.

EPA received many comments on the Section 316(a) variance and the requirements for the CWIS, including that the permittee's demonstration was inadequate to support this variance and that closed-cycle cooling is available and feasible. See, for example, Comments I.2.2, I.3.1, I.3.4, I.4.2, and II.1.0. The Final Permit's limitations and conditions result in a 92% reduction in flow, which is consistent with the best technology available to minimize adverse environmental impacts from CWISs under CWA § 316(b). In addition, the Final Permit's temperature limits result in a 98% reduction in heat load to Cape Cod Bay, which is consistent with reductions in heat achievable with the use of cooling towers. The Agencies have addressed comments about effluent limits and permit conditions for thermal discharges as well as entrainment and impingement in Responses to Comments I.2.2, I.3.1, I.3.4, I.4.2, and II.1.0.

One commenter raised concerns about discharges of cesium, tritium, and other radioactive material into the groundwater and the sole source aquifer. Radioactive discharges that are regulated separately under the Atomic Energy Act of 1954 are not also regulated as pollutants through NPDES permits. The definition of "pollutant" at 40 C.F.R. § 122.2 in turn expressly includes "radioactive materials," "*except* those regulated under the Atomic Energy Act of 1954 (AEA), as amended (42 U.S.C. 2011 et seq.)." (emphasis added). *See also* CWA § 502(6) (defining "pollutant" to include "radioactive materials"); *Train v. Colorado Pub. Interest Research Group*, 426 U.S. 1 (1976) (hereinafter, "*Train*") (interpreting the term "pollutant" at CWA § 502(6) consistent with the definition at 40 CFR § 122.2). The NRC is responsible for ensuring that any release of radioactive material is consistent with EPA's standards for radiation releases and doses to the public from normal operation of nuclear power plants and other uranium fuel cycle facilities. *See* 40 C.F.R. Part 190. *See also* 42 Fed. Reg. 2860 (January 13, 1977). EPA has responded to similar comments regarding discharges of radioactive materials in Responses to Comments I.2.6, II.1.0, III.7.0, and IV.3.0.

At the same time, EPA recognizes the public health concern raised in the comment regarding discharges of radioactive material, including tritium, to the groundwater. The Massachusetts Department of Public Health (MassDPH) oversees a monitoring program for nuclear power station emergency planning zones, including at PNPS. MassDPH's Bureau of Environmental Health monitors radiation at a series of stationary monitors surrounding PNPS. These data are transmitted to DPH, which ensures real-time environmental monitoring of radiation from PNPS. The Radiation Control Program also monitors radiation levels in surface water, sediment and biota, and fish and shellfish around PNPS. *See* AR-701. Entergy began routine monitoring of groundwater wells for tritium in 2007. Well and surface water samples are sent by Entergy to an independent analytical lab and duplicate samples are provided to MassDPH for analysis at the Massachusetts Environmental Radiation Lab. MassDPH provides quarterly updates on groundwater and surface water results.[88] Neither Entergy, nor MassDPH has indicated that the groundwater monitoring program at PNPS will be discontinued now that PNPS has shutdown. *See* Response to Comment II.1.0.

Finally, several commenters raised concerns about decommissioning, including the location of the spent fuel storage area, the method of storing spent fuel, and discharges that could result from demolition of buildings on the site. The Agencies have addressed similar concerns about decommissioning in Response to Comment IV.5.1, below. The NRC is the primary authority for overseeing the decommissioning of nuclear power plants, including decisions about the location of the ISIFI and the method of storing nuclear waste. According to the November 16, 2018 PSDAR submitted by Holtec Decommissioning International (Holtec), the planned method for PNPS is DECON, which is expected to be completed sooner than the SAFSTOR method initially proposed by Entergy. *See* AR-696. The Final Permit includes monitoring requirements, effluent limitations, and non-numeric, technology-based requirements for stormwater discharges associated with industrial activity as described in this Response to Comments and in the Fact Sheet. However, discharges of stormwater associated with construction activity and certain other discharges that may be related to decommissioning (e.g., pipeline and tank dewatering) or to dismantling and demolition of plant buildings and structures are not authorized. *See* Parts I.B and I.H.6 of the Final Permit and Condition 4 of MassDEP's Water Quality Certificate. If, during decommissioning and site restoration, the Permittee expects to discharge pollutants not covered by the Final Permit, the Permittee may be required to modify its individual permit or seek additional coverage another NPDES permit (for example, EPA's Construction General Permit).

2.2 Species of Concern

Written Comment Submitted by PilgrimWatch on 7/25/16; Public Hearing Comment from Ms. Lampert (of PilgrimWatch): EPA's analysis needs to be expanded regarding the impact on protected species, including endangered shore birds such as Rosette Terns, over the next 60 or so years. It is likely that species distribution and composition in Cape Cod Bay has changed due to human activity, climate change and other factors and EPA should take this into account when assessing Pilgrim's impacts. Also, the likely species distribution and composition in Cape Cod Bay is likely to change, has changed, due to human activity, climate change, and other factors. That has to be analyzed and then taken account of.

Written Comment Submitted by Mr. Nichols on 7/20/16: Section 7 re-initiation by NOAA Fisheries would be appropriate given that EPA is revising Pilgrim's NPDES permit, the newly established, expanded critical habitat area for North Atlantic right whales in Cape Cod Bay, the fact that endangered right whales are being sighted in the western part of the Bay with more frequency, the current special concern status of rainbow smelt, and the on-going monitoring of river herring.

Response to Comment 2.2:

[88] Monitoring data are available to the public at https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station.

The Draft Permit considered the impacts of impingement mortality, entrainment, thermal discharges, and discharges of other pollutants on aquatic life in the vicinity of the discharge, including specific species know to be present (e.g., river herring and rainbow smelt). The commenters request that EPA consider impacts to endangered shore birds and the North Atlantic Right Whale in its consultation with the Services under the Endangered Species Act (ESA). The Agencies responded to similar concerns in Response to Comment I.5.4.

EPA proposed that the re-issuance of the NPDES Permit for PNPS is not likely to adversely affect listed species or critical habitat in the action area, which includes Cape Cod Bay. In addition, EPA proposed that because the Draft Permit limits are as stringent or more stringent that the permit in effect at the time of the 2012 consultation with NRC, in which NOAA Fisheries found that the impacts of the proposed relicensing were unlikely to adversely affect listed species or designated critical habitat (including the continued operation in compliance with the administratively continued permit), re-initiation of formal consultation is not necessary at this time. *See* AR-698, AR-465. *See also* Fact Sheet at 54-65. NOAA Fisheries concurred with EPA's finding that re-initiation of consultation is not necessary for the Final Permit. *See* AR-694. All effects of the proposed action on listed species and designated critical habitat have been previously considered in the 2012 consultation and the analysis remains valid. In particular, the 2012 consultation already considered the effects to designated critical habitat for the North Atlantic right whale in Cape Cod Bay. In other words, the analysis remains valid even as the area of critical habitat was expanded in 2016 because the 2012 consultation already considered the impacts to designated critical habitat.

The comment also requests that EPA consider additional species in the ESA assessment, including rainbow smelt and river herring. The Fact Sheet (at 54-56) explains that Section 7(a) of the ESA requires Federal agencies, in consultation with and with the assistance of the Secretary of Interior, to ensure that any action that the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Rainbow smelt and river herring were not included in the ESA assessment because neither species is listed as federally threatened or endangered species. In other words, Section 7(a) does not apply to these species. Having said that, EPA did consider the potential impacts of the CWIS and effluent discharges on both species for the Draft Permit and again in responding to comments on the Draft Permit. *See*, *e.g.*, Fact Sheet Attachment D at 26-27 and Response to Comment III.2.1.6. If a new species is listed (including either river herring or rainbow smelt), or critical habitat is designated or revised, and the species or habitat may be affected by the action, EPA will re-initiate consultation with the Services.

Finally, the comment requests that EPA consider impacts to roseate terns. The roseate tern is a federally threatened species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). EPA notified USFWS of the public notice for the Draft Permit but did not receive any comments. In response to this comment, EPA corresponded with USFWS regarding the potential impacts of the permit reissuance on roseate tern (*Charadrius melodus*) and red knot (*Calidris canutus rufa*). *See* AR-699. USFWS concurred with EPA's assessment that renewal of the PNPS NPDES permit may affect, but is not likely to adversely affect, any listed species or critical habitat under USFWS' jurisdiction. *See* AR-700.

2.3 Pilgrim Should Fund Mitigation for Past Ecological Damage

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA should require Entergy to fund a mitigation account for restoration and monitoring work in Cape Cod Bay and nearby estuaries throughout the decommissioning process, to monitor for ecosystem changes due to global warming and climate change and adjust its operations to fully protect those waters. Entergy should be required to study and mitigate impacts from Pilgrim's 40-plus years of operations, including at least 10 years after shutdown and until decommissioning is complete (up to 60 years after shutdown).

Written Comment Submitted by PilgrimWatch on 7/25/16: EPA should require Entergy to fund a mitigation account for restoration and monitoring work in Cape Cod Bay to "pay back" for the 20+ year delay is reissuing the permit and the consequent environmental harm due to Pilgrim's continued use of a once-through cooling system when better technology was available. Mitigation and monitoring must occur throughout the decommissioning process. (Pilgrim Watch)

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA (and MassDEP) must hold Entergy accountable for past violations and ensure compliance with all requirements of the new permit in order to effectively reduce impacts from Pilgrim's activities and to protect Cape Cod Bay. Entergy's noncompliance with the current permit has included exceeding effluent limits for a variety of pollutants, disbanding the required Pilgrim Administrative-Technical Committee (PATC) that watched over marine impacts, and not carrying out required storm drain testing for nearly a decade. Enforcement of requirements has been mostly nonexistent.

Public Hearing Comment from Ms. Lampert (of PilgrimWatch): You should require Entergy to fund a mitigation account for 20 years of damage. And I've brought up the tricky question of who really should be paying. And I think that is an important legal question that should be looked at. Is it Entergy for not doing what they were not required to do? Or is it the agency's for not requiring that the law be followed? That is a very interesting question.

Response to Comment 2.3:

Several commenters requested that the NPDES permit include a requirement for Entergy to fund mitigation efforts in Cape Cod Bay. The Agencies responded to similar concerns in Response to Comment I.2.3.

The commenters do not identify any provision under the federal CWA, the Massachusetts Clean Waters Act, or their respective implementing regulations as requiring such a permit condition. Nor do the comments identify any other NPDES permits that include any such condition. Notably, in responding to public comments on the § 316(b) Final Rule, EPA disagreed with comments that requested additional permit requirements based on organism losses that occurred in the past. *See* Final Rule RTC at 108.

EPA also noted the potential difficulty in accurately calculating the effects of such past losses on current abundances of organisms and thereby determining an appropriate level of response. *Id.* Furthermore, in general, as part of a negotiated settlement to address past violations of a NPDES permit, the Agencies may require a Permittee to conduct supplemental environmental projects, which could include efforts to mitigate past environmental harm as described in the comment, but such a requirement occurs in the context of an enforcement action to resolve permit violations, not a permitting action.

The Agencies do not disagree with the comment that PNPS's cooling water intake has removed and killed billions of aquatic organisms in Cape Cod Bay since 1972 and indirectly impacted the aquatic environment as a result. Indeed, the Agencies closely examined environmental impacts associated with the facility's intake and discharge of cooling water in determining the appropriate BTA for the facility under CWA § 316(b) and temperature variance under § 316(a), as well as other effluent limitations. The past withdrawal and discharge of cooling water, however, occurred in the context of a permitted activity sanctioned by the Agencies under previous permits issued pursuant to federal and state law. The comment does not allege that the impacts resulted from violations of past permits. As such, the Agencies do not agree that including the requested mitigation fund permit condition in the Final Permit is appropriate here. As to the period after May 31, 2019, when the facility stopped generating electricity, the Final Permit contains more stringent flow and temperature limits that are expected to coincide with a roughly 92% reduction in losses from impingement and entrainment and 98% reduction in heat load. These reductions in flow and temperature will significantly reduce the impacts from PNPS' withdrawals and discharges.

3.0 Discharges of radioactive wastewater

Written Comment Submitted by Mr. Nichols on 7/20/16: Radionuclides in the discharge water, not mentioned in the draft permit, need to be eliminated or sharply reduced before water is discharged to be eliminated. EPA needs to take jurisdiction seeking legislation if necessary.

Public Hearing Comment from Dr. Muramoto (of Association to Preserve Cape Cod): Radioactive discharges from Pilgrim pose a regional threat to environmental quality, human health and the health of Cape Cod Bay's ecosystems. Discharges of radioactive tritium into groundwater pose a threat to Plymouth's sole-source aquifer and to Cape Cod Bay's water quality and ecosystems. APCC believes that Pilgrim's discharge of radioactive materials should cease and that permits allowing for discharge should be terminated.

Public Hearing Comment by Ms. Sheehan (of Cape Cod Bay Watch): In addition to the radioactive material that's discharged into the bay every day during operations, Pilgrim is leaking cesium, tritium, etcetera, into the groundwater, into the salt source aquifer. This is flowing into Cape Cod Bay. There has been inadequate, if any, monitoring of this. We know that Entergy has not been monitoring the storm water discharges where a lot of this is flowing into.

Response to Comment 3.0:

Several commenters raised concerns about the discharge of radioactive materials to surface water and the discharge of tritium, a nuclear byproduct material, to groundwater. The Agencies responded to similar concerns in Responses to Comments I.2.6, II.1.0, III.7.0, and IV.2.1.

While EPA has the authority under the Atomic Energy Act ("AEA") to *establish* generally applicable environmental standards for the protection of the general environment from radioactive material—which it has done at 40 C.F.R. part 190—the NRC has the responsibility to *insure adherence* to EPA standards in the NRC's regulation of individual nuclear power plants. *See* Reorganization Plan No. 3, § 2(a)(6); 10 C.F.R. parts 20, 50; 35 Fed. Reg. 15,623 (Oct. 6, 1970); *see also* 79 Fed. Reg. 6509 (Feb. 4, 2014); 42 Fed. Reg. 2860 (Jan. 13, 1977). Radioactive discharges that are regulated under the AEA are not regulated under the Clean Water Act. *Train v. Colorado Pub. Interest Research Group*, 426 U.S. 1 (1976). For this reason, the definition of "pollutant" in EPA's NPDES regulations at 40 C.F.R. § 122.2 includes "radioactive materials," "*except* those regulated under the Atomic Energy Act of 1954 (AEA), as amended (42 U.S.C. 2011 et seq.)." (emphasis added). *See also Train v. Colorado Pub. Interest Research Group*, 426 U.S. 1 (interpreting the term "pollutant" at CWA § 502(6) consistent with the definition at 40 CFR § 122.2). Thus, the permit does not regulate discharges of radioactive materials regulated under the AEA.

The Massachusetts Department of Public Health's (MassDPH) Radiation Control Program (RCP) conducts environmental radiation monitoring within the Emergency Planning Zones (EPZs) of operating nuclear power stations in or near the Commonwealth as part of its regulating responsibilities. The EPZ for PNPS has environmental radiation sampling programs. The Massachusetts Bureau of Environmental Health monitors radiation at a series of stationary monitors surrounding PNPS. These data are transmitted to MassDPH, which ensures real-time environmental monitoring of radiation from PNPS. The RCP also monitors radiation levels in surface water, sediment and biota, and fish and shellfish around PNPS. *See* AR-701. Entergy began routine monitoring of groundwater wells for tritium in 2007. Well and surface water samples are sent by Entergy to an independent analytical lab and duplicate samples are provided to MassDPH. MassDPH provides quarterly updates on groundwater and surface water results.[89] Neither Entergy, nor MassDPH has indicated that the groundwater monitoring at PNPS will be discontinued now that PNPS has shutdown.

4.0 Stormwater Monitoring

4.1 Stormwater BMPs

Written Comment Submitted by Mr. Nichols on 7/20/16: Stormwater yard drains should be fitted with backflow prevention to avoid flushing of contaminants into the sea and will require proper monitoring, particularly because pollutants are likely to increase due to climate-change caused increased flooding, sea levels, and groundwater rise, thus increased runoff.

Response to Comment 4.1:

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[89] Monitoring data are available to the public at https://www.mass.gov/lists/environmental-monitoring-data-for-tritium-in-groundwater-at-pilgrim-nuclear-power-station.

The commenter requests that the Final Permit include a requirement to fit stormwater yard drains with backflow prevention to avoid flushing of contaminants into Cape Cod Bay. EPA is not clear what the commenter means by "backflow prevention." The catch basins capture stormwater runoff from the site and the Final Permit authorizes the discharge of stormwater to Cape Cod Bay through Outfalls 004, 005, 006, and 007. Parts I.A.5 and I.A.6 of the Final Permit authorize stormwater discharges and include effluent limitations and monitoring requirements to ensure that discharges of stormwater are sufficiently monitored. Stormwater outfalls are designed to drain water away from buildings and infrastructure and fitting any of these stormwater outfalls with backflow prevention would allow water to build up on the site and may present safety and operational concerns.

In addition, Part I.D of the Final Permit (Special Conditions) includes non-numeric, technology-based requirements to address stormwater associated with industrial activity consistent with EPA's 2015 Multi-Sector General Permit (MSGP). The Permittee must implement best management practices (BMPs), consistent with the 2015 MSGP, to minimize pollutant discharges from stormwater associated with industrial activity. The Final Permit includes a brief description of each of the BMPs and refers the Permittee to Part 2.1.2 of the 2015 MSGP, which includes a more detailed discussion of potential control measures to address each of the BMPs. These include minimizing exposure of stormwater to processes and material storage areas, good housekeeping measures, preventative maintenance programs, spill prevention and response, erosion and sediment controls, runoff management practices, proper handling, and minimizing generation of dust associated with industrial activity. The Final Permit also requires the Permittee to implement employee training to ensure personnel understand the stormwater related requirements of the permit, including staff responsible for stormwater controls, staff responsible for storage and handling of materials that may be exposed to stormwater, and staff responsible for inspections. The Permittee must also develop a stormwater pollution prevention plan (SWPPP) to document how the BMPs are implemented. Together, the numeric limits, monitoring requirements, and non-numeric limits in the Final Permit will ensure that pollutants being discharged directly into Cape Cod Bay via stormwater discharges are minimized.

4.2 Stormwater in Electrical Vaults

Written Comment Submitted by Mr. Hoopingarner on 7/12/16: The water in the station's electrical vaults, which has been found to contain cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, and hexavalent chromium; not all of these are reflected under the current permit, which omits cyanide, antimony, nickel and hexavalent chromium. The new permit should address all of these contaminants.

Written Comment Submitted by Ms. Burgess (of Cape Cod National Seashore Advisory Commission) on 7/23/16: There are 25 electrical vaults on-site that were never monitored before now – these drain to the stormwater outfalls. Testing in 7 of the 25 found total suspended solids, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, and hexavalent chromium. Lead, copper, and zinc were all exceeding marine water quality criteria. EPA is only requiring a 1-time test of all 25 vaults, and only making Entergy regularly test 5 of the 25 vaults, and the substances that Entergy has to monitor for is not even the full list of pollutants they already found (cyanide, antimony, nickel, and hexavalent chromium appear to be omitted). EPA needs to test all 25 vaults, develop a complete list of parameters, then the complete list of parameters should be included in the final permit. And there should be numerical limits not just monitoring whether pollutants are present.

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA needs to require sampling of all water to be discharged into Cape Cod Bay and removal of all known contaminants prior to discharge, including total suspended solids, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, cadmium, and hexavalent chromium. The draft permit needs to be amended to include all these contaminants. EPA should test all 25 electrical vaults (contaminants were found in seven), develop a complete list of parameters, then this complete list should be included in final permit.

Response to Comment 4.2:

Several commenters noted concerns with the stormwater that accumulates in 25 electrical vaults on the property and requested that the Final Permit include monitoring requirements for all 25 electrical vaults on the property. The Agencies responded to similar concerns in Responses to Comments I.3.6 and II.1.0. The Agencies also responded to comments from the Permittee regarding permit conditions for the electrical vaults in Response to Comment III.10.

During the permit term, PNPS informed the Region that stormwater discharged from the four storm water outfalls includes stormwater that accumulates in various electrical vaults on the property and that is periodically pumped out to the closest stormwater outfall in order to assure proper working condition of electrical cables and associated equipment in the vaults. The permittee indicated that the NRC requires the inspection of these vaults on a regular basis to assure that electrical equipment and wires are not submerged in water for extended periods of time. *See* United States Nuclear Regulatory Comm'n, *NRC Information Notice 2010-26: Submerged Electrical Cables* (Dec. 2, 2010). Consequently, facility personnel routinely inspect these vaults, especially after storm events. With the exception of those vaults that have automatic pumping capability, the water that has collected in these vaults are pumped out manually by facility personnel in order to comply with the NRC guidance.

One commenter noted that stormwater discharges from all of these vaults needed to be characterized. In order to assess the constituents of the water in these vaults, EPA sent PNPS a CWA Section 308 (information request) letter on March 24, 2015 requiring water sampling from seven (7) of the electrical vaults on the property for a variety of pollutants that could possibly be found. The results of this sampling, which were submitted with a letter of June 30, 2015 by PNPS, found that the sampled pollutants were either often not detected or detected at low levels and further detailed in the fact sheet.

In the Draft Permit, quarterly monitoring is required for water that has collected in five (5) specific electrical vaults, which are located throughout the property. Since each of these 5 vaults discharges to a nearby, permitted stormwater outfall, they have been designated as internal outfalls and numbered 004A, 005A, 005B, 007A and 007B, reflecting the existing stormwater outfall to which they discharge. This sampling is required quarterly and does not need to be conducted during wet weather, since the pumping out of water from the vaults can occur in wet or dry conditions. The parameters to be sampled include TSS, cyanide, total PCBs, total copper, total iron, total lead, total zinc, and pH. This listing reflects parameters that were detected in at least one of the vaults in the initial, single sampling event in 2015. The Jones River Watershed Association pointed out in its comments that the Draft Permit neglected to include several parameters that were detected in the 2015 samples, including antimony, cyanide, nickel, and hexavalent chromium. These parameters have been included in Part I.A.7 of the Final Permit. *See* Response to Comment I.3.6.

The Final Permit establishes a one-time sampling requirement for all of the electrical vaults that were not sampled in 2015. These samples shall be analyzed for the same parameters that were required in 2015 (listed in Permit Attachment C). A characterization of water collected in the previously unsampled vaults is warranted because these vaults have not yet been sampled, are located throughout the property, and the initial sampling showed the presence of several pollutants. Depending on results from this new monitoring regime, the Agencies may request/require additional monitoring data from the Permittee, modify Part I.A.7 of the Final Permit to revise monitoring requirements for certain vaults, or both. *See* 40 C.F.R. § 122.62. The results of any additional or revised monitoring would also inform future NPDES permitting at the site.

4.3 Stormwater Monitoring

Written Comment Submitted by Ms. Burgess (of Cape Cod National Seashore Advisory Commission) on 7/23/16: For the past 10 years, Entergy has barely done any stormwater drain testing, despite it being a permit requirement. These stormwater drains are where the electrical vaults (and the long list of pollutants mentioned above) drain to. No enforcement actions have been taken for this lack of sampling. EPA has to start enforcing limits and conditions it imposes in order to protect the resources and qualities of Cape Cod Bay upon which we all depend.

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA should monitor storm drain testing with heightened scrutiny and be prepared to enforce when testing is not done or limits are exceeded. That is particularly needed because Entergy failed to test storm drains for about 10 years. Penalties should be pre-determined and automatically assessed, with particular attention to egregious exceedances or unpermitted discharges. Although EPA's design of the storm drain sampling regime and increased frequency of sampling is appropriate, Entergy's lack of adherence needs to be ended.

EPA needs to require sampling of all water to be discharged into Cape Cod Bay and removal of all known contaminants prior to discharge, including total suspended solids, cyanide, phenols, phthalates, PCBs, antimony, iron, copper, zinc, lead, nickel, cadmium, and hexavalent chromium. The draft permit needs to be amended to include all these contaminants.

Written Comment Submitted by Mr. Hoopingarner on 7/12/16: Storm drains in the facility overall should be more heavily considered, and represent another reason that the current, expired permit should be terminated and replaced with a stronger NPDES permit for the remainder of its operational life. Regular sampling of storm drains, extraction of all harmful pollutants (especially triazoles) from water before discharge and installing backflow prevention in the storm sewers should be some priorities under this new permit.

Response to Comment 4.3:

Several commenters raised concerns about the current frequency of stormwater monitoring but did not identify any specific issues with the proposed monthly stormwater monitoring or effluent limitations at Outfalls 004, 005, 006, or 007 in the Draft Permit. The Agencies also responded to similar comments about stormwater monitoring in Responses to Comments I.3.5 and I.3.6.

The Final Permit requires monthly monitoring of the four stormwater outfalls, includes language defining when sampling must occur, and authorizes sampling to be conducted at upstream locations of the outfall where appropriate. These Final Permit includes permit limits for TSS, pH, and oil and grease. In addition, the Final Permit requires quarterly monitoring of stormwater at five electrical vaults, as well as a one-time sampling requirement for stormwater from certain electrical vaults which have not yet been analyzed (See Parts I.C.3 and I.J. of the permit). The Final Permit also contains new, non-numeric limitations to develop and implement best management practices (BMPs) to identify and minimize the sources of pollution from stormwater discharged to Cape Cod Bay. The Permittee must document the implementation and inspection of these BMPs in a stormwater pollution prevention plan (SWPPP). The non-numeric limitations are consistent with EPA's 2015 Multi-Sector General Permit (MSGP) for stormwater discharges associated with industrial activity.

4.4 Stormwater Outfall 013

Written Comment Submitted by Mr. Hoopingarner on 7/12/16: As the process of climate change continues, warming seas, harsher storms, and sea level rise will introduce even more vectors for pollution coming from the plant. For this reason, Outflow 013, which drains in cases of extreme storms, should also be considered in the permit analysis.

Written Comment Submitted by Mr. Nichols on 7/20/16: Outfall 013, which drains to Cape Cod Bay during extreme storm events, should be included in the final permit and effluent limits should apply. This is essential given consensus that more intense storms and flooding will increasingly impact the Northeast, and therefore Pilgrim.

Response to Comment 4.4:

Several commenters raise concerns that Outfall 013 has not been adequately considered in the Draft Permit. The Agencies also responded to similar comments about Outfall 013 in Response to Comment I.3.5 and I.3.6.

As explained in the Fact Sheet, Outfall 013 may discharge only during extreme storm events and this discharge is believed to be representative of the other stormwater discharges at Outfalls 004, 005, 006 and 007. EPA has not established effluent limits and monitoring conditions at Outfall 013 because, under most storm conditions, stormwater at this outfall infiltrates the soil prior to discharge to the intake embayment meaning that there is not typically a discharge from this outfall. In addition, Outfall 013 is located at an inaccessible location between a concrete wall and security fence (AR-516). Monitoring at Outfall 013, will, except under extreme circumstances, result in reporting of "C" for no discharge or "F" for insufficient flow. The Final Permit authorizes stormwater discharges from Outfall 013 but has not established any monitoring requirements for this discharge. See Part I.A.6 of the Final Permit. In addition, the non-numeric, technology-based effluent limitations at Part I.C of the Final Permit are designed to minimize the discharge of pollutants in stormwater discharges associated with industrial activity at PNPS, including in the event of stormwater discharges from Outfall 013. These include best management practices (BMPs) to address exposure of stormwater to industrial activities, spill prevention, runoff management, proper materials handling, training, and specific BMPs for steam electric generating facilities.

It is not unusual for EPA to require monitoring of a limited number of outfalls as representative of stormwater and other industrial discharges. See, for example, Parts 6.1.1 and 6.2.2.2 of EPA's 2015 Multi-Sector General Permit. The Agencies may decide in a future permit proceeding to establish limits for Outfall 013 if the results from required monitoring of Outfall 006 warrant such a decision. Furthermore, the Agencies understand that Outfall 013 does not typically discharge directly to Cape Cod Bay. In short, the Agencies have not added limits or monitoring requirements for Outfall 013, because Outfall 013 drains an area that is similar in character to that drained by a monitored outfall and other permit conditions are applicable to both areas that are designed to minimize the discharge of pollutants in stormwater discharges, and because the permittee reports that Outfall 013 is inaccessible and rarely discharges directly to Cape Cod Bay.

5.0 Decommissioning

5.1 Decommissioning Process

Written Comments Submitted by PilgrimWatch on 7/25/16: The decommissioning process allowed by NRC greatly increases the probability of contamination of pollutants flowing into Cape Cod Bay. Therefore EPA must fine tune its draft to account for challenges presented by decommissioning; and EPA and DEP must be vigilant during this long decommissioning period, spanning potentially 60 years, and commit to adhering to the 5-year schedule for reissuing the permit in order to reassess and enact appropriate new requirements.

Pilgrim announced that it will follow the decommissioning option SAFSTOR- mothball the plant for up to 60 years, to 2079. During those years, there will be ample opportunity for contaminants to migrate offsite unless EPA expands its monitoring program and provide public reports. Simply consider the facts that: (1) Contamination is onsite now. There is historical evidence of oil spills, for example. (2) Pilgrim was built from 1967-1970. Some of Pilgrim's buried structures, pipes and tanks are original and that makes those components over 46 years old today. Fifty years post shutdown, they will be 100 years old or more. Corrosion is a function of age. Many of those components contain hazardous materials and are constructed of concrete and steel- both materials corrode. Pilgrim's site specific environment is corrosive.

After closure, Entergy will issue a post shutdown report but it does not include impacts associated with non-radiological contaminants and the generation and storage of non-radiological wastes. Thus, the PSDAR fails to provide sufficient information to allow EPA, the

State, and the public to assess all of the environmental impacts associated with Entergy's decommissioning activities. EPA must step in here and "fill in the blanks" as they relate to pollutant discharge into Cape Cod Bay. After issuance of Entergy's PSDAR, EPA must get to work on a re-issued permit. Many radioactive components, such as the reactor vessel, steam generators, or other components that are comparably radioactive are removed, other structures will remain. Structures that are removed are only removed to 3 feet below grade. Rubbilization is permitted. These facts indicate a very high likelihood of pollutant discharge. The discharge will go into Cape Cod Bay due to the slope of the property.

Will Entergy be required to perform an environmental assessment following shutdown? It is unlikely that NRC will require Entergy to perform a NEPA analysis at the outset of the decommissioning process; instead, based on lessons learned from Vermont Yankee, NRC will allow Entergy to rely on environmental impacts addressed in its environmental analyses done during the license renewal process. Those analyses are outdated and do not bound all the environmental impacts associated with decommissioning. Actual characterization of Pilgrim's site is not required to be submitted until 2 years before license termination, perhaps as late as 2077. How much pollution will have the opportunity to "escape" over those intervening years? In order to protect against pollutant discharges into Cape Cod Bay, EPA must push for a NEPA analysis at the outset of the decommissioning process and include in its NPDES more robust monitoring requirements.

Written Comments Submitted by Ms. Bassett: While the Pilgrim Nuclear Power Station is decommissioning it is imperative that the standards of environmental protection be upheld instead of being relaxed to the point of disaster. Already it has severely compromised the environment. We need the strictest laws.

The plant's use and discharge of water permit expired 20 years ago. This is totally unacceptable. New technology and new information, and new standards have come in for 20 years without any updated as to how better to run this PNPS. How come the neglect? How come the delay?

Written Comment Submitted by Ms. Burgess (of Cape Cod National Seashore Advisory Commission) on 7/23/16: We are very concerned that decommissioning activities, e.g., disturbing soils in combination with climate change issues such as rising seas and groundwater tables and stronger storms could cause even more pollutants to end up in storm drains and EPA isn't considering this.

Public Hearing Comment from Ms. Lampert (of PilgrimWatch): NRC gives Entergy 60 years to close, to decommission, the whole process, 60 years. And they announced they're going into this so to speak SAFESTOR, moth balling the reactor, because simply, they don't have the money. During that time, there will be ample opportunity for contaminants on site that you're responsible to look at, chemical contaminants, oils, etcetera, to migrate off site, if there isn't active monitoring by the state and EPA. NRC, as was mentioned, they don't require EIS when they shut down if the licensee can show, as they did in Entergy's Vermont plant, we already did that during license renewal. It's outdated and those analysis did not bound all the things that you are responsible and interested in.

Entergy will give a PSDAR. However, the PSDAR does not deal with chemical contaminations. You have to do your own equivalent to deal with an analysis of what's there, what we're going to deal with, how we're going to deal with it, how we're going to monitor, what there is now.

They're [Entergy] only required to take down radioactive contaminated buildings like the reactor, etcetera. They don't have to take down all the buildings. And they only have to take them down three feet below grade. Then, they can rubblize unless that state prohibits that process of allowing, once it's scraped down to NRC's allowable radioactive, and that's not talking about other stuff, too, scrunch it up and dump it in the hole, which is clearly going to have an impact eventually on Cape Cod Bay and the flow of contaminants.

Public Hearing Comment from Mr. Romeo (of Entergy): Our shut down is targeted for June 2019. It will not surprise you that shutting down a major electricity supplier is a complicated matter. As a result, the exact timing of that shutdown in 2019 depends on a variety of factors, including further discussions with the New England Independent System Operator, our fuel design, and our fuel loading considerations. For this reason, the permit must be flexible about shut down dates.

Shut down will result in cessation of the overwhelming majority of Pilgrim's existing cooling water use. The remaining cooling water systems consist of service water which have four 2700 gallon per minute service water pumps and a fit standby pump. This system will add up to a daily flow of less than 3.5 percent of the current maximum flows. In addition, some use of circulating water may occur for approximately one or two days to support nuclear operation, but not as cooling water.

The Pilgrim shut down and the subsequent decommissioning process will be overseen by the Nuclear Regulatory Commission, the NRC, in a separate public process. That separate NRC public process is expected to begin in the near term, at the earliest, within several months and no later than two years from Pilgrim's shut down. Specifically, the first major decommissioning submission to NRC, known as the post shut down decommissioning activities report, or PSDAR, is due to NRC no later than two years after Pilgrim's shut down. That document will also address the costs of decommissioning. It's worth stating that nuclear stations such as Pilgrim set aside substantial funds to manage the decommissioning. This ensures that sites like Pilgrim do not become orphaned or Superfund sites requiring taxpayers's support at clean up as occurs so frequently in other industries across the United States. That document will include, among other things, a description and schedule for future decommissioning activities at the site. We are working on it now and will continue to do so for many months. It will be submitted on a timely basis. For these reasons, there will be ample opportunity to obtain answers to questions about the nuclear aspects of shut down and decommissioning which should be reserved for the NRC process.

For more than a quarter century, Pilgrim has taken in and discharged cooling water under its permit. Throughout that time, EPA and MassDEP have required and continue to require that our operations do not adversely affect the fish communities in Cape Cod Bay. We know this is the case because we study the aquatic environment, we evaluate the effects of our operations continuously, we provide annual reports that are defined, overseen, and reviewed by EPA and MassDEP staff. For this renewed permit, and because Pilgrim will continue to operate during the renewed term, EPA and MassDEP focused on Pilgrim's cooling water use. EPA did so to ensure its past permitting decision, including its best technology available decision on our cooling water, remains current, correct and consistent with EPA's recent Final Rule, the rule for existing steam electric generation facilities. MassDEP did so to fulfill its obligations under applicable Commonwealth water quality standards.

There are relatively minor issues and errors in the draft report. We fully expect those to be readily resolved with EPA and MassDEP during the written comment period. Most of them relate to matters that are squarely within NRC's oversight, such as the appropriate service water or dilution limits necessary to support nuclear operations in a compliant, safe, and effective manner. The fundamental terms and conditions of the draft renewed NPDES permit, when corrected to redress inadvertent errors and omissions will ensure that the balanced aquatic populations, not to mention the best usage of Cape Cod Bay waters, are maintained. Further, the permit does so without compromising Pilgrim's ability to provide reliable and cost effective electricity to its customers through 2019 and manage to shut down and subsequent decommissioning.

Response to Comment 5.1:

Several commenters raised concerns about environmental impacts of discharges during the decommissioning process for PNPS. The Agencies also responded to similar comments about decommissioning in Responses to Comments I.2.2, I.2.5, II.1, and II.2.

On July 30, 2018, Entergy entered into an Equity Purchase and Sale Agreement with Holtec Decommissioning International (Holtec) for the sale of PNPS. Closing of this sale occurred on August 26, 2019. *See* AR-727. On November 16, 2018, both Entergy and Holtec submitted PSDARs for the decommissioning of PNPS. At the same time, Entergy submitted to NRC its application for a license transfer from Entergy to Holtec. *See* AR-692, AR-696, AR-727. NRC Staff issued an order approving the transfer of the NRC licenses for PNPS from Entergy to Holtec on August 22, 2019.[90] *See also* Response to Comments I.2.5, IV.1.2. In its PSDAR, Holtec proposes to move forward with accelerated decommissioning of PNPS under DECON, which is a substantial departure from SAFSTOR, the option mentioned in the comment and proposed by Entergy in its PSDAR. *See* AR-696. Under SAFSTOR, the facility would be placed in a storage condition for safe storage and deferred decontamination after the plant is shut down and defueled. The site may be maintained intact for close to 60 years. Under DECON, the equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the NRC license within the immediate years after cessation of operations. *See* AR-714 Section 3.2. According to the PSDAR, Holtec plans to release all portions of the site excluding the ISFSI within 8 years after license transfer. If the license were not transferred, decommissioning would proceed under

[90] Both PilgrimWatch and the Massachusetts Attorney General (AG) filed motions with the NRC asking the NRC to stay, among other things, the NRC Staff Order approving the transfer of the NRC licenses from Entergy to Holtec. In addition, on September 25, 2019, the Massachusetts AG petitioned the United States Court of Appeals for the District of Columbia Circuit to review the NRC's approval. This litigation is still pending.

Entergy's SAFSTOR PSDAR, which anticipated releasing the site in 60 years. One commenter raised concerns about the corrosion of equipment during the lengthy SAFSTOR process. Holtec's accelerated decommissioning option may serve to reduce risks due to corrosion as the equipment at issue may be dismantled and removed relatively soon. At the same time, the accelerated pace of decommissioning under the DECON option raises other issues and concerns related to the discharge of pollutants at the site that could occur over the term covered by the reissued permit that would not have occurred during this period under SAFSTOR. These issues are addressed below.

First, it is important to establish that the decommissioning process is overseen and regulated by the NRC. However, licensees are required to comply with the Clean Water Act (CWA) and implementing regulations related to release of pollutants within the meaning of the CWA (i.e., not including special nuclear materials, by-product, and source materials) in effluent discharges to waters of the U.S. *See* AR-714. The Agencies have considered comments on the decommissioning process as they relate to authority under the CWA and the NPDES permit at issue.[91] In addition to the CWA, the investigation and clean-up of contamination from non-radiological, hazardous materials at the site may also be addressed by EPA and/or MassDEP under the Resource Conservation and Recovery Act (RCRA) (*see* 42 U.S.C. 6901 et seq.) and by MassDEP under other state environmental laws.

Several commenters raised concerns about the release of contaminants during decommissioning. One commenter requested that EPA "fine tune its draft to account for challenges presented by decommissioning." Neither Entergy nor Holtec, however, provided sufficient information by which to characterize decommissioning-related discharges. Both companies' PSDARs include a brief discussion of non-radiological water quality (AR-692 at 22-3 and AR-696 at 22-3) but the discussions provide no detail about the possible non-radiological pollutants that may be discharged related to various decommissioning activities (*e.g.*, draining, flushing, and liquid processing, decontamination and dismantlement activities, water spraying for dust suppression). The NRC's GEIS (AR-714, Appendix E) provides some limited additional information about the decommissioning activities and issues related to water quality, including transfer of fuel to the spent fuel pool, draining the primary system, processing liquid, draining and flushing the system, high-pressure water sprays, demolition, and removal of structures. Because Entergy did not provide the Agencies with information about discharges associated with decommissioning activities (with the exception of expected post-shutdown water withdrawals and associated discharges related to the CWIS) and because certain decommissioning activities and discharges may now occur sooner under Holtec's ownership (pursuant to DECON) than was anticipated under Entergy's ownership (pursuant to SAFSTOR), the Agencies clarify here whether and how the NPDES Permit would address these potentially uncharacterized discharges.

The Draft Permit proposed to authorize specific post-shutdown discharges that were disclosed by Entergy at the time of permit development including, as the commenter from Entergy points out,

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[91] While one comment requests that EPA require the Permittee complete a National Environmental Policy Act (NEPA) analysis "at the outset of the decommissioning process," it does not cite any specific statutory or regulatory basis requiring EPA to do so. The decommissioning process is overseen by NRC, whereas in the current proceeding, EPA is re-issuing a NPDES permit under the CWA. This permit re-issuance action is not subject to NEPA, because EPA is not issuing a permit for a "new source." *See* CWA §§ 306(a)(2), 511(c)(1); 40 C.F.R. § 122.29(c)(1).

cooling water discharges. Post-shutdown withdrawals and discharges include non-contact cooling water (Outfall 010), circulating pump water (Outfall 001), non-thermal backwash water (Outfall 002), various low volume wastes and waste from the neutralizing sumps (Outfalls 011 and 014), screenwash water (Outfall 012), stormwater associated with industrial activity (Outfalls 004, 005, 006, 007, and 013), and stormwater that collects in electrical vaults on the property (via stormwater Outfalls 004, 005, 006, and 007). In its comments on the Draft Permit, Entergy included minor clarifications for these discharges but did not disclose any new discharges related to shutdown or decommissioning.[92]

According to the NRC's GEIS, decommissioning activities that may influence water use include fuel removal, staffing changes, large component removal, decontamination and dismantlement, and structure dismantlement. Surface waters are most likely to be impacted by these activities through stormwater runoff (*e.g.*, an increase in suspended sediment) or by releases of substances (*e.g*., from potential disposal of concrete onsite). *See* AR-714 at 4-9, 4-12. Establishing continued monitoring of the discharges associated with these activities under an NPDES permit will ensure that water quality is protected by demonstrating that levels of pollutants are not likely to impact water quality or by establishing effluent limitations. Discharges related to activities such as dismantlement and decontamination may contain pollutants at levels not evaluated in the Draft Permit. Neither Entergy nor Holtec has provided information to the Agencies to characterize discharges related to the dismantlement of plant structures at this time. Therefore, the Final Permit authorizes the post-shutdown discharges as they were characterized by Entergy, subject to the limitations and conditions therein.

The shift from SAFSTOR to DECON raises concerns that pollutants in discharges resulting from decommissioning could occur during this permit term. As one commenter notes, the Agencies are left to "fill in the blanks" as they relate to certain undisclosed pollutant discharges into Cape Cod Bay that were not discussed during the development of the Draft Permit, nor subsequently described to the Agencies by Entergy or Holtec. Holtec, who has proposed the DECON option, has not provided any additional information to characterize discharges that might occur during decommissioning. For example, under SAFSTOR, dismantling and decontamination of plant systems, components, and buildings, and thus the potential discharge of pollutants associated with these activities, was expected to begin in 2074, nearly 56 years from cessation of operations at PNPS. *See* AR-692 (Attachment 1, Table 1). In contrast, the DECON option favored by Holtec anticipates completing dismantling and decontamination by March 2025. *See* AR-696 Enclosure 1, Table 2-1. Transfer of the fuel from the spent fuel pool to the ISFSI is expected to occur by 2022 under DECON (AR-696 Figure 5-1).

A recent permit for a decommissioned nuclear facility in Massachusetts, the Yankee Rowe NPDES permit (MA0004367), included specific effluent conditions for authorization of discharges related to certain decommissioning activities, including test tank water, demolition activities, construction dewatering, and spent fuel pool water. Entergy, however, did not provide

[92] At the public hearing, Mr. Romeo also commented that the Draft Permit and Fact Sheet contained "minor issues and errors" related to service water and dilution limits. The Agencies disagree with Entergy's characterization of certain aspects of the Draft Permit and Fact Sheet as "errors" but, as the commenter anticipates, we address these issues in this Response to Comment. See, for example, Responses to Comments III.4.0.

the Agencies prior to the issuance of the Draft Permit with any explanation for how it would dispose of spent fuel pool water or whether other discharges of pollutants similar to those regulated in the NPDES permit for Yankee Rowe (e.g., boron) would occur at PNPS. Nor have Entergy or Holtec subsequently notified the Agencies of specific plans for such discharges or characterized such discharges. Moreover, the Agencies acknowledge the confusion expressed by several commenters about the role of the NPDES permit in the decommissioning of the site. We clarify, therefore, that the Final Permit does not authorize the discharge of pollutants associated with the spent fuel pool water. Similarly, the Final Permit does not authorize the discharge of pollutants associated with other activities related to the decommissioning at PNPS, including, but not limited to, contaminated site dewatering, pipeline and tank dewatering, collection structure dewatering, dredge-related dewatering, or dismantlement and decontamination of plant systems and structures. If pollutants in these or similar wastestreams, or other wastestreams not expressly authorized by the Final Permit are expected to be discharged, the Permittee must either seek coverage for such discharges under another NPDES permit (i.e., an applicable General Permit)[93] or obtain a modification to the Final Permit. *See also* Fact Sheet at 55-56. Pursuant to 40 C.F.R. § 122.62(a), EPA may modify a NPDES permit if material and substantial alterations or additions to the facility or activity occurred after permit issuance which justify the application of new or different permit conditions. Alternatively, the Permittee may choose to collect and dispose of previously undisclosed or unknown discharges off site (i.e., without discharge to waters of the United States) under other applicable laws. Pursuant to NPDES Standard Conditions in Part II.D.1.a of the permit, *see also* 40 C.F.R. § 122.41(*l*) and 314 CMR 3.19(20)(c), a permittee has a duty to provide the permitting authority with notice as soon as possible of any planned physical alterations or additions to the permitted facility when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. A permitting authority may also modify a permit if it receives new information not available at the time of permit issuance that would have justified the application of different permit conditions. In addition, Part II.A.3 in the Standard Conditions of the Final Permit, in accordance with 40 C.F.R. § 122.41(h) and 314 CMR 3.19(8), requires the Permittee to furnish to the permitting authority, within a reasonable time, any information which the permitting authority may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. EPA or MassDEP may request additional information about decommissioning activities and/or potential changes at PNPS which may result in changes to the discharge of pollutants to Cape Cod Bay, including information associated with new or increased discharges of pollutants authorized under the Final Permit as well as those listed as unauthorized discharges at Part I.B of the Final Permit.

Several commenters raise concern about the likelihood of discharges related to soil disturbance and demolition of buildings and structures. Under the SAFSTOR option, these disturbances were not likely to occur within the next five years of the permit term. In contrast, Holtec's DECON option anticipates decontamination and dismantlement of plant systems and structures within the next five years. That option, however, was never raised with the Agencies during development of

[93] EPA's 2017 General Permit for Remediation Activity Discharges (RGP) (MAG910000) provides authorization for discharges of site dewatering, pipeline and tank dewatering, and dredge-related dewatering for volumes less than 1 million gallons per day. However, discharges to ocean sanctuaries are not eligible for coverage under the RGP. The Massachusetts Ocean Sanctuaries Act, M.G.L. c. 132A § 13 establishes the Cape Cod Bay Ocean Sanctuary as the body of water known as Cape Cod Bay seaward of the mean low water line.

the Draft Permit or during the public comment period. Nor has Holtec subsequently provided the Agencies with information about discharges at PNPS under DECON. As described above, the Final Permit authorizes only those discharges that were disclosed and adequately characterized to the Agencies in support of permit reissuance and expressly authorized in the Final Permit. For clarity, Part I.B of the Final Permit has been revised to clarify that several specific discharges are not authorized under the Final Permit, including stormwater associated with construction activity. According to the PSDARs, the stormwater runoff and drainage paths will be maintained in their current configuration. *See* AR-692 at 22 and 696 at 22. In developing the Draft Permit, EPA looked, in part, to the 2015 Multi-Sector General Permit (MSGP) for guidance on the stormwater conditions to include in the individual permit for PNPS. *See* Fact Sheet at 29. Stormwater discharges associated with construction activity disturbing one acre or more, however, are not eligible for coverage under the 2015 MSGP. *See* 2015 MSGP Part 1.14.2. The conditions and effluent limitations in the Draft Permit, therefore, were not intended to cover discharges associated with construction activity which, in this case, would include discharge related to the dismantlement of plant structures, systems, and buildings, as well as dust suppression water. Holtec correctly recognizes in its PSDAR that discharge of pollutants in stormwater related to construction activities would require additional NPDES permit coverage. *See* AR-696 at 22 ("[A]reas of one acre or more disturbed during decommissioning that are not covered by the existing permit will require stormwater permits from the MSDEP or USEPA.").[94] Because the Draft Permit did not consider the potential contribution of pollutants in stormwater discharges related to the dismantling and demolition of plant systems and structures, in part because under SAFSTOR such discharges were not expected to occur for many years, the Final Permit likewise does not authorize the discharge of pollutants associated with construction activities, including demolition, decontamination, and dismantlement of plant structures, systems, and buildings. The Permittee may request a permit modification to authorize coverage for construction-related stormwater discharges. Any request must be accompanied by a sufficiently detailed characterization of the types of activities, effluent, and outfalls that the request for authorization covers. Alternatively, the Permittee may seek authorization for construction-related stormwater discharges under an applicable NPDES General Permit, such as the Construction General Permit, if appropriate.

In summary, several commenters raised concerns about the discharge of pollutants related to activities expected to be performed during decommissioning. Although Entergy informed the Agencies of anticipated changes in CWIS withdrawals and discharges due to the shutdown, it did not indicate to the Agencies its plans for other decommissioning activities and potentially associated certain discharges, such as site dewatering, pipeline and tank dewatering, disposal of spent fuel pool water, stormwater runoff from demolition and/or decontamination activities, and dust suppression. *See also* AR-761; AR-762. Furthermore, because Holtec has proposed the DECON decommissioning option, many of the activities that may contribute pollutants are expected to occur much sooner than was expected with the SAFSTOR option initially indicated by Entergy, especially decontamination, dismantlement, and demolition of plant systems and structures and the transfer of spent nuclear fuel from the spent fuel pool to the ISFSI. Discharges of pollutants that result from these activities have not been adequately characterized. For these

[94] Holtec's PSDAR also recognizes that it must maintain compliance with its MassDEP groundwater discharge permit (SE #2-329) and may require remedial activities to meet the Massachusetts Contingency Plant (MCP) and other applicable state environmental response and remediation requirements. *See* AR-696 at 22.

reasons, the Agencies are clarifying that the NPDES Permit only authorizes the discharge of pollutants associated with the wastestreams named in Part I.A of the Final Permit and that the discharge of pollutants in other wastestreams are not authorized. In accordance with Parts II.D.1.a and II.D.1.b of the Standard Conditions of the Final Permit, the Permittee must report any planned physical alterations or additions to the permitted facility that could significantly change the nature or increase the quantity of pollutants or which could result in noncompliance with permit requirements. *See also* 40 C.F.R. § 122.41(*l*) and 314 CMR 3.19(20)(c). The Permittee may request a permit modification to authorize coverage for such discharges or potentially seek coverage under a separate NPDES permit. Any request must be accompanied by a sufficiently detailed characterization of the types of activities, effluent, and outfalls that the request for authorization covers. See Parts I.B and I.H.6 of the Final Permit and Condition 4 of MassDEP's Water Quality Certificate. Alternatively, wastestreams from unauthorized discharges may potentially be transported offsite for disposal, pursuant to appropriate authorization under other applicable laws. Additionally, to emphasize the importance of prompt notice of any discharges to surface water that may endanger public health or the environment, MassDEP has included Part I.H.1 in the Final Permit and Condition 1 in its Water Quality Certificate.

5.2 Corrosion and Contamination From Buried structures

Written Comment Submitted by Representative Keating on 7/21/16; Public Hearing Comment from Mr. Jackman (representing Representative Keating): Recently I hosted a conference on ocean and coastal acidification where I heard from many experts concerned by the effects that lower pH levels have had on shellfish and other marine organisms in Cape Cod Bay, Buzzards Bay, etcetera. I remain concerned that the increasing acidity in Cape Cod Bay waters will result in increased corrosion of affected components of the plant, including the outfall systems and buried pipes and tanks. Increased corrosion can lead to leaks of onsite chemicals such as oil and gasoline. And I would urge EPA to taken these factors into consideration in the NPDES permit.

Written Comments Submitted by PilgrimWatch on 7/25/16: EPA's analysis does not consider, but must, the impact of increased levels of acidity in ocean water due to pollution. The increased acidity adds to the other site specific factors that cause corrosion of buried components on site and hastens leakage that absent vigorous monitoring will end up in the bay.

These structures are subject to corrosion. Pilgrim was built 1967-1970. Many of these buried components are over 40 years old now. They likely will remain onsite for 50 years post shutdown making them over 100 years old at that date; and some will remain onsite indefinitely. The inevitable result is increased contamination of Cape Cod Bay. Absent a vigorous monitoring system the damage is likely to be extensive. Consider for example that there are 6 fuel oil tanks and their associated lines to send the oil into buildings underground at PNPS. There are 2 for the heating boilers, 2 for the emergency diesel generators, and 2 for the station blackout diesel. They can and most likely will leak with time and when they do they would cause an environmental mess.

Buried structures and components are made of corrosive materials (concrete and carbon steel). All metals corrode. Aging and corrosion go together. The older the component or tanks/pipes are the more likely it is that corrosion will occur. Pilgrim was built from 1967-1970. Many components are original. Engineers explain the aging phenomenon by using what is known as the “Bathtub Curve.” The curve is a graph of failure rate according to age. The failure rate is relatively high at the beginning (due to unidentified leaks), flattens out in the middle, and rises again at the “wear-out” phase. Evidence shows that most of Pilgrim Station’s buried components would be in the wear-out phase now and well beyond decommissioning.

Pilgrim’s site specific environment is corrosive. For example, the soil is wet and will increasingly be so due ot the impacts of climate change (increased severe storms, more frequent and severe precipitation, rising sea levels, and groundwater tables) all resulting in flooding. Cathodic depolarizers are in the soil. An important condition for corrosion is chloride. Pilgrim sites on the shoreline and chloride is naturally abundant is seawaters. Underground corrosion is amplified by stray currents which are present in one degree or another at power generating statins. Pilgrim’s soils are sandy. Sand and soil particles move in the subsurface and are abrasive; the buried pipes were initially packed in a sand bed. Corrosion occurs on the inside of components. The rate of degradation on interior surfaces is a function of aggressive chemicals, pH level, dissolved oxygen, and biological elements.

The Buried Piles and Tanks Aging Management Program during license renewal 2012-2019 is inadequate. Buried components are inspected when excavated during maintenance – leaving inspection to happenstance. A focused inspection will be performed within the first 10 years of the period of extended operation, unless an opportunistic inspection (or an inspection via a method that allows assessment of pipe condition without excavation) occurs within this 10-year period. A one-time inspection in ten years incorrectly assumes that corrosion is gradual, linear, and predictable. Consider that the vast majority of the buried pipes and tanks will be more than 47 when operations cease in 2019; and approximately 97 years old fifty years after operations cease and cleanup begins. EPA must assure more frequent inspections and monitoring.

During license renewal proceedings, Entergy claimed that the chemistry and service water programs are effective in preventing internal corrosion. If they were effective, leaks would not occur throughout the industry and at Pilgrim historically. The program will not continue into the lengthy post shutdown period.

Industry experience nationwide shows that there has been a proliferation of leaks from buried components around the country and will continue during operations and following shutdown. Lessons learned from Entergy’s Vermont Yankee reactor.

Public Hearing Comments from Ms. Lampert (of PilgrimWatch): There also has to be analysis of increased levels of acidity in the ocean due to pollution. This is particularly important because of the corrosion factor of buried structures, pipes and tanks, many of which are now 50 years old, and at the end of license renewal, rather the end of decommissioning, could well be over 100 years old. There is no material, whether it be carbon, steel, whether it be concrete, that doesn’t corrode.

The buried structures, buried pipes, buried tanks, most were put in place when Pilgrim was built, that is 67’ to 70’. So they’re not young. One of the main factors of corrosion is age. You’re talking about components that have been buried for maybe almost 50 years, and potentially 100. They are also buried in a site specific environment that is conducive to corrosion. It's wet. You have chlorine. There are all these factors that will contribute to corrosion. Plus the aging management program that was put in place at license renewal only required one inspection of these components during a 10 year period. Unless they happen to excavate for some reason. In other words, an aging management program is happenstance. For all these reasons, you would expect to find significant corrosion of these structures, the DEP and EPA have to get ahead of, because we know where it's going to go, because the pitch of the land is into the bay.

Response to Comment 5.2:

Several commenters raised concerns related to the corrosion of pipes and other buried structures at PNPS. The Agencies addressed similar concerns in Response to Comment IV.5.1. The Draft Permit contains requirements to implement best management practices (BMPs) and to establish a stormwater pollution prevention plan (SWPPP). The goal of the BMPs is to reduce or prevent the discharge of pollutants through the stormwater drainage system. The permittee is required to amend and update the SWPPP periodically 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. To the extent that post-shutdown activities discharge pollutants that are authorized by the Final Permit into the stormwater drainage system, the Permittee must revise its SWPPP to reflect such changes and explain measures it will take that will reduce or prevent the discharge of pollutants through the storm water drainage system as a result of these site changes.

At the same time, the Agencies have clarified that neither Entergy nor Holtec have characterized all of the post-shutdown pollutants that could potentially be discharged, particularly those associated with the demolition of plant structures and buildings and which may be discharged sooner under the proposed, accelerated decommissioning timeline. As described in Response to Comment 5.1, above, the Agencies are clarifying that the NPDES Permit authorizes the discharge of pollutants associated with the wastestreams named in Part I.A of the Final Permit and that the discharge of pollutants in other wastestreams are not authorized. In particular, Parts I.B.3 and 4 of the Final Permit do not authorize the discharge of pollutants in stormwater associated with construction activity (such as demolition of buildings) or other discharges of pollutants associated with the dismantlement and decontamination of plant systems and structures and/or the demolition of buildings. The Permittee must seek a permit modification or alternative NPDES permit coverage for these discharges. In accordance with Parts II.D.1.a and II.D.1.b of the Standard Conditions of the Final Permit, the Permittee must report any planned physical alterations or additions to the permitted facility that could significantly change the nature or increase the quantity of pollutants or which could result in noncompliance with permit requirements. *See also* 40 C.F.R. § 122.41(*l*) and 314 CMR 3.19(20)(c). The Permittee may request a permit modification to authorize coverage for such discharges or potentially seek coverage under a separate NPDES permit or potentially a separate permitting program.[95] Any request must be accompanied by a detailed characterization of the types of activities, effluent,

[95] Oil tanks, for example, are regulated by EPA's RCRA Program and are subject to SPCC plans. If there is evidence of a leak from any of these oil tanks, the facility would need to go through the MassDEP's site waste cleanup (21E) program and possibly need additional NPDES permit coverage to address the remediation of such leaks.

and outfalls that the request for authorization covers. See Parts I.B and I.H.6 of the Final Permit and Condition 4 of MassDEP's Water Quality Certificate.

6.0 Determination of Best Technology Available

6.1 Closed-Cycle Cooling is the BTA

Written Comment Submitted by Ms. Burgess (of Cape Cod National Seashore Advisory Commission) on 7/23/16: EPA is not requiring updated technology. The Clean Water Act (Section 316(b)) requires dischargers to update to BTA (best technology available) to reduce impacts to the environment, but the new permit is allowing the continued use of a once-through cooling system, not BTA. We support closed-cycle cooling to minimize importing water from Cape Cod Bay.

Written Comment Submitted by Mr. Delaney (of Center for Coastal Studies) on 7/25/16: Although none of CCS's regular monitoring stations are in the proximity of the Pilgrim Nuclear Power Station, nor are our monitoring efforts targeted towards documenting environmental changes that may result from operation of Pilgrim, the CCS data do show that humans are having an impact on our coastal waters.

The CCS urges the EPA to apply the precautionary principle in its upcoming decision on the renewal of the NPDES permit for Entergy's Pilgrim Nuclear Power Plant including a requirement to use a closed cycle cooling system to reduce impact on the Cape Cod Bay midwater ecosystem.

Written Comment Submitted by Mr. Nichols on 7/20/16: Pilgrim's once through cooling system is not the best technology available and should no longer be permitted. EPA should require shutdown until a closed-cycle cooling system is installed.

Written Comment Submitted by Mr. Hoopingarner on 7/12/16: Seeing as Pilgrim Nuclear Power Station is using an outdated "once-through" cooling system that pollutes Cape Cod Bay and kills large amounts of marine life each year, it is not at all reasonable to allow them to continue operating on the same water pollution permit that expired 20 years ago. As long as it's necessary to keep the intake and cooling systems online, it would be preferable by any standard of reasoning to update the cooling system to a closed-loop, or at the very least a Beaudrey water intake protection system.

Written Comment Submitted by Ms. Carpenter on 7/25/16: Your callous disregard of safety and the environment is exemplified by EPA's looking at "the cost and benefits and feasibility." This clearly works in favor of the Corporation and is detrimental to public health and safety and to the environment. EPA further stated that in looking "at estimated plant life, we thought the time to put these technologies in place would go beyond operation time." The fact is that the plant has already exceeded its planned lifetime. Its permit to operate should not have been renewed in 2012 with outdated technology in place. It has deteriorated and is deteriorating further as Entergy no longer has an incentive to invest in any upgrades or repairs choosing, instead, to coast along until the announced closing date in 2019. This permit should not be issued as written. EPA must put its mandate to ensure environmental protection ahead of its sympathies for any financial burdens incurred by the Entergy Corporation.

Public Hearing Comment from Mr. Agnew: The Clean Water Act requires the best available technology. And as you pointed out, Entergy probably couldn't put the cooling towers in place before they shut down in 2019. Although, I'm not sure that's true. Brayton Point did it pretty quickly. But, I believe that cooling towers have been around since at least the '70s. So, they were available back then. So, you know, basically, there's been no compliance with the Clean Water Act. So, after 20 years of allowing Pilgrim to operate in violation of the Act, you're now requiring some changes, most of which will take effect just after the reactor closes, when stopping the daily misuse of a half million gallons of Cape Cod Bay won't cut into Entergy's profits. That's what really matters here.

Public Hearing Comment from Ms. Vale (of Cape Downwinders); Written Comments submitted by Cape Downwinders on 7/25/16: Pilgrim is a GE Mark 1 reactor built by Bechtel in the late 1960s. It went online in 1972. The 1960s technology is outdated and is not the "best technology available" as now required by the CWA:

"Any standard established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse impact."

This GE Mark 1 boiling water reactor has already shown the world through the Fukushima catastrophe the tragically failed design that does not withstand the test of time. The current cooling system used at Pilgrim is part of that outdated design. We should not rely on 60's technology to protect the public health and safety, nor consider it capable of protecting the environment. GE didn't care about the repercussions of a known defect in their containment design that threatens public health and safety. Fukushima was not an accident but a predicted tragic event. Does the EPA think Bechtel was concerned about the damage to the environment from the cooling system back then? It was not designed with those considerations.

Cape Cod Bay is Entergy's dump. The NPDES permit that EPA is recommending allows Entergy to continue to use the damaging once through cooling system through the closing date of 2019 and after shut down. In Vermont, even though Entergy was closing Vermont Yankee in December of 2014, the Vermont utility directors issued a new thermal discharge permit in March of 2014 and changed the terms of that permit to hold Entergy accountable. So, the changes can be done now. Three more years of knowingly damaging the environment is both unacceptable and irresponsible. After 20 years of a free pass, action to end the destruction is needed today.

Public Hearing Comment from Dr. Muramoto (representing the Association for Preservation of Cape Cod): The EPA should require implementation of BTA such as closed cycle cooling system technology for limiting discharges and minimizing harm to fisheries. The economic analysis is flawed and should be based on 23 years of return on investment, not just the remaining three years of plant operations. EPA noted that a decade without BTA would result in loss of another 15,000,000,000 fish from Cape Cod Bay. Allowing this to occur would be inexcusable. The permit should require the plant to close by 2019 or implement a BTA cooling system.

Since 2014 we have become even more concerned about Pilgrim's risk to the environment and Entergy's declining performance that poses risks to public safety and the environment. NPDES permits allow EPA to require best technology available or BTA to minimize and eliminate pollutant discharges and environmental damage. The Draft NPDES Permit for Pilgrim merely protects the status quo and does nothing to eliminated pollutant discharges or require BTA to protect fish and shellfish.

The EPA should require implementation of BTA such as closed cycle cooling system technology for limiting discharges and minimizing harm to fisheries. The economic analysis is flawed and should be based on 23 years of return on investment, not just the remaining three years of plant operations.

There is no guarantee that the plant will close by 2019 other than Entergy's stated intention. The plant's license expires in 2032. So there is potential for more than a decade of operation without BTA. EPA noted that a decade without BTA would result in loss of another 15,000,000,000 fish from Cape Cod Bay. Allowing this to occur would be inexcusable. The permit should require the plant to close by 2019 or implement a BTA cooling system.

Public Hearing Comment from Ms. Lampert (of PilgrimWatch): The draft, like others have said here, should not allow the continuation of once through cooling. It's in violation of the law. And when you're doing a cost benefits analysis, cost is not only how much it would cost Entergy to replace it. The real costs are 20 years of damage. The real costs are also unknown, because there has been over reliance on Entergy's assessments. There have not been studies on what value of putting in other flounders, are they [breeding] and reacting with what was taken out. And so, you don't know. You only know the surface of the damage. So, therefore, you require it. If you can't obey the law then shut down.

Public Hearing Comment from Ms. Vale (of JRWA): Continuing to allow the once through cooling system is in no way requiring updated technology or minimizing harm to the environment as required by the Clean Water Act.

Response to Comment 6.1:

Many commenters raised concerns about the once-through cooling system and requested that the Final Permit require closed-cycle cooling as the best technology available (BTA) for the cooling water intake structure (CWIS) consistent with Section 316(b) of the CWA. The Agencies responded to similar concerns about the CWIS and the BTA in Responses to Comments I.4.2, II.1, II.2., and IV.2.1. The Agencies responded to the Permittee's comments on BTA and the Draft Permit's CWIS requirements in Response to Comments III.8.

The BTA requirements at Part I.C of the Final Permit are consistent with the *Final Regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities* (79 Fed. Reg. 48,300 August 14, 2014) at 40 C.F.R Part 125, including consideration of the relevant factors in determining the BTA for entrainment. *See* 40 C.F.R. § 125.98(f)(2) and (3). The post-shutdown flow limits in the Final Permit for Outfall 010, which is the primary intake and discharge during shutdown, result in a 96% reduction in cooling water flow as compared to the current permit limits. The Final Permit also authorizes the operation of the circulating water pumps to support shutdown operations (though Outfall 001 will not supply cooling water) for no more than 48 hours over a single calendar month. Together, the total flow at the intake for Outfalls 001 and 010 on an average monthly basis represent a 92% reduction in flow as compared to the current permit, which equates roughly to a 92% reduction in entrainment. The expected net reduction in flow in PNPS had installed closed-cycle cooling would have been 91%. See Fact Sheet Attachment D at 45. The Final Permit requires the Permittee to meet flow limits that are consistent with operation of closed-cycle cooling at PNPS as the BTA for entrainment and which is one of the approved BTA standards to minimize impingement mortality under the Final Rule. *See* 40 C.F.R. § 125.94(c)(1). That PNPS did not install closed-cycle cooling to meet the flow reductions, as a result of the shutdown, does not diminish the environmental benefits gained by reducing impingement mortality and entrainment under the new flow limits.[96] EPA maintains that the BTA performance standards in the Final Permit, which require PNPS to achieve a flow reduction greater than 92% as a monthly average and achieve a through-screen velocity of 0.5 fps, represent the BTA for impingement and entrainment at PNPS. This site-specific determination was made under 40 C.F.R. § 125.98(g) in consideration of the relevant factors at § 125.98(f)(2) and (3) and the impingement mortality BTA standards at § 125.94(c). As such, this determination is consistent with CWA § 316(b).

6.2 Alternative Available Technologies Were Not Considered

Written Comment Submitted by Mr. Nichols on 7/20/16: If EPA is unwilling to require closed-cycle cooling under the new permit, than a Beaudrey WIP system should be designed to retrofit Pilgrim and be installed at the earliest opportunity. This system could be required for the period post-shutdown.

Written Comment Submitted by PilgrimWatch on 7/25/16: The draft permit should not allow the continuation of Pilgrim's once-through cooling system. It is harmful to the marine environment and not the best technology available, as required. If EPA does not require a closed cooling system, as it should, then a Beaudrey WIP system should be installed during the refueling outage 2017.

[96] One commenter suggests that installing closed-cycle cooling at PNPS should be able to completed in a timely manner because "Brayton Point Station did it pretty quickly." EPA notes that although the actual construction of the cooling towers at Brayton Point Station was achieved in three years, the Final NPDES Permit requiring the technology was issued in 2003 and construction did not begin until 2009, fully 6 years after the permit was issued and more than a year after EPA and Dominion Energy reached an agreement to end the permit litigation. Even had PNPS began construction in 2016 (when the Draft Permit was issued), the cooling towers would only have been operable for, at most, a few months before the Facility shut down. Entergy did shut down PNPS on May 31, 2019 and the Facility is achieving flow reductions commensurate with operation of closed-cycle cooling and consistent with the Final Permit flow limits.

Public Hearing Comment from Ms. Lampert (of PilgrimWatch): You did not even require something like that Beaudrey WIP system, which would reduce at least going forward the amount of intake of fish and creation of bouillabaisse and all that stuff.

You should require Entergy to fund a mitigation account for 20 years of damage. And I've brought up a tricky question of who should really be paying. And I think that is an important legal question that should be looked at. Is it Entergy for not doing what they were not required to do? Or is it the Agency's for not requiring that the law be followed?

Public Hearing Comment from Ms. Vale (of JRWA): There are other technologies out there. So, this Beaudrey system was mentioned back in 2008. It was an Entergy report to EPA. I think, it was in response to a 308 letter to EPA. And it seems like the system was disregarded fairly quickly, and in our opinion, somewhat improperly. For example, according to Entergy, the Beaudrey system is infeasible at Pilgrim because it hadn't been used yet in the United States and also because of the fragility of the species that are found near Pilgrim. However, the system is, in fact, used worldwide, including here in the US. And there's been additional studies that have come out fairly recently that look at the impacts of this type of system on the species found near Pilgrim. River herring was one of those. I think it was alewife. The point is that, EPA needs to really and fully vet systems like this using the most updated information that's available.

Response to Comment 6.2:

Many commenters recommended that EPA require a Beaudrey Water Intake Protection (WIP) screen as the best technology available (BTA) for the cooling water intake structure (CWIS), presumably because this technology is more effective than the proposed Draft Permit limits for minimizing impingement mortality and entrainment. The Agencies responded to similar comments about the feasibility of WIP screens in Responses to Comment I.4.2. EPA notes that the comments above do not identify how WIP screens would result in greater reductions in impingement mortality or entrainment than the Draft Permit limits, nor have any comments presented any specific information to suggest that WIP are feasible or particularly effective at minimizing impingement and entrainment for species present at PNPS. [97]

In the Draft Permit, EPA did not consider traveling screens, including the WIP screen, as an available technology for entrainment because this technology is not considered effective for reducing entrainment. Screens must consist of fine mesh to prevent entrainment of eggs and larvae, and fine mesh screens may lead to increased morality of impinged eggs and larvae that would have otherwise been entrained. See *Technical Development Document for the § 316(b) Existing Facilities Rule* (TDD) at 6-23 and 6-45 to 48. WIP screens have been shown to be as effective or even more effective than modified traveling screens for reducing impingement mortality for many species. *See Id*. at 6-40 to 41. However, WIP screens to reduce entrainment at PNPS would likely have to be fitted with mesh sizes in the range of 0.5 to 1.0 mm. In addition,

[97] Entergy evaluated traveling screens in its 2008 Engineering Response (AR-489 at 35) and concluded that upgrading the traveling screens, including to a WIP screen, would not measurably reduce impingement mortality because the majority of mortality at PNPS (89%) involves Atlantic menhaden and Atlantic silversides, which are not expected to survive screen impacts associated with impingement regardless of the screening technology employed.

there are technical challenges to the installation of WIP screens that must be considered in an evaluation of this technology for PNPS.

According to the manufacturer, WIP screens can be installed in the existing traveling screen bays, which can make for easier and more cost-effective installation. However, because of the design, the WIP screen has a smaller dimension that the conventional traveling screen (see Figure 1). If the same number of screen bays are replaced with the WIP screens, the through-screen velocity will increase because the flow rate will be withdrawn through a smaller screen area. If PNPS were to install WIP screens without increasing the existing through-screen velocity (or to achieve, as the comment suggests, through screen velocities of no greater than 0.5 fps), the existing intake structure would have to be expanded to accommodate additional screens. Similarly, because the screen mesh affects the velocity, decreasing the mesh size of WIP screens to exclude early life stages of marine fish (*e.g.*, less than 1 mm) would also necessitate additional screens to accommodate the required cooling water volume, which would require expansion of the existing intake structure. Expanding the intake structure would be more costly and would likely add a significant amount of time to the project as compared to simply installing new WIP screens in the existing bay. From a technical standpoint, while a WIP screen may be feasible for PNPS, it is not likely that it would meet the BTA requirements indicated in the comment without significant expansion of the CWIS. Moreover, the technology is not as effective as reducing impingement mortality and entrainment as the flow and intake velocity BTA requirements that can be achieved with the shutdown.

6.3 Justification for BTA Determination

Written Comment Submitted by J. Nichols on 7/20/16: In the revised permit, water use if reduced form 510 MGD to 447 MGD before shutdown. This reduction is appropriate, but there should be an established end date for water withdrawals. Prior to refueling in spring 2017 is a prudent time. After Pilgrim shuts down, the draft permit reduces intake to a maximum of 224 MGD daily, and an average of 11.2 MGD monthly. EPA must provide a justification for the large maximum daily withdrawal limit.

Response to Comment 6.3:

One commenter requested that EPA justify post-shutdown the maximum daily withdrawal limit for Outfall 001. JRWA has a similar comment about the post-shutdown discharge volume at Outfall 001. The Agencies responded to that comment in Response to Comment I.3.1. The Agencies responded to the issues that the Permittee raised related to the intake and discharge from Outfall 001 in Response to Comment III.4.1.

PNPS ceased operations on May 31, 2019 and as such, no longer operates the circulating water pumps to withdraw cooling water for the condenser on a continuous basis. Circulating water flow is necessary to support shutdown operations for purposes other than cooling the spent fuel pool. Because the circulating water pumps are not connected to the spent fuel pool, this water will not be used for that purpose. According to Entergy, the circulating water is primarily used for dilution to meet the NRC's requirements for the liquid radiological waste disposal system and for fire protection purposes, as well as for backflushing the circulating water pump lines to manage biofouling.

The Draft Permit authorized limited operation of a single circulating water pump, which has a design flow of 155,500 gallons per minute (gpm), or 224 million gallons per day (MGD), not to exceed 5% of the time on a monthly basis. These limits were based on pre-Draft Permit communications with Entergy about the anticipated need for circulating water after shutdown. During the comment period, Entergy provided additional explanation for running the circulating water pumps and clarified its need to operate a circulating water pump for up to 48 hours on a monthly basis. Part I.C.4 of the Final Permit authorizes the Permittee to operate one circulating water pump at a time (at 155,500 gpm or 224 MGD) for up to 48 hours during a single calendar month. The Final Permit requires the Permittee to report the average monthly flow at Outfall 001and the hours of circulating pump operation. Based on the maximum daily flow and authorized period of operation, the average monthly flow at Outfall 001 could increase to 16 MGD (based on 28 days in February). These permit conditions result in a 96% reduction in water withdrawals through the circulating water pumps as compared to the current permit, which the Agencies believe represents the BTA for minimizing impingement and entrainment.

7.0 Temperature Effluent Limitations and Thermal Impacts

7.1 Thermal Impacts

Written Comment Submitted by PilgrimWatch on 7/25/16: EPA's analysis does not consider, but must, the impacts of climate change – warming seas, sea level rise, storms, flooding and increased precipitation that likely will cause further pollutant discharges into Cape Cod Bay and heighten the effects of thermal pollution.

Written Comment from Mr. Pappalardo (of Cape Cod Commercial Fishermen's Alliance) submitted 7/22/16: The Cape Cod Commercial Fishermen's Alliance is concerned about any activity that could negatively impact fish stocks and the marine environment in Cape Cod Bay. We have concerns that Pilgrim's outdated 'once through cooling' systems jeopardize the marine life that thousands of Massachusetts commercial fishermen rely upon. For example, New England is already seeing faster ocean warming than other parts of the country and does not need additional thermal pollution contributing to the rate of ocean warming.

We encourage the EPA to protect Cape Cod Bay's environment and require the Pilgrim Nuclear Power Station to use the best technology available and protocols to protect our waters, for today's fishermen and for generations to come.

Written Comment Submitted by Representative Keating on 7/21/16; Public Hearing Comment from Mr. Jackman (representing State Congressman Keating): I respectfully encourage EPA to continue incorporating current data on climate change and ocean acidification in review of PNPS draft permit. Given that EPA is considering decades old data that may not reflect the most recent sea level rise and ocean temperature information, and that PNPS, under the variance proposed the NPDES, will be discharging significantly heated water into Cape Cod

Bay for three more years, I urge the EPA to reconsider whether a closed-cycle system would provide significant environmental benefits and contribute to the safeguarding of Cape Cod Bay.

Response to Comment 7.1:

Several commenters raised concerns about thermal impacts from the operation of PNPS and recommended that EPA consider the most updated thermal data, including data that reflects warming temperatures in Cape Cod Bay due to climate change when making its determination on the Final Permit's thermal limits. The Agencies responded to similar comments about thermal impacts in Response to Comments I.2.2, I.3.1, I.3.4, and II.1.

In its Assessment of Impacts to Marine Organisms from the PNPS Thermal Discharge (Attachment C to the Fact Sheet), MassDEP evaluated the long-term warming trend in Cape Cod Bay and the potential effect this warming trend could have on the thermal impacts from the PNPS discharge. MassDEP also evaluated whether the thermal discharge from PNPS had resulted in any impacts of local populations for a number of resident species, including commercially and recreationally important fisheries and species of concern. MassDEP found that the thermal impacts were not likely to have measurably impacted any of the resident fish populations in Cape Cod Bay. EPA, in Attachment B to the Fact Sheet, determined that the pre-shutdown operation of PNPS at the proposed Draft Permit limits would assure the protection and propagation of a balanced, indigenous population of fish, shellfish, and wildlife.

PNPS shutdown on May 31, 2019 and ceased operation of the main condenser, which was the primary source of heated effluent at the Facility. As a result of the shutdown, the Permittee can achieve much lower temperature limits than when PNPS was operating, which results in a 98% reduction in the heat load to Cape Cod Bay. The Final Permit includes temperature limits at Outfall 010, which is the remaining source of heated effluent, that assures this reduction in heat load will be maintained.

7.2 Justification for Granting Thermal Variance

Written Comment Submitted by M. Burgess (of Cape Cod National Seashore Advisory Commission) on 7/23/16: Pilgrim is discharging water hotter than allowed by the State Water Quality Standards, so it requires a variance. The variance was based on old, insufficient Demonstration Report, and is definitely insufficient today. EPA should deny the variance, and require Entergy to re-characterize the thermal plume impacts based on current trends and data on global warming issues.

Written Comment Submitted by J. Nichols on 7/20/16: The 32°F allowed temperature range, based on a previous variance is excessive and should be denied. That variance is based on a flawed 'Demonstration Report' that relies on outdated and incomplete data, an outdated list of "representative important species," and does not consider changes in Cape Cod Bay such as invasive species, northern migration of species, and ocean warming and acidification. Until thermal impacts are reassessed in light of current information and new thermal plume modeling is done, the variance should be denied.

In order to effectively set thermal limits, EPA should clearly determine and outline which activities will create thermal effluent at Outfall 001.

Public Hearing Comment from Ms. Vale (of JRWA): I wanted to bring up Pilgrim's variance that allows for discharging hotter water than is allowed by the state's water quality standards. The problem that we see with this is that, some of the temperature limits allowed in the draft permit, and that goes for the delta limits as well as the daily and monthly limits, are allowed based on a previous variance. And I know you said earlier that there's a new variance. But, from my understanding, from reading the permit, it's essentially reusing the old variance. I think, you called it prospectively using the old variance. And that old variance relies on an older demonstration report. And we think that that demonstration report has a lot of problems.

For example, the demonstration report relies largely on what would be considered now to be really outdated information. A lot of the studies were from the 1970s. There was one study from 1995 that was incorporated into the 2000 updated version of the demonstration report. But, that study was cut short. They had storms that came in. Pilgrim had to shut down unexpectedly. So, that study that cited quite a bit while actually only collected two and a half days worth of data. So, there's a problem with the limited data as well.

And lastly I think, one of the most important issues, the warming water temperatures in Cape Cod Bay, was not considered. In a demonstration report, you're trying to demonstrate that there's no impacts from thermal effluent. And if you don't look at the warming of Cape Cod Bay, I don't see how that's possible.

There's just not enough updated evidence to prove that there's no harm from those thermal effluent limits that are in the draft permit. EPA needs to reassess the thermal impacts using more current data, considering more modern trends in Cape Cod Bay. Until this is done, we think that the variance should be denied or otherwise make sure that all the thermal limits in the draft permit meet state standards.

Response to Comment 7.2:

Several commenters raised concerns about the pre-shutdown temperature limits, which are based on a variance under Section 316(a) of the CWA. Under Section 316(a), a less stringent thermal limit may be authorized where the Permittee demonstrates to the satisfaction of the permitting authority (EPA and MassDEP) that the otherwise applicable technology-based and water quality-based limits are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of fish, shellfish, and wildlife in and on the receiving water. Entergy sought renewal of the 316(a) variance from the 1991 permit and, in support of its request, provided a retrospective demonstration that past thermal discharges have not appreciably harmed the balanced, indigenous population of Cape Cod Bay. Many commenters have raised concerns with the demonstration provided, notably that it is outdated and fails to adequately account for the rising water temperature in Cape Cod Bay. The Agencies also received similar comments on the thermal variance from other parties. See Comments I.2.2, I.3.1. and II.1.

MassDEP and EPA evaluated the thermal impacts from the pre-shutdown discharge of heat under the current variance in Attachments B and C to the Fact Sheet. After considering the information provided by Entergy, recent intake temperature data, and assessing the potential impacts on communities and individual species, the Agencies determined that the surface-oriented thermal plume is relatively small compared to the size of the receiving water and dissipates rapidly. Considering impacts over 40 years of operation, the Agencies concluded that the current variance will assure the protection and propagation of the balanced, indigenous population and proposed renewing the variance in the Draft Permit. On May 31, 2019, before the Final Permit was issued, PNPS ceased operating and shutdown the reactor. Therefore, the permit conditions and effluent limitations from the Draft Permit specific to operation of the electric generation facility and which would have been effective prior to the shutdown date, including the variance-based temperature limits (maximum daily temperature of 102°F and delta-T of 32°F), are not included in the Final Permit.

Following shutdown, PNPS no longer operates the condenser, which required a large volume of cooling water and was the primary source of heated effluent. The only remaining source of heated effluent is the cooling water withdrawn for cooling the spent fuel pool, which requires far less cooling water and discharges less residual heat. In addition, the residual heat from the spent fuel pool will decay over time and, as a result, the heated effluent from Outfall 010 will decrease. Holtec plans to move the spent fuel to dry cask storage by 2022, at which time there will be no heated effluent from PNPS remaining. *See* AR-696.

The Final Permit limits the remaining thermal discharge from Outfall 010 to a maximum daily flow of 19.4 MGD and delta-T of 10°F. These limits, which reflect operations following shutdown, result in a substantial reduction in the heat load to Cape Cod Bay. Under the current permit, which reflects operating conditions for generating electricity at PNPS, the total heat load to Cape Cod Bay from the circulating water pumps was about 14,304 mm BTU/day. The Final Permit limits result in a 98.6% decrease in the heat load to Cape Cod Bay. This reduction in heat load will ensure protection and propagation of a balanced, indigenous population in Cape Cod Bay and is consistent with the reduction in heat load that would be achieved through operation of closed-cycle cooling as the best available technology. Temperature monitoring at Outfall 001 will confirm the extent to which the effluent from Outfall 010 is mixed prior to discharge. See also Responses to Comments I.2.2, I.3.1, and I.3.4.

7.3 Post-Shutdown Temperature Limits

Written Comment Submitted by PilgrimWatch on 7/25/16: EPA must require that thermal discharge temperature readings are electronic and continuous and public access to those readings available online. Entergy must be required to report the highest level recorded each month - not simply an average. EPA should consider restrictions. Thermal backwash discharges restricted to high tides if harmful impacts are shown to increase at low tide.

Written Comment Submitted by J. Nichols on 7/20/16: For backwash operations, until shutdown the temperature limit should not be allowed to be 115°F, but should meet the lower MA SWQS. If Pilgrim cannot meet that, impacts from its thermal effluent should be reassessed in light of global warming and more current information. A new Demonstration Report should be required before a variance is granted.

For outfall 010, EPA decision to set temperature limits that meet the MA SWQS is supported, but EPA should use 1.5°F instead of 3°F as the allowed temperature rise. After shutdown, temperature rise is reduced from 32°F to 3°F. This reduced limit seems arbitrary and should instead meet MA State Water Quality Standards (MA SWQS) limit of 1.5°F. EPA does not present evidence of the cause of a 3°F increase.

Response to Comment 7.3:

Several commenters raised questions about the post-shutdown thermal limits at Outfall 002 (backwash) and Outfall 010 (non-contact cooling water). The Agencies have responded to similar comments in Responses to Comments I.3.2 and I.3.4.

One commenter requested that the maximum daily temperature limit for the thermal backwash operation at Outfall 002 and the post-shutdown, rise in temperature limit at Outfall 010 should both be lowered to meet water quality standards. At Outfall 002, the source of heat for the backwash effluent was the condenser. Since PNPS has shutdown, there is no longer any source of heat for this discharge and the effluent will be at ambient temperature. Part I.A.2 of the Final Permit authorizes only non-thermal backwashes and does not include a temperature limit.

Federal regulations at 40 C.F.R. § 122.44(d) require establishing effluent limitations more stringent than technology-based effluent limitations or standards if necessary to achieve water quality standards, including State narrative criteria for water quality. More stringent limitations are necessary to control pollutants or parameters that may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including narrative criteria. *See* 40 C.F.R. § 122.44(d)(1)(i). When determining if there is reasonable potential to cause or contribute to an excursion of water quality standards, the permitting authority must consider, among other things, the dilution of the effluent in the receiving water. *See* 40 C.F.R. § 122.44(d)(1)(ii). In other words, the water quality standards apply as in-stream limits to be met in the receiving water taking into account any available dilution between the outfall discharge location and the receiving water. In this case, the comingling of discharges in the discharge canal and the mixing of the discharge in the receiving water offer potential additional sources of dilution which would ensure that a higher end-of-pipe limit will still meet water quality standards in the receiving water. In addition, temperature limits may be based on a variance under Section 316(a), under which, as described in Response to Comments IV.7.2 (above) and I.3.4, a less stringent thermal limit may be authorized where the Permittee demonstrates to the satisfaction of the permitting authority (EPA and MassDEP) that the otherwise applicable technology-based and water quality-based limits are more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of fish, shellfish, and wildlife in and on the receiving water.

Post-shutdown, Outfall 010 will discharge non-contact cooling water used for the spent fuel pool, which consists of substantially less heat at a lower volume that the once-through cooling water discharged from Outfall 001 when PNPS was operating. The Draft Permit proposed a post-shutdown, rise in temperature limit of 3°F, average monthly temperature limit of 80°F, and maximum daily temperature limit of 85°F at Outfall 010. These limits were based on communication with Entergy about the anticipated need for cooling water after shutdown. *See* AR-520. During the comment period, Entergy provided additional explanation about cooling water needs after ceasing electrical generation, including that an 85°F maximum daily limit for service water may not reasonably support the use of service water for necessary nuclear-safety functions post-shutdown, particularly given that this period will represent a greatly reduced flow dynamic compared to PNPS's historic electric-generating operations. See Comment III.5.2 and corresponding response. Part I.A.3 of the Final Permit retains the average monthly temperature of 80°F but raises the maximum daily temperature limit from 85°F to 90°F and the maximum delta-T from 3°F to 10°F at Outfall 010. Even at a maximum daily flow of 19.4 MGD and delta-T of 10°F, the thermal effluent from Outfall 010 is expected to mix quickly with the receiving waters in the discharge canal and will be protective of the aquatic community of Cape Cod Bay. As described in Response to Comment IV.7.2 (above) and I.3.4, the total heat load to Cape Cod Bay from the circulating water pumps has been reduced by about 98.6% due to the shutdown. A delta T of 10°F will assure the protection and propagation of the BIP after shutdown, since the volume and overall rise in temperature have both substantially decreased, resulting in a substantial decrease in the heat load to Cape Cod Bay.

The Permittee is required to submit monthly discharge monitoring reports (DMRs) on which it must report the average monthly temperature, maximum daily temperature, and maximum rise in temperature at Outfalls 001 and 010 based on continuous temperature monitoring. The data reported in the NetDMR are publicly available through the Enforcement and Compliance History Online website at https://echo.epa.gov/.

8.0 Impacts of Closing Plant on Regional Electrical System

Written Comment Submitted by Mr. Campbell on 7/19/16: The Draft NPDES Permit complies with the Clean Water Act. Pilgrim Nuclear Power Plant provides 79% of Massachusetts' green, emission-free power. Massachusetts needs Pilgrim and more nuclear power, not less. Closing Pilgrim WILL violate the RGGI treaty.

The bigger factor in the rise of carbon emissions in the New England region was probably the 2014 closing of the Vermont Yankee nuclear plant, specialists said (*Boston Globe,* David Abel, May 16, 2016). The uptick comes as Massachusetts works to curb carbon emissions in nearly every sector of its economy, in hopes of reaching its 2020 targets. Massachusetts is legally required to reduce greenhouse gases 25 percent below 1990 levels by that date — part of a national effort to stave off global warming.

Written Comment Submitted by Dr. Garb on 6/10/2016: Pilgrim's energy contribution to the New England power grid is relatively small, and there is enough excess capacity in the grid to not cause power disruptions should Pilgrim close sooner than anticipated. Other, more environmentally friendly sources of power will be developed in Massachusetts and New England over the next several years.

Response to Comment 8.0:

Several commenters raised issues related to the role of PNPS is the regional power grid. One commenter supported the operation of PNPS because it factors in the region's ability to meet carbon-free power, while the second supported shutting down PNPS and maintains that its closure will not negatively impact the regional power supply.

The ISO-New England is responsible for operation of the regional power generation and transmission system, for regional power system planning, and for developing and administering the region's wholesale electricity markets. In response to Entergy's request to retire PNPS, ISO-New England conducted a study to see how the retirement could affect the overall reliability of the region's bulk power system and, if the impact is expected impact reliability, ISO-New England may ask the retiring resource to remain online. In this case, ISO-New England did not find that retirement of PNPS will impact reliability of the region's bulk power system and PNPS shutdown as announced on May 31, 2019. *See* AR-725.

9.0 Comments on Miscellaneous Discharges

Written Comment from Mr. Nichols Submitted 7/20/16: EPA must prevent not only ongoing pollutant discharges into Cape Cod Bay, but also the increased pollutant discharges expected because of climate change. Warming seas, sea level rise, storms, flooding, and increased precipitation are likely to cause further pollutant discharges into Cape Cod Bay and/or exacerbate the effects of thermal pollution and impingement/entrainment. Effluent limits should be reduced and new limits set for pollutants not in the previous permit.

Public Hearing Comment from Ms. DuBois: Our concern is sea level is rising, groundwater is rising. That's going to affect your discharges. It's going to affect your discharges especially post 2019. But, if you allow them -- if you extend the permit, basically, that's what you're doing; right? You're saying, okay. We believe you Entergy. We believe that another three years is not such a big deal. We're going to let you run the same way that you've run for the last 42 years for the next three years, because it doesn't matter. Well, it does matter, because it extends this whole stockpiling of nuclear waste for an additional five years. They're going to have to have it in the spent fuel pool. They're going to have to have their damn FLEX strategy that's so stupid, I can't even begin to tell you. Please learn about it. They're going to postpone the clean up and decommissioning on site, whatever that clean up and decommissioning in the PSDAR might say.

Response to Comment 9.0:

Several commenters raised concerns about the potential impacts of rising sea level and climate change on future discharges from PNPS. The Agencies responded to similar concerns about climate change in Response to Comment I.2.2. The Final Permit's monitoring requirements and effluent limits will adequately characterize and/or limit the pollutants present in the site's discharges through the next permit term.

10.0 Monitoring and Assessment

10.1 Effluent Monitoring

Written Comment from PilgrimWatch Letter Submitted 7/25/16; Written Comment from J. Nichols submitted 7/20/16: EPA should explicitly require all effluent testing be reported publicly in monthly discharge monitoring reports so that EPA and the public are able to assess whether requirements are being met.

Written Comment Submitted by Representative Keating on 7/21/16; Public Hearing Comment from Mr. Jackman (representing Representative Keating): I encourage EPA to expand its monitoring of discharges of all of the plant's outfalls. Effluent limits and thermal discharge measurements should be made as frequently as feasible, and resulting data should be made available to the public in an easily accessible format. As we look toward the decommissioning of Pilgrim Station, it is critical that EPA provide for vigorous post-closure monitoring and environmental assessments to ensure that contaminants do not migrate off of the plant and into Cape Cod Bay.

Response to Comment 10.1:

Several commenters requested that the Final Permit require monitoring at all authorized outfalls and that the data be made publicly available. The Final Permit includes post-shutdown effluent limits and monitoring requirements at all authorized outfalls and specifies the frequency of monitoring for each listed parameter for as long as the permit remains effective. When the Final Permit becomes effective, the Permittee will use NetDMR to report monitoring results at each outfall on a monthly basis. The data are publicly available through the Enforcement and Compliance History Online website at https://echo.epa.gov/.

10.2 Biological Monitoring

Written Comment Submitted by Mr. Delaney (of Center for Coastal Studies) on 7/25/16: If the permit is renewed, CCS recommends that extensive ecosystem monitoring be required and that an independent science advisory panel be established, with functions similar to those of the MWRA Outfall Monitoring Science Advisory Panel.

Written Comment Submitted by Mr. Nichols on 7/20/16: EPA should require the PATC to be reinstated immediately so that it may provide much needed oversight for marine impacts, and help guide practical adjustments and mitigation efforts during the remainder of operations as well as during decommissioning.

Public Hearing Comment from Ms. Vale (of JRWA): The draft permit does not acknowledge the Pilgrim administrative technical committee, or the PATC. The PATC was disbanded by Entergy in 2001. We feel that the PATC is a really important part of the permit and of the monitoring program and that it or something similar to the PATC should be reinstated and required in the new permit to provide independent oversight of re-monitoring efforts, as well as the results that come from those monitoring efforts. And that includes up until shut down as well as during the decommissioning years as well.

Written Comment Submitted by Mr. Nichols on 7/20/16: Impingement/entrainment monitoring should be required until the spent fuel pool is no longer used, and the intake system is shut down permanently; winter flounder studies should be mandated to continue after shutdown to monitor improvements to populations. Rainbow smelt studies should be reestablished. Entergy no longer carries out rainbow smelt studies, despite Pilgrim continuing to impinge and entrain them with impunity. One study estimates that more than 1,300,000 rainbow smelt are killed each year. Entergy should be required to monitor for ecosystem changes due to global warming and climate change to fully understand the impact of Pilgrim's operations.

Written Comment Submitted by Mr. Hoopingarner on 7/12/16: Entergy needs to fund restoration, further study on the ecological impacts of Pilgrim's 40+ years of operations, and immediate reestablishment of studies on rainbow smelt and other aquatic life. Additional study on the impacts of global warming and climate change should accompany these regional studies.

Response to Comment 10.2:

Several commenters requested that the Final Permit require ongoing biological monitoring at PNPS following shutdown and recommended that an advisory committee, similar to the former Pilgrim Technical Advisory Committee (PTAC), be formed to oversee biological monitoring. The Agencies responded to similar comments about biological monitoring and the PATC in Responses to Comments I.4.1, I.5.2 and I.5.5.

Parts I.A.1, I.A.2, and I.C of the Final Permit requires the Permittee to meet flow limits that will achieve a flow reduction greater than 92% as compared to the current permit. This flow reduction is commensurate with or better than the flow reduction that could have been achieved through the operation of closed-cycle cooling system. In addition, the Permittee must maintain an actual through-screen velocity of no greater than 0.5 fps except when operating the circulating water pumps. EPA has determined that this velocity will enable most adult and juvenile fish to avoid impingement, including rainbow smelt. This technology is particularly appropriate for PNPS because many of the species that had been impinged in the past, including rainbow smelt, river herring, and Atlantic silversides, were observed to suffer high mortality when impinged and returned to the source water via the traveling screens. When operating the circulating pumps, which occurs for a limited time on a monthly basis, the Permittee must continuously rotate the existing traveling screens. The Draft Permit proposed a reduced biological monitoring frequency following shutdown, including impingement monitoring once per week only when PNPS operates one of the circulating water pumps, and entrainment monitoring twice per month.

In response to this and other comments on the proposed biological monitoring in the Draft Permit, EPA looked to the compliance monitoring requirements in the 2014 Final Rule. Monitoring requirements for impingement mortality in compliance with the 2014 Final Rule are established at 40 C.F.R. §§ 125.94(c) and 125.96(a). Monitoring requirements for entrainment are determined on a site-specific basis to meet the requirements established for minimizing entrainment at 40 C.F.R. § 125.94(d). *See* 40 C.F.R. § 125.96(b). To demonstrate compliance with the flow reduction requirements, the Permittee must monitor flow daily at each pump and report the average monthly and maximum daily flows for each monitoring period. *See* Final Permit Part I.A.1, I.A.2. To demonstrate compliance with the actual through-screen velocity, the Permittee must monitor the through-screen velocity at the intake screens daily. In lieu of monitoring, the Permittee may calculate the maximum through-screen velocity using water flow, depth, and open screen area. *See* Final Permit Part I.A.2, I.C.2; *see also* 40 C.F.R. § 125.94(c)(3). Facilities complying with an actual through-screen velocity of 0.5 fps in compliance with the BTA standard for impingement mortality under 40 C.F.R. § 125.94(c)(3) are not subject to biological compliance monitoring under the Final Rule unless otherwise specified by the permitting authority. *See* 79 Fed. Reg. at 48,325, 48,373. In addition, the Final Rule does not explicitly require facilities operating closed-cycle cooling to conduct biological compliance monitoring unless otherwise specified by the permitting authority. *See* 40 C.F.R. § 124.94(c)(1). While the Agencies did not determine closed-cycle cooling to be the BTA for PNPS, the facility has reduced its flows to those that would be similar to closed-cycle cooling had it continued to operate.

The compliance monitoring required by the Final Permit will ensure that the Permittee meets the BTA requirements, including the flow limits, operating restrictions, and the intake velocity limitations. In addition, there is an extensive record of entrainment at PNPS's CWIS dating back to 1980 and the baseline entrainment density under the pre-shutdown flow regime is well documented. EPA established in the Fact Sheet that the BTA for PNPS is a flow reduction commensurate with closed-cycle cooling. The benefit of this requirement can be calculated using the existing record of entrainment and the anticipated flow reductions at PNPS without additional biological monitoring. For this reason, the Final Permit does not require biological monitoring to demonstrate compliance with entrainment BTA requirements. The Agencies have determined that part of the BTA to minimize impingement mortality (in addition to meeting a through-screen velocity no greater than 0.5 fps when operating only the SSW pumps) includes limiting operation of the circulating water pumps to no more than 48 hours in a calendar month and continuously rotating the screens when a circulating water pump is in operation. The Final Permit requires impingement monitoring of the traveling screens once per month when operating a circulating pump. See Part I.C.6 and Attachment B of the Final Permit.

V. LIST OF COMMENTERS

A) Goodwin Proctor, on behalf of Entergy (permittee) – also at Public Hearing (PH)

B) Congressman Keating's office – (PH)

C) Association to Preserve Cape Cod (Ed Witt) and at PH (Dr. JoAnn Muramoto)

By email, 18 commenters attached the following comment:

I fully support the comments submitted by the Association to Preserve Cape Cod (APCC) concerning the NPDES draft permit for the Pilgrim Nuclear Power Station. I am very concerned that the draft NPDES permit violates the Clean Water Act.

D) Letter requesting public hearing from Jones River WA and CapeCod Bay Watch – 6/2/16

E) Pilgrim Watch (Mary Lampert) by email and at PH

F) Jones River Watershed Association (Pine Dubois and Karen Vale) email comments of 7/25/16 and at PH

G) Email comment from Ian Hoopingarner - 7/12/16

H) Individual letter from Terry Bassett

I) Joan Holt and Paul Sharaga email comments of 7/16/16

J) Brian Campbell – email comments of 7/19/16

K) John Nichols – email comments of 7/20/16

L) Mary Lampert (Pilgrim Watch) email of 7/25/16

M) Cape Cod Fisherman's Alliance (Pappalardo) letter of 7/22/16

N) Janet Azarovitz – 7/25/16 email comments and PH

O) Center for Coastal Studies – 7/25/2016 letter

P) Susan Carpenter – email comments of 7/25/16

Q) Lillia Frantin – email comments of 7/25/16

R) Cape Cod Downwinders – (Diane Turco/Susan Carpenter) email comments of 7/25/16 & PH

S) Cape Cod National Seashore Advisory Commission (Burgess)

T) David Agnew (PH)

U) Steve Sollog – at PH

V) Meg Sheehan – at PH

W(1) to W(9) Nine letters to Gina McCarthy in June that were replied to by Region 1 notifying of upcoming public hearing and reiterating that all comments would be responded to in RTC document.

DRAFT AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

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

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

is authorized to discharge from a facility located at

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

to receiving water named

Cape Cod Bay

a Class SA water, 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 signature if comments are received. If no comments are received, this permit shall become effective on the date of signature.

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

This permit supersedes the permit that was issued on April 29, 1991, modified on August 30, 1994, and expired on April 29, 1996.

This permit consists of **41** pages in Part I including effluent limitations, monitoring requirements and state permit conditions, Attachment A – Marine Acute Toxicity Test Protocol (July 2012), Attachment B – Biological Monitoring Program, Attachment C - Summary of Monitoring Parameters for Electrical Vault Sampling, and 25 pages in Part II, Standard Conditions.

Signed this day of , 2016.

Ken Moraff, Director Office of Ecosystem Protection Environmental Protection Agency Boston, MA	David Ferris, Director Massachusetts Wastewater Management Program Department of Environmental Protection Commonwealth of Massachusetts Boston, MA

Summary of Effluent Limitation Pages

Part	Outfalls	Discharges
Part I.A**.** These effluent limitations and permit conditions apply during the period beginning on the **effective date of the permit** and lasting through **the date of termination of electricity generation** at the facility, no later than May 31, 2019.		
Part	**Outfalls**	**Discharges**
I.A.1	**001**	Once-through non-contact cooling water – chlorinated
I.A.2	**002**	Thermal and non-thermal backwash water
I.A.3	**003 and 012**	Screenwash water (traveling screens) to intake embayment – dechlorinated (003) Screenwash water to discharge canal – dechlorinated (012)
I.A.4	**010**	Salt Service water (SSW) for turbine building closed cycle cooling water (TBCCW) and reactor building closed cycle cooling (RBCCW) systems– chlorinated
Part I.B **-** These effluent limitations and permit conditions apply during the period beginning on the **date following termination of electricity generation** at the facility, no later than June 1, 2019, and lasting through the **expiration date of the permit**.		
I.B.1	**001**	Once-through non-contact cooling water – chlorinated
I.B.2	**002**	Non-thermal backwash water
I.B.3	**010**	Salt Service Water (SSW) for TBCCW and RBCCW systems– chlorinated
I.B.4	**012**	Screenwash water to discharge canal – dechlorinated
Part I.C **-**These effluent limitations and permit conditions apply during the period beginning on the **effective date of the permit** and lasting through the **expiration date of the permit**.		
I.C.1	**004 and 005**	Storm water from yard drains
I.C.2	**006 and 007**	Storm water from yard drains
I.C.3	**004A, 005A, 005B, 007A, 007B**	Storm water from electrical vaults
I.C.4	**011**	Internal outfall – demineralizer reject water, station heating and service water systems
I.C.5	**014**	Various process and wastewaters from waste neutralization sump

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The effluent limitations and permit conditions in Part I.A apply during the period beginning on the **effective date of the permit** and lasting through **the date of termination of electricity generation** at the facility, no later than May 31, 2019.

1. The permittee is authorized to discharge non-contact condenser cooling water through **Outfall Serial Number 001** to the discharge canal which flows to Cape Cod Bay. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate	MGD	447	447	Continuous [3]	Recorder
pH [4]	SU	6.5 to 8.5		1/Week	Grab
Total Residual Oxidants (TRO) [5]	ug/L	7.5	13	2/Day, when in use	Grab
Oil and Grease (O&G) [6]	mg/L	---	Report	1/Month	Grab
Temperature, Effluent	°F	---	102	Continuous [3]	Recorder
Temperature Rise (delta T) [7]	°F	---	32	Continuous [3]	Recorder

See page 4 for explanation of footnotes.

The permittee may use sawdust (wood flour) to seal condenser leaks only to the extent necessary. The permittee shall report the total amount of sawdust used during each month on its DMR. The use of any other material to seal condenser leaks must be approved by EPA and MassDEP prior to use.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 001, taken at a location between the point of discharge from the condensers and the outfall channel discharge to Cape Cod Bay. This sampling point shall also include flows from Outfalls 004, 005, 010, 011, and 014 when discharging. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report (DMR) submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 Code of Federal Regulations (CFR) §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.
2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event during each calendar week, when discharge occurs. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., "C" for "No Discharge") on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.
3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made available upon request by EPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minutes apart each day is acceptable in lieu of continuous monitoring data. The permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate may be estimated from pump capacity curves and operational hours. The daily maximum discharge temperature and delta T shall be the highest level recorded during the month.
4. The pH of the effluent shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.
5. These limits are based on the marine water quality criteria for TRC. The minimum level (ML) for total residual chlorine is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. Compliance with the TRC limits shall be measured at the ML of detection for the test method used. In order to establish less stringent TRC limits, the permittee shall demonstrate to EPA and the MassDEP that the discharge of higher levels of TRC are required for macroinvertebrate control and shall include any dilution estimates based on an acceptable dilution model of Cape Cod Bay in the vicinity of the discharge. Only chlorine may be used as a biocide. Sampling shall be conducted only during periods of chlorination at the Facility, when chlorine is expected to be present in the discharge. No other biocide shall be used without explicit approval from the Regional Administrator (RA) of Region I of the EPA and the Commissioner of the MassDEP or their designees. The permittee shall use a sufficiently sensitive test procedures (method) for TRC consistent with Part I.D.4 below.
6. The permittee shall use EPA Method 1664A for O&G analysis, which has an ML of 5 mg/l, where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern.
7. The temperature rise, or delta T, is defined as the difference between the cooling water discharge temperature and the intake temperature.

Part I.A.

2. The permittee is authorized to discharge thermal and non-thermal backwash water through **Outfall Serial Number 002**, which flows back through the intake structure and out to the intake embayment (Cape Cod Bay). Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow [3]	MGD	---	28	Total Daily	Estimate
Discharge Frequency [4]	count	---	1	1/Week	Count
Discharge Duration [4]	hours	---	3	1/Thermal Backwash	Duration
pH [5]	SU	6.5 - 8.5		1/Backwash	Grab
Total Residual Oxidants (TRO) [6]	mg/L	---	Report	1/Backwash	Grab
Temperature	°F	---	115	Continuous [7]	Recorder

See pages 6 for explanation of footnotes.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 002, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to the intake embayment. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event during each calendar week, when discharge occurs. The results of sampling for any parameter above its required frequency must also be reported. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html.

3. The maximum daily flow of all thermal and non-thermal backwashes shall be recorded and reported on the DMR.

4. The discharge from a thermal backwash shall not be more frequent than three hours per event and not more frequent than once per week per intake bay. In addition, the time between thermal backwash events shall be at least seven (7) consecutive calendar days. For example, if a thermal backwash occurred on a Tuesday, the next thermal backwash could occur no earlier than on the following Tuesday. The permittee shall record the backwash duration for each event and the backwash frequency on a monthly basis. The permittee shall explain any exceedance of the discharge frequency and/or duration on the DMR cover letter. The frequency and duration of non-thermal backwashes shall be reported in an attachment to the DMR for each month.

5. The pH of the effluent shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

6. Chlorination of the cooling water system shall not be conducted during any backwash procedure total residual oxidants (TRO) discharges shall be monitored once per backwash. The permittee shall use a sufficiently sensitive test procedure (method) for TRO consistent with Part I.D.4 below.

7. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made readily available upon request by USEPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minutes apart each day is acceptable in lieu of continuous monitoring data. The permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The daily maximum limit for effluent temperature for any backwash event shall be the highest level recorded during each month.

Part I.A.

3. The permittee is authorized to discharge intake screenwash water through **Outfall Serial Numbers 003 and 012** to Cape Cod Bay via the main fish sluiceway which flows to the intake embayment and to the alternative fish sluiceway which discharges directly to the discharge canal, respectively. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate [3]	MGD	4.1	4.1	Daily	Estimate
pH [4]	SU	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO)	mg/L	Report	Report	1/Month	Grab

See page 8 for explanation of footnotes

a. The screenwash water shall consist of up to 3.2 MGD of Cape Cod Bay marine water and up to 0.90 MGD of potable freshwater normally used as Station Fire water. All water used for screenwash operations, with the exception of Station Fire water used during emergency conditions, shall be dechlorinated before being sprayed on the traveling screens and shall not have been used for any cooling purposes at the facility.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 003, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to either intake embayment (or to the discharge canal during storm conditions). A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code (e.g., “C” for “No Discharge”) on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. The permittee shall record the estimated percentage of time each month that discharge of screenwash water through Outfall 012 to the discharge canal occurs and report these on the DMR cover letter. During the time period when the traveling screens are in operation, all live fish, shellfish, and other aquatic organisms that collect or are trapped on the screens or the intake bays shall be returned to the receiving water with minimal stress and at a sufficient distance from the intake so as to prevent reimpingement. All other material, except natural debris (e.g. leaves, seaweed, and algae), shall be removed from the intake screens and recycled or disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Any such material shall not be returned to the receiving water. This discharge may include up to 0.9 MGD of potable water which is typically intended for use as Fire Station water. This water shall be used only under emergency conditions [as authorized by the U.S. Nuclear Regulatory Commission (NRC)] when traveling screen operation is impeded by the accumulation of algae or other biological material.

4. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

Part I.A.

4. The permittee is authorized to discharge non-contact cooling water from the Salt Service Water (SSW) system, classified as low volume waste, through **Outfall Serial Number 010** to the discharge canal, which flows to Cape Cod Bay. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate	MGD	19.4	19.4	Continuous [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
pH[4]	SU	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO)	mg/L	0.5	1.0	2/Day	Grab

See page 10 for explanation of footnotes.

a. Continuous chlorination of the SSW may be conducted for macroinvertebrate control.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 010, taken at a representative location of the discharge exiting from the heat exchangers and prior to mixing with any other flows. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., "C" for "No Discharge") on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made readily available upon request by USEPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minute apart each day is acceptable in lieu of continuous monitoring data. The permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate shall be estimated from pump capacity curves and operational hours.

4. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

PART I.B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The effluent limitations and permit conditions in Part I.B apply during the period beginning on the **date following termination of electricity generation** at the facility, no later than June 1, 2019, and lasting through the **expiration date of the permit**.

1. The permittee is authorized to discharge cooling water to support shutdown operations through **Outfall Serial Number 001** to the discharge canal which flows to Cape Cod Bay. Intake water shall not be used for cooling the main condenser at the facility. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate	MGD	11.2	224	Continuous [3]	Recorder
pH [4]	SU	6.5 to 8.5		1/Week	Grab
Intake Velocity [5]	fps	Report	Report	1/Day	Estimate or Calculation [5]
Oil and Grease (O&G) [6]	mg/L	---	Report	1/Month	Grab
Temperature, Effluent	°F	80	85	Continuous [3]	Recorder
Temperature Rise (delta T) [7]	°F	---	3	Continuous [3]	Recorder

a. Chlorination of the intake water from either circulating water pump is prohibited.

See page 12 for explanation of footnotes

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 001, taken at a location in the outfall channel discharge to Cape Cod Bay. This sampling pojnt shall also include flows from Outfalls 004, 005, 010, 011, and 014 when discharging. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report (DMR) submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 Code of Federal Regulations (CFR) §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event during each calendar week, when discharge occurs. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., "C" for "No Discharge") on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made available upon request by EPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minutes apart each day is acceptable in lieu of continuous monitoring data. The permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate may be estimated from pump capacity curves and operational hours. The daily maximum limits for effluent temperature and delta T shall be the highest level recorded during the month.

4. The pH of the effluent shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

5. The intake velocity shall be monitored at the traveling screens at a minimum frequency of daily or may be calculated using water flow, depth, and screen open area. The maximum daily intake velocity is the maximum instantaneous velocity that is measured or calculated.

6. The permittee shall use EPA Method 1664A for O&G analysis, which has an ML of 5 mg/l, where the ML is the lowest point on the curve to calibrate the test equipment for the pollutant of concern.

7. The temperature rise, or delta T, is defined as the difference between the discharge temperature and the intake temperature.

Part I.B.

2. The permittee is authorized to discharge non-thermal backwash water through **Outfall Serial Number 002**, which flows back through the intake structure and out to the intake embayment (Cape Cod Bay). Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow [3]	MGD	---	28	Total Daily	Estimate
Discharge Frequency	count	---	1	1/Week	Count
Discharge Duration	hours	---	Report	1/Backwash	Duration
pH [4]	SU	6.5 - 8.5		1/Backwash	Grab

a. Thermal backwashes are prohibited beginning on the **date following termination of electricity generation** at the facility, and not later than June 1, 2019.

b. Chlorination of the cooling water system shall not be conducted during any backwash procedure.

1. All samples shall be representative of the effluent that is discharged through Outfall 002, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to the intake embayment. All samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event during each calendar week, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. The maximum daily flow of all non-thermal backwashes shall be recorded and reported on the DMR.

4. The pH of the effluent shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

Part I.B.

3. The permittee is authorized to discharge non-contact cooling water from the Salt Service Water (SSW) system, classified as low volume waste, through **Outfall Serial Number 010** to the discharge canal, which flows to Cape Cod Bay. Such discharge shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency[2]	Sample Type
Flow Rate	MGD	7.8	15.6	Continuous, [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
Temperature, Effluent	°F	80	85	Continuous [3]	Recorder
Temperature Rise (delta T) [4]	°F	---	3	Continuous [3]	Recorder
pH [5]	SU	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO) [6]	ug/L	7.5	13	2/Day	Grab

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 010, taken at a representative location of the discharge exiting from the heat exchangers and prior to mixing with any other flows. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a No Data Indicator (NODI) Code (e.g., “C” for “No Discharge”) on the DMR. In Attachment E of *NPDES Permit Program Instructions for the DMRs*, a list of NODI codes are included at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made readily available upon request by EPA or MassDEP. If continuous monitoring equipment at the outfall is unavailable, a minimum of four (4) manual grab samples taken at least fifteen (15) minute apart each day is acceptable in lieu of continuous monitoring data. The permittee shall provide an explanation of why continuous monitoring was not available and when continuous monitoring would be expected to be resumed. The flow rate shall be estimated from pump capacity curves and operational hours.

4. The temperature rise, or delta T, is defined as the difference between the discharge temperature and the intake temperature.

5. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

6. These limits are based on the marine water quality criteria for TRC. The minimum level (ML) for TRC is defined as 20 ug/l. This value is the minimum level for chlorine using EPA approved methods found in the most currently approved version of Standard Methods for the Examination of Water and Wastewater, Method 4500 CL-E and G. One of these methods must be used to determine total residual chlorine. Compliance with the TRC limits shall be measured at the ML of detection for the test method used. In order to establish less stringent TRC limits, the permittee shall demonstrate to EPA and the MassDEP that the discharge of higher levels of TRC are required for macroinvertebrate control and shall include any dilution estimates based on an acceptable dilution model of Cape Cod Bay in the vicinity of the discharge. Only chlorine may be used as a biocide. Sampling shall be conducted only during periods of chlorination at the Facility, when chlorine is expected to be present in the discharge. No other biocide shall be used without explicit approval from the Regional Administrator (RA) of Region I of the EPA and the Commissioner of the MassDEP or their designees. The permittee shall use a sufficiently sensitive test procedures (method) for TRC consistent with Part I.D.4 below.

4. The permittee is authorized to discharge intake screenwash water through **Outfall Serial Number 012** to Cape Cod Bay via the fish sluiceway which discharges directly to the discharge canal. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate [3]	MGD	4.1	4.1	Daily	Estimate
pH [4]	SU	6.5 – 8.5		1/Month	Grab
Total Residual Oxidants (TRO)	mg/L	Report	Report	1/Month	Grab

See page 17 for explanation of the footnotes

a. All water used for screenwash operations, with the exception of Station Fire water used during emergency conditions, shall be dechlorinated before being sprayed on the traveling screens and shall not have been used for any cooling purposes at the facility.

b. During the time period when the traveling screens are in operation, all live fish, shellfish, and other aquatic organisms that collected or are trapped on the screens or the intake bays shall be returned to the receiving water with minimal stress and at a sufficient distance from the intake so as to prevent reimpingement. All other material, except natural debris (e.g. leaves, seaweed, and algae), shall be removed from the intake screens and recycled or disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Any such material shall not be returned to the receiving water.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through Outfall 012, taken at a representative location at the fish sluiceway, between the point of discharge from the intake screens and the discharge to the discharge canal. A routine sampling program shall be developed in which samples are taken at the same location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code (e.g., “C” for “No Discharge”) on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. The screenwash water shall consist of up to 3.2 MGD of Cape Cod Bay marine water and up to 0.90 MGD of potable freshwater normally used as Station Fire water. This water shall be used only under emergency conditions [as authorized by the U.S. Nuclear Regulatory Commission (NRC)] when traveling screen operation is impeded by the accumulation of algae or other biological material.

4. The pH of this discharge shall be in the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

PART I.C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

The effluent limitations and permit conditions in Part I.C apply during the period beginning on the **effective date of the permit** and lasting through the **expiration date of the permit**.

1. The permittee is authorized to discharge stormwater through **Outfall Serial Numbers 004 and 005*** to the discharge canal to Cape Cod Bay. **Stormwater pumped out from electrical vaults may also be discharged to these stormwater outfalls**. **(See separate monitoring requirements for electrical vault discharges in Part I.C.3 below**) Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type [3]
Flow Rate	MGD	---	Report	1/Month	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L		Non-detect [4]	1/Month	Grab
pH [5]	SU	6.0 – 8.5		1/Month	Grab

See page 19 for explanation of footnotes.

* Outfall 005 also discharges a portion of the flows from Internal Outfall 011 (Part I.C.3 of this permit). Discharges from the heating boiler blowdown via a floor drain to Outfall 005 are prohibited, except in an emergency situation. This discharge has occurred two times from 1998 to 2013. If this discharge occurs, it shall be sampled and be subject to the monitoring conditions and effluent limitations for the stormwater discharges shown above.

Footnotes:

1. All samples shall be representative of the effluent that is discharged through each outfall and taken at a representative location at the point of discharge from the outfall to the discharge to the discharge canal. If an outfall is inaccessible or submerged, the permittee shall proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with its analytical results. A routine sampling program shall be developed in which samples are taken at the same day, time, and location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Stormwater samples shall be taken during the first flush of wet weather, defined as during the first hour of a storm event greater than 0.1 inches in magnitude and which occurs at least twenty four (24) hours from the previously measurable (greater than 0.1inch rainfall) storm event. If sampling within the first hour of a storm event is not feasible, the permittee shall sample as soon as is practicable after the start of a storm which meets this definition and provide a brief explanation on the DMR or cover letter for that month as to why a first flush sample was not taken. For example, the permittee may cite an unsafe condition (e.g. icing, high wind) as the reason why first flush sampling was not conducted. Flow for these stormwater outfalls shall be estimated for those storm events associated with the monthly sampling events.

4. For Outfalls 004 and 005, there shall be no detectable discharge of oil and grease. The permittee shall use EPA Method 1664A for O&G analysis. Compliance with the non-detect limit for Outfalls 004 and 005 shall be measured at the minimum level (ML) of detection for the EPA approved test methods. The ML for oil and grease is 5 mg/l using EPA Method 1664A, where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern. If EPA approves a method under 40 CFR Part 136 for oil and grease that has a ML lower than 5 mg/l, the permittee shall be required to use the improved method. If EPA approves a method under 40 CFR Part 136 for oil and grease that has a ML lower than 5 mg/l, the permittee shall be required to use the improved method

5. The pH of this discharge shall be in the range of 6.0 to 8.5 standard units and no more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

PART I.C. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

2. The permittee is authorized to discharge stormwater through **Outfall Serial Numbers 006 and 007,** to the intake embayment, which flows out to Cape Cod Bay. Discharges to Outfall 006 may include municipal water from the fire water storage tanks. **Stormwater pumped out from electrical vaults may also be discharged to these stormwater outfalls**. **(See separate monitoring requirements for electrical vault discharges in Part I.C.3 below**) Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type [3]
Flow Rate	MGD	---	Report	1/Month	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	---	Non-detect [4]	1/Month	Grab
pH [5]	SU	6.0 – 8.5		1/Month	Grab

Footnotes:

1. All samples shall be representative of the effluent that is discharged through each outfall and taken at a representative location at the point of discharge from the outfall to the discharge to the intake embayment. If an outfall is inaccessible or submerged, the permittee shall proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with its analytical results. A routine sampling program shall be developed in which samples are taken at the same day, time, and location each month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

Part I.C.2 (continued) footnotes:

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Stormwater samples shall be taken during the first flush of wet weather, defined as during the first hour of a storm event greater than 0.1 inches in magnitude and which occurs at least twenty four (24) hours from the previously measurable (greater than 0.1inch rainfall) storm event. If sampling within the first hour of a storm event is not feasible, the permittee shall sample as soon as is practicable after the start of a storm which meets this definition and provide a brief explanation on the DMR or cover letter for that month as to why a first flush sample was not taken. For example, the permittee may cite an unsafe condition (e.g. icing, high wind) as the reason why first flush sampling was not conducted. Flow for these stormwater outfalls shall be estimated for those storm events associated with the monthly sampling events.

4. For Outfalls 006 and 007, there shall be no detectable discharge of oil and grease. The permittee shall use EPA Method 1664A for O&G analysis. Compliance with the non-detect limit for Outfalls 006 and 007 shall be measured at the minimum level (ML) of detection for the EPA approved test methods. The ML for oil and grease is 5 mg/l using EPA Method 1664A, where the ML is the lowest point on the curve used to calibrate the test equipment for the pollutant of concern. If EPA approves a method under 40 CFR Part 136 for oil and grease that has a ML lower than 5 mg/l, the permittee shall be required to use the improved method.

5. The pH of this discharge shall be in the range of 6.0 to 8.5 standard units and no more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

PART I.C.3

The permittee is authorized to discharge stormwater from electrical vaults (manholes) through internal **Outfall Serial Numbers 004A (manhole MH-4[1]), 005A (CP-4[1]), and 005B (MH-27A[1])** to the discharge canal to Cape Cod Bay **and through internal Outfall Serial Numbers 007A (MH-L[1]) and 007B (MH-2A[1])** to the intake embayment, which flows out to Cape Cod Bay. Such discharges shall consist of stormwater runoff only and shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [2]	
		Average Monthly	Maximum Daily	Measurement Frequency [3]	Sample Type [4]
Total Suspended Solids (TSS)	mg/L	---	Report	1/Quarter	Grab
Total Phenols	ug/L	---	Report	1/Quarter	Grab
Total Polychlorinated Biphenyls (PCBs) [4]	ug/l	---	Report	1/Quarter	Grab
Total Phthalates	ug/l	---	Report	1/Quarter	Grab
Total Cadmium	ug/l	---	Report	1/Quarter	Grab
Total Copper [5]	ug/l	---	Report	1/Quarter	Grab
Total Iron	ug/l	---	Report	1/Quarter	Grab
Total Lead [5]	ug/l	---	Report	1/Quarter	Grab
Total Zinc	ug/l	---	Report	1/Quarter	Grab
pH [6]	SU	Report		1/Quarter	Grab

See page 23 for explanation of footnotes.

Footnotes:

1. Manhole designations are provided by the permittee in the June 30, 2015 CWA Section 308(a) information request letter submittal to EPA.

2. Sampling shall be representative of the water that has collected in each electrical vault and prior to being pumped out and discharged to a permitted outfall. Sampling may be conducted in wet or dry weather and does not need to be at a time when the vault contents are being discharged to a stormwater outfall. Sampling locations in these five (5) vaults are considered internal outfalls to eventual discharge points, which are Outfalls 004, 005, and 007. The permittee shall note the total precipitation and snowmelt over the forty-eight (48) hours prior to sampling. If there is any visible sheen present, the permittee shall pump out the vault water and dispose of it off-site. A routine sampling program shall be developed in which samples are taken at the same day, time, and location each quarter. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable DMR submitted to EPA. In addition, all samples shall be analyzed using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

3. Sampling frequency of 1/quarter is defined as the sampling of one (1) discharge event during each calendar quarter, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive. The permittee shall conduct sampling of electrical vault water during the first month of the calendar quarter. If the vault is dry, the sampling shall be attempted during the following two (2) months of the quarter until a sample is obtained. For those months when there are no discharges, the Permittee must report a NODI Code on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

4. The minimum level (ML) for analysis for total PCBs shall be no greater than 0.022 µg/L. 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. Provide the results of PCB analyses as the sum of all Aroclors. Sampling results less than the detection limit shall be reported as "≤ [detection limit]" on the DMR.

5. The minimum levels (ML) for copper and lead are defined as 3 ug/l and 0.5 ug/l, respectively. These values are the MLs for copper and lead using the Furnace Atomic Absorption analytical method (EPA Method 220.2). This method or another EPA-approved method with an equivalent or lower ML shall be used. Sampling results less than the detection limit shall be reported as "≤ [detection limit]" on the DMR.

6. The pH of this discharge shall be no more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

Part I.C.4

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge station heating system water, closed-cycle cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, drainage from the floor drains in the boiler room (station heating water), SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the demineralizer system * through **Internal Outfall Serial Number 011** which is directed through the drain line associated with Outfall 005 and discharged to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate	MGD	0.015	0.06	Continuous, when in use [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Month	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Month	Grab
pH[4]	SU	6.1 – 8.4		1/Month	Grab
Sodium Nitrite[5]	mg/L	Report	2.0 mg/l	1/Month	Grab
Tolyltriazole[5]	mg/L	Report	1.48 mg/l	1/Month	Grab
Effluent Boron[6]	mg/L	Report	5.6 mg/l	1/Month	Grab
Boron[6], Ambient	mg/L	Report	Report mg/l	1/Month	Grab

See pages 25 to 27 for explanation of footnotes.
* purified city water which does not meet the requirements of condenser makeup water

Effluent Characteristic	Discharge Limitation		Monitoring Requirements [1]	
	Average Monthly	Maximum Daily	Measurement Frequency [2,3]	Sample Type
WHOLE EFFLUENT TOXICITY [7,8,9,10]				
LC_{50} & NOAEL	Report %		2/Year	24-Hour Composite [7]
Total Residual Chlorine	Report mg/l		2/Year	Grab
Salinity	Report g/kg		2/Year	24-Hour Composite [7]
pH	Report s.u.		2/Year	Grab
Total Solids	Report mg/l		2/Year	24-Hour Composite [7]
Total Suspended Solids	Report mg/l		2/Year	24-Hour Composite [7]
Ammonia	Report mg/l		2/Year	24-Hour Composite [7]
Total Organic Carbon	Report mg/l		2/Year	24-Hour Composite [7]
Total Recoverable Cadmium	Report mg/l		2/Year	24-Hour Composite [7]
Total Recoverable Lead	Report mg/l		2/Year	24-Hour Composite [7]
Total Recoverable Copper	Report mg/l		2/Year	24-Hour Composite [7]
Total Recoverable Zinc	Report mg/l		2/Year	24-Hour Composite [7]
Total Recoverable Nickel	Report mg/l		2/Year	24-Hour Composite [7]

Footnotes:

1. All samples shall be representative of the effluent that is discharged through internal Outfalls 011, taken at a representative location of the discharge, prior to mixing with any other flows including flow through Outfall 005. All samples shall be analyzed using the analytical methods found in 40 CFR § 136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR § 136. Any change in sampling location must be reviewed and approved in writing by EPA and MassDEP.

2. Sampling frequency of 1/month is defined as the sampling of one (1) discharge event during each calendar month, when discharge occurs. If no discharge occurs during the monitoring period, the permittee shall indicate this on the Discharge Monitoring Report (DMR). For Outfall 014, quarterly sampling shall be conducted when discharge occurs. Such sampling shall be conducted during periods when the majority of the listed flows to this outfall are being discharged. For those months when there are no discharges, the Permittee must report a NODI Code (e.g., "C" for "No Discharge") on the DMR. A list of NODI codes are found in Attachment E of *NPDES Permit Program Instructions for the Discharge Monitoring Report Forms (DMRs)*, available at http://www.epa.gov/region1/enforcement/water/dmr.html. The results of sampling for any parameter above its required frequency must also be reported.

3. Continuous monitoring shall be defined as monitoring at a minimum of fifteen (15) minute intervals during discharge. The results shall be recorded with the time and date on a chart, and shall be made readily available upon request by USEPA or MassDEP. If continuous monitoring at the outfall is unavailable, a minimum of four (4) manual grab samples taken at a minimum fifteen (15) minute intervals each day is acceptable in lieu of continuous monitoring data.

4. The pH of this discharge shall be in the range of 6.1 to 8.4 standard units and not more than 0.2 standard units outside of the natural background range. There shall be no change from natural background conditions that would impair any use assigned to this Class.

5. The permittee shall monitor the discharge through Outfall 011 and Outfall 014 for sodium nitrite and tolyltriazole on a monthly basis and provide the calculated concentration in the discharge canal upon mixing with Outfall 001, as described below, to assure that the sodium nitrite limit of 2.0 mg/l and the tolyltriazole limit of 1.48 mg/l are not exceeded. To calculate the estimated concentrations of sodium nitrite and tolyltriazole in the discharge canal, the permittee shall divide the concentration of these parameters in the Outfall 011 internal discharge by the dilution factor derived by dividing the flow rate of the cooling water flow being used from the combination of CW and SSW pumps that are operating at the time of the batch discharge of these waters by the flow rate of this discharge. These discharges may be made directly to the discharge canal.

6. Each release of boron will be reported in that month's DMR and the permittee shall provide the concentration of boron in the tank before release, and the calculated boron concentration in the discharge canal before mixing with Cape Cod Bay water. Sodium pentaborate may be discharged in 20,000 gallon batches at a maximum concentration of 16,500 mg/l calculated as boron. The boron concentration shall not exceed 1.0 mg/l above background, by calculation, in the discharge from the discharge canal. Each sodium pentaborate release shall be conducted at a rate and with adequate dilution to assure that this concentration is not exceeded in the discharge canal at any time. To calculate the estimated concentration of boron in the discharge canal, the permittee shall divide the concentration of boron in this internal batch discharge by the dilution factor derived by dividing the flow rate of the cooling water flow being used from the combination of CW and SW pumps that are operating at the time of the batch discharge by the flow rate of this batch discharge. This estimate shall meet the limit of 1.0 mg/l above background of boron. These discharges may be made directly to the discharge canal. In order to confirm that the background concentration of boron is approximately 4.6 mg/l, the permittee shall sample the ambient water at the intake for boron once per month during the same day that the batch discharge of boron occurs.

7. The permittee shall conduct acute whole effluent toxicity (WET) tests on samples collected during the months of April and October for years 1, 3 and 5 of the permit for Outfalls 011 and 014. If there are no discharges from these outfalls for the month that sampling is required, sampling shall be conducted the next time that there is a discharge from these outfalls. The permittee shall test the Mysid Shrimp, *Americamysis bahia*, and the Inland Silverside, *Menidia beryllina*. Toxicity testing reporting is due to be submitted with the May and November DMRs, which must be transmitted no later than June 15th and December 15th, respectively. The testing schedule is summarized in the table below. The test must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit and conducted during normal operating conditions. A 24-hour composite shall consist of twenty-four (24) grab samples collected at hourly intervals during a twenty-four hour period (*i.e.*, 0700 Monday to 0700 Tuesday), combined proportional to flow. If the discharge duration is less than 24 hours, the composite sample shall consist of a shorter time interval than hourly to assure that 24 grab samples are taken. This sampling shall be done during dry weather for both outfalls and be taken prior to comingling with any other flow discharging to Outfall 005 for Outfall 011.

Test Month:	**Submit Results With:**	**Test Species**	**LC_{50}**	**NOAEL**
April October	May DMR November DMR	*Americamysis bahia* (Mysid Shrimp) *Menidia beryllina* (Inland Silverside)	Report %	Report %

8. The LC_{50} is the concentration of the effluent which causes mortality to 50% of the test organisms. The NOAEL (no observed acute effect level) is defined as the highest effluent concentration at which there is no statistically-significant adverse effect on the survival of the test organisms when compared with the diluent control survival at the time of observation.

9. For each WET test, the permittee shall report the concentrations of the parameters listed under the WET testing in the table on Page 23 that are detected in a 100% effluent sample, on the appropriate DMR. All of these chemical parameters shall be determined to at least the minimum levels of quantification (ML) shown on Pages 8 to 10 of **Attachment A**, as amended. The permittee should note that all chemical parameter results must still be reported in the appropriate WET test report.

10. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall follow procedures outlined in **Attachment A, Section IV,** of this permit in order to obtain permission to use an alternate dilution water. In lieu of individual approvals for alternate dilution water required **in Attachment A**, the permittee may use the EPA New England guidance document entitled Self-Implementing Alternative Dilution Water Guidance ("Guidance Document") to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. If the Guidance Document is revoked, the permittee shall revert to obtaining approval as outlined in **Attachment A.** The Guidance Document is included as Attachment G of the DMR Instructions on the EPA website at http://www.epa.gov/region1/enforcementandassistance/dmr.html and is not intended as a direct attachment to this permit.

Part I.C.5

During the period beginning on the effective date and lasting through the expiration date, the permittee is authorized to discharge station heating system water, closed-cycle cooling water from heat exchangers of the Turbine Building Closed Cooling Water (TBCCW) system and Reactor Building Closed Cooling Water (RBCCW) system, drainage from the floor drains in the boiler room (station heating water), SSW system chlorinated salt water from various sumps in the Turbine and Reactor buildings, and reject water from the emergency standby liquid control system* through **Outfall Serial Number 014** to the discharge canal and ultimately to Cape Cod Bay. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Units	Discharge Limitation		Monitoring Requirements [1]	
		Average Monthly	Maximum Daily	Measurement Frequency [2]	Sample Type
Flow Rate	MGD	0.015	0.06	Continuous, when in use [3]	Estimate
Total Suspended Solids (TSS)	mg/L	30	100	1/Quarter, when discharging	Grab
Oil and Grease (O&G)	mg/L	15	20	1/Quarter, when discharging	Grab
pH[4]	SU	6.1 – 8.4		1/Quarter, when discharging	Grab
Sodium Nitrite[5]	mg/L	Report	2.0 mg/l	1/Quarter, when discharging	Grab
Tolyltriazole[5]	mg/L	Report	1.48 mg/l	1/Quarter, when discharging	Grab
Effluent Boron[6]	mg/L	Report	5.6 mg/l	1/Quarter, when discharging	Grab
Boron[6], Ambient	mg/L	Report	Report mg/l	1/Quarter, when discharging	Grab

See pages 25 to 27 for explanation of footnotes. * boronated water from the demineralizer which does not meet technical specifications

Part I.D.

These provisions apply to all listed outfalls in Parts I.A through I.C above.

1. The effluents shall not cause objectionable discoloration of the receiving waters.

2. The effluents shall not cause a violation of the water quality standards of the receiving waters.

3. The effluents shall be free from visible oil sheens or floating, suspended, and settleable solids in concentrations or combinations that would impair any use assigned to the receiving water, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom.

4. 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 limits). A method is considered "sufficiently sensitive" when either (*1*) The method minimum level (ML) is at or below the level of the effluent limit established in this permit for the measured pollutant or pollutant parameter; or (*2*) The method has the lowest ML of the analytical methods approved under 40 C.F.R. § 136 or required under 40 C.F.R. Chapter I, Subchapter N or O for the measured pollutant or the pollutant parameter. The ML is not the minimum level of detection, but rather the lowest level at which the test equipment produces a recognizable signal and acceptable calibration point for an analyte, representative of the lowest concentration at which an analyte can be measured with a known level of confidence.

5. Toxics Control

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

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

6. Numerical Effluent Limitations for Toxicants

   EPA or MassDEP may use the results of the chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including, but not limited to, those pollutants listed in Appendix D of 40 C.F.R. Part 122.

7. EPA may modify this permit in accordance with EPA regulations in 40 C.F.R. §§ 122.62 and 122.63 to incorporate more stringent effluent limitations, increase the frequency of analyses, or impose additional sampling and analytical requirements.

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

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

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

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

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

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

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

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

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

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

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

   e. 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.

9. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

10. Any thermal plume in the receiving water resulting from the discharges from the Facility shall not block or severely restrict fish passage, nor interfere with the spawning of indigenous populations of fish in the receiving water, nor change the balanced indigenous population of the receiving water, and shall have minimal contact with the surrounding shoreline.

11. Beginning on the effective date of the permit and until the date of termination of electricity generation at the facility, the rate of change of the delta T (difference between intake and effluent temperature) from Outfall 001 shall not exceed:

    a. A 3^{o} F rise or fall in temperature for any sixty (60) minute period during normal steady state operation and
    b. A 10^{o} F rise or fall in temperature for any sixty (60) minute period during normal load cycling.

    Variation in inlet temperature shall not be considered as an operational rise or fall of temperature. The normal startup temperature rise shall not exceed the maximum allowed in Part I.A.1. above. Any temperature excursion as described in this Part shall be reported to EPA and MassDEP with the DMR for the month when such excursion occurred.

    In the event of an emergency or unplanned reactor shutdown, the allowable decrease of 10^{o} F per hour may be exceeded. In such an event, the permittee shall report the occurrence in the next monthly DMR to EPA and MassDEP.

12. Unusual Impingement Event (UIE)

    During the period beginning on the effective date of the permit, the permittee shall report all "unusual impingement events" at the Facility. An "unusual impingement event" (UIE) at PNPS is defined as the impingement of twenty (20) or more total fish of all species impinged per hour and includes fish in the traveling screens and the intake bays. UIEs will be reported to EPA and MassDEP by telephone no later than twelve (12) hours after the permittee is aware of or has reason to believe an UIE has occurred (See Part I.K.7). A written confirmation report is to be provided within five (5) business days. The MassDEP and EPA addresses to be used are found in Part I.K.4 and 5 of this permit. The written reports shall include the following information:

    a. All fish shall be enumerated and recorded by species. Report the species, size ranges (maximum and minimum length), and approximate number of organisms involved in the UIE. In addition, a representative sample of 25% of fish specimens from each species, up to a maximum of 50 total fish specimens, shall be measured to the nearest centimeter total length.

    b. The date and time of occurrence.

    c. The opinion of the permittee as to the reason the incident occurred.

    d. The remedial action that the permittee recommends to reduce or eliminate this type of incident in the future.

13. All live fish, shellfish, and other aquatic organisms collected or trapped on the screens or in the intake bays shall be returned to the receiving water with minimal stress and at a sufficient distance from the intake so as to minimize reimpingement. All other material, except natural debris (e.g.

leaves, seaweeed and twigs), shall be removed from the intake screens and recycled or disposed of in accordance with all existing Federal, State, and/or Local laws and regulations that apply to waste disposal. Such material shall not be returned to the receiving water.

14. Sand Removal from CWIS

The permittee may remove accumulated sand from the concrete surfaces of the CWIS as necessary to assure that the operation of the traveling screens is not compromised. Such sand shall be disposed of in accordance with local and state regulations or ordinances. Each sand removal occurrence shall be reported as an attachment to that month's DMR.

15. Radioactive materials

The discharge of radioactive materials shall be in accordance with and regulated by the Nuclear Regulatory Commission (NRC) operational requirements (10 C.F.R. Part 20 and NRC Technical Specifications set forth in facility operating license, DPR-35).

16. Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act.

E. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfalls listed in Parts I.A. through I.C. of this permit. Discharges of wastewater from any other point sources not authorized by this permit shall be reported in accordance with the twenty-four hour reporting provision found in Section D.1.e.(1) of Part II (Standard Conditions) of this permit.

F. COOLING WATER INTAKE STRUCTURE (CWIS) REQUIREMENTS TO MINIMIZE ADVERSE IMPACTS FROM IMPINGEMENT AND ENTRAINMENT

Section 316(b) of the CWA, 33 U.S.C. § 1326(b), dictates that this permit must require that the cooling water intake structure's (CWIS) design, location, construction, and capacity reflect the best technology available for minimizing adverse environmental impact (BTA), including the CWIS's entrainment and impingement of various life stages of aquatic organisms (e.g., eggs, larvae, juveniles, and adults). Accordingly, EPA has determined the BTA for PNPS' CWIS and has specified requirements reflecting this BTA below in Parts I.F.1 and I.F.2 of this permit.

The permittee has informed EPA and MassDEP that it will terminate operations at PNPS and enter a decommissioning phase no later than June 1, 2019. As of this date, PNPS will terminate cooling water withdrawals for the main condenser and will be authorized to continue withdrawing cooling water only as necessary to support decommissioning activities and to cool the spent fuel rods for a limited period of time following shutdown of PNPS. The BTA requirements in this permit reflect the current operations of PNPS prior to shutdown or June 1, 2019, whichever comes first and the anticipated operations from June 1, 2019 through the end of the decommissioning phase or the expiration of this permit, whichever comes first.

1. Upon termination of generation of electricity or no later than June 1, 2019, the permittee shall:

   a. Operate the traveling screens with a maximum through-screen intake velocity no greater than 0.5 feet per second. Limited exceedances of the maximum through-screen velocity are authorized for the purposes of maintaining the CWIS and when the circulating water pumps are required to withdraw water to support decommissioning activities not to exceed five (5) percent of the time on a monthly basis.

   b. Monitor the through-screen velocity at the screen at a minimum frequency of daily. Alternatively, the permittee shall calculate the daily maximum through-screen velocity using water flow, depth, and screen open area. For this purpose, the maximum intake velocity shall be calculated during minimum ambient source water surface elevations and periods of maximum head loss across the screens. The average monthly and maximum daily through-screen intake velocity shall be reported each month on the DMR. See Part I.B.1. of this permit.

   c. Cease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD. Cooling water withdrawals at the salt service water pumps shall be limited to a maximum daily flow of 15.6 MGD.

   d. Withdrawal of seawater using a single circulating water pump not to exceed five (5) percent of the time on a monthly basis is authorized to support decommissioning activities.

   e. Continuously rotate the traveling screens when operating the circulating water pumps.

2. From the effective date of the permit until termination of generation of electricity, no later than June 1, 2019, the permittee shall continuously rotate the traveling screens.

3. Any change in the location, design, or capacity of any CWIS, except as expressed in the above requirements, must be approved in advance and in writing by the EPA and MassDEP.

G. BIOLOGICAL MONITORING

The permittee shall conduct biological monitoring which has been determined by EPA and MassDEP to be necessary to evaluate the effect of the permittee’s discharges on the balanced indigenous population of shellfish, fish, and wildlife in and on Cape Cod Bay.

The permittee shall conduct monitoring as described in Permit Attachment B and submit biological monitoring reports for each year of operation through 2019. Annual reports for each year through 2018 shall be submitted no later than May 15th of the following year, with the April DMR. The annual report for 2019 shall be submitted no later than January 15, 2020, with the December 2019 DMR.

No later than January 15th of each year, with the December DMR, the permittee shall submit to EPA and the MassDEP for approval, any revisions to the existing biological monitoring program (BMP) which may be warranted by the availability of new information. Upon approval by the Regional

Administrator (EPA) and the Director (MassDEP), the revised program submitted in accordance with this paragraph shall be incorporated as a part of this permit.

H. STORMWATER POLLUTION PREVENTION PLAN

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

2. The SWPPP shall be developed and certified by the permittee within one hundred and eighty days (180) days after the effective date of this permit. The permittee shall certify that its SWPPP has been completed and signed in accordance with the requirements identified in 40 C.F.R. §122.22. A copy of this certification shall be sent to EPA and MassDEP within thirty (30) days after the certification date.

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 most current version of the MSGP. In the current MSGP (effective June 4, 2015), the general SWPPP provisions are included in Part 5. Additionally, the permittee shall incorporate into the SWPPP all the specific pollution control activities and other requirements found in the MSGP's Industrial Sector O, Steam Electric Generating Facilities. Specifically, the SWPPP shall document the selection, design, and installation 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, stormwater monitoring points, stormwater inlets and outlets, **electrical vaults which collect stormwater**, and industrial activities exposed to precipitation such as those associated with materials storage, disposal, and material handling.

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

   d. A description of structural and non-structural stormwater controls.

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

f. Sector specific SWPPP provisions included in Sector O (Steam Electric Generating Facilities) of the MSGP.

4. The SWPPP shall document the appropriate BMPs implemented or to be implemented at the facility to minimize the discharge of pollutants in stormwater to waters of the United States and to satisfy any non-numeric technology-based effluent limitations included in this permit. At a minimum, these BMPs shall be consistent with the control measures described in the most current version of the MSGP. In the current MSGP, these control measures are described in Part 2.1.2. Specifically, BMPs must be selected and implemented to satisfy the following non-numeric technology-based effluent limitations:

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

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

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.

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

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

g. Proper handling procedures for salt, materials containing chlorides, or any deicing chemicals that are used for snow and ice control.

5. All areas with industrial materials or activities exposed to stormwater and all structural controls used to comply with effluent limits in this permit, shall be inspected, at least once per month, **including all electrical vaults that are required to be routinely pumped out to a stormwater outfall**, by qualified personnel with one or more members of the stormwater pollution prevention team. Inspections shall begin during the 1st full calendar month after the effective date of this permit. Each inspection must include a visual assessment of stormwater samples (from Outfalls 004, 005, 006 and 007 as required by the permit), which shall be collected within the first sixty (60) minutes of discharge from a storm event, 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. The permittee shall document the following information for each inspection and maintain the records along with the SWPPP:

a. The date and time of the inspection and at which any samples were collected;

b. The name(s) and signature(s) of the inspector(s)/sample collector(s);

c. If applicable, why it was not possible to take samples within the first 60 minutes;

d. Weather information and a description of any discharges occurring at the time of the inspection;

e. Results of observations of stormwater discharges, including any observed discharges of pollutants and the probable sources of those pollutants;

f. Any control measures needing maintenance, repairs or replacement; and,

g. Any additional control measures needed to comply with the permit requirements.

6. The permittee shall amend and update the SWPPP within thirty (30) days of any changes at the facility that result in a significant effect on the potential for the discharge of pollutants to the waters of the United States. Changes which may affect the SWPPP include, but are not limited to, the following activities: a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to the waters of the United States; a release of a reportable quantity of pollutants as described in 40 CFR §302; or a determination by the permittee or EPA that the SWPPP appears to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with industrial activity.

7. Any amended, modified, or new version of the SWPPP shall be re-certified and signed by the permittee in accordance with the requirements identified in 40 C.F.R. §122.22. The permittee shall also 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. 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. Such annual certifications also shall be signed in accordance with the requirements identified in 40 C.F.R. §122.22. The permittee shall maintain at the facility a copy of its current SWPPP and all SWPPP certifications (the initial certification, re-certifications, and annual certifications) signed during the effective period of this permit, and shall make these available for inspection by EPA and MassDEP. In addition, the permittee shall document in the SWPPP any violation of numerical or non-numerical stormwater effluent limits with a date and description of any corrective actions taken.

I. REOPENER CLAUSE

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

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

   b. Controls any pollutants not limited in the permit.

J. ELECTRICAL VAULT SAMPLING

The permittee shall conduct a one-time sampling for all of the electrical vaults which were not sampled pursuant to EPA's March 24, 2015 CWA Section 308(a) letter. The permittee shall reference Exhibit B of its "Response to USEPA's March 24, 2015 Request for Information" submittal, which listed the twenty five (25) electrical vaults on the property as identified by the permittee. Since stormwater was sampled for six (6) of these electrical vaults, this requirement shall apply for the remaining nineteen (19) electrical vaults. These samples shall be analyzed for the same parameters which were required by the 2015 308(a) letter which are listed in Permit Attachment C. The sampling results shall be submitted within 180 days of the effective date of the permit.

K. 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 MassDEP 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 on the effective date of the permit the permittee must submit its monthly monitoring data in discharge monitoring reports (DMRs) to EPA and MassDEP no later than the 15th day of the month following the completed reporting period. **For a period of three (3) months from the effective date of the permit**, the permittee may submit its monthly monitoring data in discharge monitoring reports (DMRs) to EPA and MassDEP either in hard copy form, as described in Part I.K.4, 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 three (3) months after the effective date of the permit**, the permittee shall begin reporting monthly monitoring data using NetDMR, unless, in accordance with Part I.K.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, it will no longer be required to submit hard copies of DMRs to EPA or MassDEP.

2. Submittal of Reports as NetDMR Attachments

After the permittee begins submitting DMR reports to EPA electronically using NetDMR, the permittee shall electronically submit all reports to EPA as NetDMR attachments rather than as hard copies, unless otherwise specified in this permit. The permittee shall continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP. (See Part I.K.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 and MassDEP

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

a. Transfer of Permit notice
b. Request for changes in sampling location
c. Request for reduction in testing frequency
d. Request for Reduction in WET Testing Requirement
e. Report on unacceptable dilution water/request for alternative dilution water for WET testing
f. Change in location, design or capacity of cooling water intake structure
g. Notification of proposal to add or replace chemicals and bio-remedial agents including microbes
h. Ichthyoplankton Entrainment Report
i. Biological Monitoring Report

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

Submit hard copies of reports listed above to MassDEP at the following address:

Massachusetts Department of Environmental Protection
Bureau of Water Resources
1 Winter St.
Boston, Massachusetts 02108

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. Notice of unauthorized discharges
c. Reports and DMRs submitted prior to the use of NetDMR
d. Unusual Impingement Event

This information shall be submitted to EPA/OES and MassDEP at the following addresses:

U.S. Environmental Protection Agency
Office or Environmental Stewardship (OES)
Water Technical Unit
5 Post Office Square, Suite 100 (OES04-4)
Boston, MA 02109-3912

Massachusetts Department of Environmental Protection
Bureau of Water Resources
1 Winter St.
Boston, Massachusetts 02108

Massachusetts Department of Environmental Protection
Southeast Regional Office
Bureau of Air and Waste
20 Riverside Drive
Lakeville, MA 02347

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.K.3 and I.K.4 also shall be submitted to the MassDEP at the following addresses:

Massachusetts Department of Environmental Protection
Southeast Regional Office
Bureau of Air and Waste
20 Riverside Drive
Lakeville, MA 02347

Copies of toxicity tests only shall be submitted to:

Massachusetts Department of Environmental Protection
Surface Water Discharge Permit Program
8 New Bond Street
Worcester, Massachusetts 01606

6. Submittal of NetDMR Opt-Out Requests

NetDMR opt-out requests must be submitted in writing to EPA and MassDEP 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 (OES04-4)
Boston, MA 02109-3912

And

Massachusetts Department of Environmental Protection
Bureau of Water Resources
1 Winter St.
Boston, Massachusetts 02108

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-New England and to MassDEP. This includes verbal reports and notifications notification 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**

L. STATE PERMIT CONDITIONS

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

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

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

ATTACHMENT A

MARINE ACUTE
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

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

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

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

II. METHODS

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

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

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

III. SAMPLE COLLECTION

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

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

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

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

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

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

IV. DILUTION WATER

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

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

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

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

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

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

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

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

and

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

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

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

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

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

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

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

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

Footnotes:

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

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

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

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

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

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

Footnotes:

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

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

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

V.1. Test Acceptability Criteria

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

V.2. Use of Reference Toxicity Testing

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

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

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

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

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

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

VI. CHEMICAL ANALYSIS

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

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

Superscript:

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

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

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

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration

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

Methods of Estimation:

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

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

No Observed Acute Effect Level (NOAEL)

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

VIII. TOXICITY TEST REPORTING

A report of results must include the following:

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

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

In addition to the summary sheets the report must include:

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

PERMIT ATTACHMENT B
BIOLOGICAL MONITORING PROGRAM

1. IMPINGEMENT MONITORING

Impingement monitoring shall begin on the first day of the calendar month following the effective date of the permit and continue through the first day of the calendar month following the termination of electricity generation at the facility, expected to be no later than June 1, 2019, with the exception of those times after termination of condenser cooling withdrawals that PNPS must operate the circulating water pumps.

Impingement monitoring shall be conducted each week during three, non-consecutive eight-hour collections that represent morning, afternoon, and night (e.g. once on Monday morning at 8:00 am, once on Wednesday afternoon at 2:00 pm, and once on Friday night at 8:00 pm). Impingement sampling shall be conducted using 1/4-inch or smaller stainless steel baskets placed in the screenwash return sluiceway. All fish will be immediately examined for initial condition (live, dead, or injured). All fish shall be identified to the lowest distinguishable taxonomic category, counted, and measured (to the nearest mm total length). In the event of a large impingement event of a school of equivalently sized forage fish, a subsample of 50 fish can be taken for length measurements.

Following termination of condenser cooling withdrawals, PNPS shall conduct impingement monitoring a minimum of once per week only for weeks when PNPS operates one of the circulating water pumps. To the maximum extent practicable, the permittee shall follow the impingement monitoring requirements indicated above. In the event that fewer than three samples, or non-consecutive samples, are conducted, the permittee shall provide an explanation in the Biological Monitoring Report.

For fish determined to be alive or injured at the time of collection, a representative sample of 25% of the total collection for each species (up to a maximum of 50 specimens per species) shall be placed in a holding tank supplied with continuously running ambient seawater. Latent survival shall be determined after 48 hours after which any live fish shall be safely returned to the subtidal waters of Cape Cod Bay.

2. ENTRAINMENT MONITORING

Entrainment monitoring shall begin on the first day of the calendar month following the effective date of the permit. From the commencement of entrainment monitoring until the last day of the calendar month following termination of the cooling water withdrawals for the main condenser, entrainment monitoring shall be conducted weekly during the months of March through October, and twice per month during November, December, January and February. Beginning the first day of the calendar month following termination of the cooling water withdrawals for the main condenser, entrainment monitoring shall be conducted twice per month. Three entrainment samples shall be collected each sampling week representing morning, afternoon and night (e.g., once on Monday morning at 8:00 am, once on Wednesday afternoon at 2:00 pm, and once on Friday night at 8:00 pm).

Entrainment samples shall be collected from a representative location within the intake structure if feasible. Alternatively, if it is not feasible to conduct sampling from the intake bay, the permittee may collect entrainment samples from the discharge canal.

Sampling shall be conducted using a 0.5-mm mesh, 60-cm diameter collection net with a flow meter mounted in the mouth of the net. Filtration volume shall be recorded for each event and each sample shall represent approximately 100 square meters (m^3) of water. After each sample, the collection nets shall be washed down and the sample transferred from the net to a jar containing sufficient formalin to produce a 5 to 10% solution. In the laboratory, all fish eggs and larvae shall be identified to the lowest distinguishable taxonomic category and counted.

3. BIOLOGICAL MONITORING REPORT

Annual Biological Monitoring Reports with results of the above monitoring (Items A, B, and C) will be submitted to the EPA and MassDEP at the addresses in the permit by May 15th each year, with the April Discharge Monitoring Report (DMR).

Results of the impingement monitoring shall be reported as twenty-four hour and monthly totals based on actual and design intake flows. The permittee shall report total lengths, initial survival, and latent survival for each species. Annual impingement rates shall be extrapolated from the sampling events.

Results of entrainment monitoring shall be reported as total number of eggs and larvae entrained. Ichthyoplankton counts shall be converted to densities per 100 m^3 based on the flow through the sampling net. Entrainment losses shall be converted from weekly estimates of density per unit volume, to monthly and yearly loss estimates based on the actual and permitted cooling water withdrawals. In addition, loss estimates should be converted to adult equivalents for species for which regionally specific larval survival rates are available. Winter flounder larvae collected should be "staged"(i.e., identified as belonging to one or another of four larval life stages based on physical characteristics of the larvae) as follows:

Stage 1 – from hatching until the yolk sac is fully absorbed (approximately 2.3 to 2.8 mm TL)
Stage 2 – from the end of stage 1 until a loop or coil forms in the gut (approximately 2.6 to 4 mm TL)
Stage 3 – from the end of stage 2 until the left eye migrates past the midline of the head during transformation (approximately 3.5 to 8 mm TL)
Stage 4 – from the end of stage 3 until the full complement of juvenile characteristics is present (approximately 7.3 mm to 8.2 mm TL)

Equivalent adult estimates for winter flounder losses will utilize the staged larval data for the larval portion of the facility's entrainment loss estimates.

4. MARINE FISHERIES MONITORING

Cape Cod Bay serves as spawning, nursery, and feeding habitat for winter flounder (*Pseudopleuronectes americanus*), a commercially and recreationally valuable species. Impingement and entrainment monitoring at PNPS have demonstrated mortality of winter flounder as a result of operation of its cooling water intake structure. Since 2000, PNPS has continued monitoring that the Massachusetts Division of Marine Fisheries (MassDMF) began in 1995 to estimate the size of the winter flounder population in the vicinity of PNPS and the proportion of this population killed as a result of entrainment in the CWIS.

PNPS shall continue this monitoring (the "Area Swept Estimate") using the methodology described in the Winter Flounder Area Swept Estimate Western Cape Cod Bay Report included with the most recent annual impingement and entrainment report during each full calendar year following the effective date of this permit that PNPS generates electricity. Results of this study shall be included with the annual Biological Monitoring Report.

Attachment C

Summary of Monitoring Parameters for Electrical Vault Sampling

	Parameter	Minimum Level (ML) of detection [1]
	1. Total Suspended Solids (TSS)	5 mg/L
	2. Total Petroleum Hydrocarbons (TPH)	5.0 mg/L
	3. Cyanide (CN)	10 ug/L
	4. Benzene (B)	2 ug/L
	5. Toluene (T)	2 ug/L
	6. Ethylbenzene (E)	2 ug/L
	7. (m,p,o) Xylenes (X)	2 ug/L
	8. Total Benzene, Toluene, Ethyl Benzene, and Xylenes (BTEX) [2]	2 ug/L
	9. Naphthalene	2 ug/L
	10. Total Phenols	50 ug/L
	11. Total Phthalates (Phthalate esters)	5 ug/L
	12. Bis (2-Ethylhexyl) Phthalate	5 ug/L
	13. Total Polychlorinated Biphenyls (PCBs)	0.5 ug/L

	Metal parameter	Total Recoverable Metal [3] - ML
	14. Antimony	10 ug/l
	15. Arsenic	20 ug/l
	16. Cadmium	10 ug/l
	17. Chromium III (trivalent)	15 ug/l
	18. Chromium VI (hexavalent)	10 ug/l
	19. Copper	3 ug/l
	20. Lead	0.5 ug/l
	21. Mercury	0.2 ug/l
	22. Nickel	20 ug/l

	Metal parameter	**Total Recoverable Metal [3] - ML**
	23. Selenium	20 ug/l
	24. Silver	10 ug/l
	25. Zinc	15 ug/l
	26. Iron	20 ug/l

Footnotes:

[1] Minimum Level (ML) is the lowest level at which the analytical system gives a recognizable signal and acceptable calibration point for the analyte. The ML represents the lowest concentration at which an analyte can be measured with a known level of confidence. The ML is calculated by multiplying the laboratory-determined method detection limit by 3.18 (see 40 CFR Part 136, Appendix B).

[2] BTEX = sum of Benzene, Toluene, Ethylbenzene, and total Xylenes.

[3] With the exception of Chromium III and Chromium VI

NPDES PART II STANDARD CONDITIONS
(January, 2007)

TABLE OF CONTENTS

PART II. A. GENERAL REQUIREMENTS

1. Duty to Comply

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

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

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

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

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

2. Permit Actions

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

3. Duty to Provide Information

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

4. Reopener Clause

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

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

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

5. Oil and Hazardous Substance Liability

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

6. Property Rights

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

7. Confidentiality of Information

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

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

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

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

8. Duty to Reapply

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

9. State Authorities

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

10. Other Laws

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

PART II. B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

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

2. Need to Halt or Reduce Not a Defense

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

3. Duty to Mitigate

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

4. Bypass

a. Definitions

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

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

b. Bypass not exceeding limitations

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

c. Notice

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

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

d. Prohibition of bypass

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

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

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

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

5. <u>Upset</u>

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

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

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

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

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

PART II. C. MONITORING REQUIREMENTS

1. Monitoring and Records

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

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

c. Records of monitoring information shall include:

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

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

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

2. Inspection and Entry

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

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

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

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

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

PART II. D. REPORTING REQUIREMENTS

1. Reporting Requirements

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

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

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

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

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

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

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

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

e. Twenty-four hour reporting.

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

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

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

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

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

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

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

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

2. Signatory Requirement

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

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

3. Availability of Reports.

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

PART II. E. DEFINITIONS AND ABBREVIATIONS

1. Definitions for Individual NPDES Permits including Storm Water Requirements

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

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

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

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

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

Average weekly discharge limitation means the highest allowable average of "daily discharges" measured during the calendar week divided by the number of "daily discharges" measured during the week.

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

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

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

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

Construction Activities - The following definitions apply to construction activities:

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

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

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

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

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

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

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

CWA means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended by Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117; 33 USC §§1251 et seq.

Daily Discharge means the discharge of a pollutant measured during the calendar day or any other 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

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

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

Discharge of a pollutant means:

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

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

This definition includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances owned by a State, municipality, or other person which do not lead to a treatment works; and discharges through pipes, sewers, or other conveyances leading into privately owned treatment works.

This term does not include an addition of pollutants by any "indirect discharger."

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

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

EPA means the United States "Environmental Protection Agency".

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) Which is not a "new source"; and

(d) Which has never received a finally effective NPDES permit for discharges at that "site".

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

An offshore or coastal mobile exploratory drilling rig or coastal mobile developmental drilling rig will be considered a "new discharger" only for the duration of its discharge in an area of biological concern.

New source means any building, structure, facility, or installation from which there is or may be a "discharge of pollutants", the construction of which commenced:

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

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

NPDES means "National Pollutant Discharge Elimination System".

Owner or operator means the owner or operator of any "facility or activity" subject to regulation under the NPDES programs.

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

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

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

Point Source means any discernible, confined, and discrete conveyance, including but not limited to any pipe ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff (see 40 CFR §122.2).

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

(a) Sewage from vessels; or

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

Primary industry category means any industry category listed in the NRDC settlement agreement (Natural Resources Defense Council et al. v. Train, 8 E.R.C. 2120 (D.D.C. 1976), modified 12 E.R.C. 1833 (D. D.C. 1979)); also listed in Appendix A of 40 CFR Part 122.

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

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

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

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

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

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

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

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

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

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

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

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

Sewage Sludge means any solid, semisolid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, Type III Marine Sanitation Device pumpings (33 CFR Part 159), and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

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

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

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

Sludge-only facility means any "treatment works treating domestic sewage" whose methods of sewage sludge use or disposal are subject to regulations promulgated pursuant to Section 405(d) of the CWA, and is required to obtain a permit under 40 CFR §122.1(b)(3).

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

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

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

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

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

Treatment works treating domestic sewage means a POTW or any other sewage sludge or wastewater treatment devices or systems, regardless of ownership (including federal facilities), used in the storage, treatment, recycling, and reclamation of municipal or domestic sewage, including land dedicated for the disposal of sewage sludge. This definition does not include septic tanks or similar devices.

For purposes of this definition, "domestic sewage" includes waste and wastewater from humans or household operations that are discharged to or otherwise enter a treatment works. In States where there is no approved State sludge management program under Section 405(f) of the CWA, the Regional Administrator may designate any person subject to the standards for sewage sludge use and disposal in 40 CFR Part 503 as a "treatment works treating domestic sewage", where he or she finds that there is a potential for adverse effects on public health and the environment from poor sludge quality or poor sludge handling, use or disposal practices, or where he or she finds that such designation is necessary to ensure that such person is in compliance with 40 CFR Part 503.

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

Waters of the United States means:

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

(b) All interstate waters, including interstate "wetlands";

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

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

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

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

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

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

(f) The territorial sea; and

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

Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA (other than cooling ponds as defined in 40 CFR §423.11(m) which also meet the criteria of this definition) are not waters of the United States.

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

Whole Effluent Toxicity (WET) means the aggregate toxic effect of an effluent measured directly by a toxicity test. (See Abbreviations Section, following, for additional information.)

2. <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
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100 (OEP06-1)
BOSTON, MASSACHUSETTS 02109-3912

FACT SHEET

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

NPDES PERMIT NUMBER: **MA0003557**

PUBLIC NOTICE START AND END DATES: May 18, 2016 – July 18, 2016

NAME AND MAILING ADDRESS OF APPLICANT:

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

RECEIVING WATER(S): **Cape Cod Bay**

RECEIVING WATER CLASSIFICATION(S): **Class SA**

SIC CODE: **4911 (Electric Services)**

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1.0 PROPOSED ACTION, TYPE OF FACILITY, AND DISCHARGE LOCATION

Entergy Nuclear Generation Company (Entergy), the permittee, owns and operates Pilgrim Nuclear Power Station (PNPS) in Plymouth, MA. PNPS is a 670 megawatt (MW) electric generating station adjacent to Cape Cod Bay in Plymouth, MA. The facility discharges wastewater from a combination of once-through cooling water, traveling screen washwater, treated process wastewaters, miscellaneous low volume wastewaters, and storm water.

The site was purchased in 1967 for the main purpose of constructing PNPS. Commercial operation of the station began in December of 1972 by Boston Edison Company and this permit was subsequently transferred to Entergy with a change of ownership in 1999. The PNPS facility occupies approximately 140 acres and utilizes one-through cooling water from Cape Cod Bay for its condenser. Entergy also owns an additional 1500 acres adjacent to the plant site that has been placed in a forest management trust. PNPS is located on the western shore of Cape Cod Bay and occupies one (1) mile of continuous shoreline frontage. The site can be accessed by land or from Cape Cod Bay. See Figures 1 and 2 for local and regional site locus maps.

The major features of the PNPS site are the reactor and turbine buildings, the off-gas retention building, the radwaste building, the diesel generator building, the intake structure and main discharge canal, the switchyard, the main stack, administration buildings, and the former recreational facilities. Refer to Figure 3 for the site layout including the intake embayment, discharge channel, and permitted outfalls.

PNPS has one boiling water reactor unit and a steam-driven turbine generator system. The PNPS fuel is low-enriched uranium dioxide with maximum enrichment of 4.6 percent by weight uranium-235 and fuel burn-up levels of 48,000 megawatt-days per metric ton uranium. The primary containment for the reactor is a pressure suppression system, which includes a drywell, pressure suppression chamber, vent system, isolation valves, containment cooling system, and other service equipment. The containment is designed to withstand an internal pressure of 62 pounds per square inch (PSI) above atmospheric pressure and to act as a radioactive materials barrier. A secondary containment completely encloses both the primary containment and fuel storage areas and acts as a radioactive material barrier as well.

A quantitative description of the discharge in terms of significant effluent parameters based upon historical discharge data is shown on Attachment A. The data are shown for what is referred to in this fact sheet as the monitoring period, which covers the period of January 2008 through March 2016.

On April 29th, 1991, the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) issued PNPS (then owned by Boston Edison Company) a NPDES permit (Current Permit) under the federal Clean Water Act (CWA) and the Massachusetts Clean Waters Act, respectively, to govern the facility’s withdrawal of water from Cape Cod Bay for cooling uses and its discharges of pollutants to Cape Cod Bay as part of a variety of wastewater streams. These wastewater streams consist of condenser non-contact cooling water [circulating water (CW) system] (Outfall 001), thermal backwash for bio-fouling control (Outfall 002), intake screen wash water (Outfalls 003 and 012), plant service cooling water [service water (SW) system, also referred to as Salt Service Water (SSW) system] (Outfall 010), and neutralizing sump waste commingled with demineralizer reject water, station heating water, and SW (Outfalls 011 and 014). Additionally, two outfalls discharge stormwater (Outfalls 004 and 007), one outfall discharges stormwater commingled with fire water storage tank discharge (Outfall 006), and one outfall discharges stormwater commingled with most of the flows from Outfall 011 (Outfall 005). See Figure 4 for the water flow diagram.

Under normal operating conditions when electricity is being generated, continuous discharges at the facility include flows from Outfalls 001[1] and 010. All other discharges, from Outfalls 002, 003, 004, 005, 006, 007, 011, 012, and 014 are intermittent.

Table 1 - Outfall Summary

Outfall Serial Number	Description of Discharge
001	Once-through non-contact cooling water – chlorinated
002	Thermal and non-thermal backwash water
003	Screenwash water (traveling screens) to intake embayment – dechlorinated
004, 006, 007	Storm water from yard drains, including electrical vault water
005	Storm water from yard drains, including electrical vault water, demineralizer reject water
010	Service water (SW) for turbine building closed cycle cooling water (TBCCW) and reactor building closed cycle cooling (RBCCW) systems– chlorinated
011	Internal outfall - Various wastewaters from station heating and service water systems and demineralizer reject water
012	Screenwash water to discharge canal - dechlorinated
014 (new outfall)	Discharges from waste neutralization sump including TBCCW and RBCCW systems, standby liquid control (SLC) system

The facility also discharges from two outfalls which are not included in the current NPDES permit: a radwaste system discharge, which is currently sampled for boron, nitrates, and radioactivity and a small miscellaneous stormwater discharge, which only discharges under extreme storm conditions and has not discharged in the last 5 years. The radwaste system discharge shall be in accordance with the U.S. Nuclear Regulatory Commission (USNRC) operational requirements at 10 C.F.R. Part 20 and USNRC technical specifications set forth in the facility's operating license, DPR-35. The miscellaneous stormwater discharge that was

[1] CW flow to the discharge canal [001] is usually continuous, except for condenser backwashes (including thermal backwashes [002]), and when both CW pumps are shut off during refueling outages.

reported by the permittee during the permit term is acknowledged and authorized by this permit and designated Outfall 013.

Additives at the facility consist of sodium hypochlorite [chlorination of Outfall 001 (CW system) and 010 (SW system)], sodium thiosulfate [dechlorination of screenwash water for Outfalls 003 and 012)], sodium nitrite and tolyltriazole (corrosion inhibitors present in periodic discharges through Outfalls 011 and 014), and sodium pentaborate (added to produce boronated water). No biocides other than chlorine, in the form of sodium hypochlorite solution, are used at the facility. Use of any other biocide shall be approved as described on Page 3, footnote 5 of the permit.

The current permit (1991 Permit) was issued and effective on April 29, 1991, was modified on August 30th, 1994, and expired on April 29, 1996. On September 19th, 1995, Boston Edison, the permittee at the time, submitted a timely and complete permit renewal application. Since the permit renewal application was deemed timely and complete by EPA, the permit was administratively continued pursuant to 40 C.F.R. § 122.6. In a letter dated July 7, 1999, the permittee requested transfer of ownership from Boston Edison Company to Entergy. Entergy submitted a permit reapplication update on December 1, 1999.

Additionally, Entergy has submitted additional information in Response to Requests for Information under Section 308(a) of the CWA from EPA dated September 10, 1999, June 9, 2000, October 25, 2004 (which was supplemented by an additional request on July 31, 2007), August 18, 2014, and June 30, 2015 (for electrical vault water sampling).

Certain operational changes at PNPS have been granted approval since the last permit issuance, including the following:

- A letter from EPA dated June 30, 1995, approved the use of Tolyltriazole, a corrosion inhibitor, in various Pilgrim Station systems [station heating systems, and reactor building and turbine building closed cooling-water systems (RBCCW and TBCCW), which discharge through Outfall 011].
- EPA approved, subject to annual review, removal of the PNPS discharge canal fish barrier net on November 23, 1994.
- Two daily, manual grab samples of the service water (SW) System continuous chlorination for total residual oxidants (chlorine) were approved by EPA in lieu of continuous chlorination monitoring on August 26, 1998.
- On October 1, 1998 (AR #74), EPA approved the discharge of demineralizer reject water to Outfall 005.

On October 13, 2015, citing poor market conditions, reduced revenues and increased operational costs, Entergy announced that it would shut PNPS down, essentially terminating electricity generation at the facility, no later than June 1, 2019.[2] In a press release of April 14, 2016, Entergy announced that it would be refueling the Pilgrim facility in 2017 to continue providing

[2] Press Release, Entergy, Entergy to Close Pilgrim Nuclear Power Station in Massachusetts No Later than June 1, 2019 (Oct. 13, 2015), AR#515.

electricity and will be ceasing operations on May 31, 2019.[3] On December 18, 2015, the Independent System Operator of New England (ISO-NE) accepted Entergy's Non-Price Retirement request for the facility.[4] Because Entergy has advised EPA that some discharges and water withdrawals will continue after the cessation of electricity generation, the draft permit reflects post-shutdown operations and discharges as appropriate. However, since the permittee cannot fully anticipate all changes in permitted flows that will take place post-shutdown, this permit may be modified post-shutdown if warranted.

2.0 DESCRIPTION OF PROCESSES AND DISCHARGES

2.1 Nuclear Steam Supply System Operation

The Boiling Water Reactor (BWR) that is employed by PNPS is designed to: produce electrical energy through conversion, via a turbine driven generator, of a portion of thermal energy contained in the steam supplied from the reactor; condense the turbine exhaust steam into water; and return the water to the reactor as heated feedwater with a major portion of the gaseous, dissolved, and particulate impurities removed. The major components of the power generation system are: turbine generator, main condenser, condensate pumps, condensate demineralizers, reactor feed pumps, feedwater heaters, and condensate storage system. The heat rejected to the main condenser (the waste heat inherent in any thermodynamic cycle) is removed by the circulating water (CW) system.

The saturated steam produced by the reactor is passed through the high pressure turbine where the steam is expanded and then exhausted through moisture separators. Moisture is removed in the moisture separators and the steam is then passed through the low pressure turbines where the steam is again expanded. From the low pressure turbines, the steam is exhausted into the condenser where the steam is condensed and de-aerated, and then returned to the cycle as condensate.

2.2 Cooling Water Intake Structure (CWIS)

Cape Cod Bay is the source of cooling water and service water for PNPS. The facility uses a once-through cooling system in which seawater is withdrawn from the bay via an embayment formed by two breakwaters and is discharged into a 900-ft-long discharge canal immediately adjacent to the intake embayment. (See Figure 3) The CWIS provides 311,000 gpm, or 448 MGD, of condenser cooling water via two (2) circulating water (CW) pumps and can provide up to 13,500 gpm, or 19.4 MGD, of cooling water to the service water system via five (5) service water (SW) pumps. The intake structure also supplies flow, as demanded, to the Fire Protection System Pumps. PNPS obtains its potable and reactor makeup water from the Town of Plymouth's municipal water system. See Figure 5 for a plan view and cross sectional views of PNPS' CWIS.

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[3] *Id.*

[4] Letter from Stephen J. Rourke, Vice President, ISO-NE, to Marc Plotkin, Vice President, Entergy Nuclear Power Marketing (Dec. 18, 2015), (AR# 514) *available at* http://www.iso-ne.com/static-assets/documents/2015/12/entergy_537.pdf.

The intake structure consists of wing walls, a skimmer wall that functions as a submerged baffle, slanted vertical bar racks that capture large debris, vertical traveling screens to prevent entrainment, fish-return sluiceways, condenser cooling water pumps, and service water pumps. (See Figure 6 for the cooling water process flow diagram) The two wing walls are constructed of concrete, and guide flow into four separate intake bays. Each wing wall extends from the face of the intake structure at a 45-degree angle, one to a distance of 130 ft to the northwest and the other one to a distance of 63 feet to the northeast. The entrance of the intake measures 62 feet wide at the stop log guide, and extends to the floor of the intake structure at 24 feet below mean sea level (MSL). The skimmer wall at the front of the intake removes floating debris, with the bottom of the wall extending to 12 feet below MSL. Fish are able to escape the system by way of approximately 6 to 12 10-inch circular openings that are located in the skimmer walls at each end of the intake structure. According to the applicant, divers have visually verified that the escape openings are effective. Bar racks behind the skimmer wall intercept large debris. The racks are constructed of 3-inch by 3/8-inch rectangular bars, with a 3-inch opening between each bar. Divers remove debris and large, impinged organisms from the bar racks as necessary.

Under normal operation, seawater is heated in the condenser to approximately 27 to 30°F above the intake temperature, with the permit limit being 32°F. With the cooling water flow being relatively constant at 311,000 gpm throughout the year, the discharge temperature is almost entirely a function of the intake water temperature. The purpose of the main condenser is to serve as a heat sink (*i.e.*, a mechanism for heat removal) for the turbine exhaust steam, the turbine bypass steam, and for other flows. The PNPS main condenser is a twin shell, horizontal titanium tube, seawater cooled unit and is located in the Turbine Building below the main turbine's low-pressure sections. The location of the condenser below the main turbine is indicative of its function, whereby the cooling water of the CW system condenses the steam exhausted from the turbine, which is then returned to the reactor as feedwater. The arrangement of CW piping allows backwashing of the condenser by section to remove possible debris accumulated on the inlet tube sheets. See Figure 6 for a schematic of the cooling process flow.

From the condenser, water flows through a buried concrete conveyance to the discharge canal. This discharge is designated as Outfall 001. The conveyance consists of a 13 foot by 17 foot reinforced concrete box culvert that runs for about 235 feet, followed by a 10.5 foot diameter concrete pipe that runs for about 250 feet. Upon exiting the concrete pipe, discharged water enters a 900 foot long trapezoidal discharge canal separated from the intake embayment by a breakwater. The discharge from the SW system also discharges through this canal. See Figure 3 for a schematic of the intake embayment and discharge channel.

The discharge canal was created by two breakwaters that are oriented perpendicular to the shoreline, one of which is shared with the intake embayment. The channel sides are sloped at a 2:1 horizontal-to-vertical ratio. The bottom is 30 foot wide at an elevation of 0 ft MLW, or 4.8 ft below MSL. The channel bottom remains at this elevation until it converges with the shore, which has a slope of approximately 4:1 at the channel mouth. The discharge canal is extended over the beach to mean low water (MLW) by rock-fill jetties. The jetties are of rubble mound construction and are protected by heavy capstone. The jetties have a nominal elevation of +16 MLW sloping down to a height of 4 ft at MLW. The elevation of the bed of the discharge canal is 0 ft MLW. The discharge canal jetties also serve to promote rapid mixing in Cape Cod Bay for heat dissipation and to protect the CWIS and discharge structures from wave action. At low tide, the water in the discharge canal is several feet higher than sea level, and the discharge is rapid and turbulent, estimated at 8.1 feet per second (fps). At high tide, the velocity is estimated at 1.4 fps, because the cross sectional area of flow in the channel is greater. Discharge of the heated water creates a thermal plume in the nearshore area of PNPS.

Outfalls 001 [condenser cooling water (CW system)], 002 (thermal backwash), and 010 [plant service cooling water (SW system)] are "once-through" discharge points. The source water for these outfalls is Cape Cod Bay. Outfalls 003 and 012 (intake screen wash) and 011 and 014 (waste neutralization sump) use Cape Cod Bay water and/or City of Plymouth municipal (drinking) water. Outfalls 004, 005, 006, 007, and 013 are designated storm water outfalls. In addition to stormwater, Outfall 005 also intermittently discharges a portion of the flows from Outfall 011, with the remainder being discharged through Outfall 014. In addition to stormwater, Outfall 006 discharges fire water storage tank water (municipal water) during maintenance.

2.3 Cooling and Auxiliary Water Systems

Located in the seawater pump wells of the CWIS, two vertical, mixed-flow, wet-type pumps provide a continuous supply to the CW system. Each 1450-horsepower pump has a capacity of 155,500 gallons per minute (gpm). The water is pumped from the intake structure to the condenser via two buried concrete pipes measuring 7.5 feet in diameter. Measurements taken at the breakwaters during mid-tide level with both pumps running indicate that the average intake velocity is 0.05 fps. At the intake, before the screens, the velocity is about 1 fps during all tidal conditions. Through the traveling screens, the velocity has been estimated by calculation to be 1.57 fps. The velocity is approximately 0.15 fps near the east fish-return sluiceway, which is located in the intake embayment just east of the intake structure.

Located in the central wet well of the intake structure are five service water pumps that supply the SW system. Generally, four pumps run while one is kept on standby. Each pump has a capacity of 2500 gpm, providing a combined capacity at normal operation of approximately 10,000 gpm. The service water system is continuously chlorinated in order to control nuisance biological organisms, such as mollusks, barnacles, algae and other organisms, in the service water system. Diffusers located downstream of the racks deliver a 12-percent sodium hypochlorite and seawater mixture to each intake bay. The mixture is used to ensure the total residual chlorine discharge concentration does not exceed a maximum daily concentration of 1.0 part per million (ppm) and an average monthly concentration of 0.5 ppm in the service water discharge and 0.1 ppm maximum daily and average monthly concentration in the condenser cooling water.

Chlorination of the CW system also takes place, on a periodic basis, and typically occurs during spring, summer, and fall, when the circulating water system is chlorinated two hours per day (one hour for each pump). Sodium hypochlorite is also added inboard of the bar rack to control fouling.

2.4 Traveling Screens

Prior to water flowing through either the cooling water pumps or the service water pumps, water passes through one of four (4), ten (10) foot wide traveling screens. The screens work to prevent small debris and small aquatic organisms from being entrained into the cooling water or service water systems. Each screen is constructed of 53 segments with ¼-inch by ½-inch stainless steel wire mesh. Each segment has a stainless steel lip that is used to lift debris and organisms and direct them into a fish-return sluiceway.

The traveling screens are not rotated continuously but are operated on average, 3 to 4 times each day, depending on the scenarios listed below. The screens normally operate at 5 fps, but can be operated at up to 20 fps during storm events that could cause extreme debris loading. The screens operate under the following circumstances or conditions:

- When there is an indication that fish are being impinged at a rate exceeding 20 fish per hour, at which time the traveling screens are turned continuously until the impingement rate drops below 20 fish per hour for two consecutive sampling events.
- During impingement sampling that is required by the permit's marine life monitoring program. Each impingement sampling event is conducted for a minimum of 30 minutes, three (3) times per week.
- When the difference in water level on each side of the screen reaches a specified threshold at an alarm set point. The threshold is typically set at six (6) inches. This level difference signifies that too much debris has collected on the screen. Level differences are rare and usually the result of a storm event.
- During chlorination, which occurs each day for two hours when the main cooling water system is chlorinated inboard of the trash rack to control fouling.
- Whenever water temperatures are less than 30 degrees Fahrenheit (F).
- At a minimum, once per each 12-hour shift, usually at the beginning and end of each shift, and lasting for a few hours.

The screens are washed when they are in operation, using a dual level spray wash. Service water is used as the source for the spray wash. Sodium thiosulfate is added to the wash water to remove chlorine and protect organisms returned to the intake embayment or the discharge canal. The screens are washed from the side that faces the approaching flow at the splash housing, which is located about 46 feet above the bottom of the intake structure. Low pressure spray, at about 20 pounds per square inch (psi), removes light fouling and organisms from the screen. Subsequently, a high pressure spray, at about 100 psi, is applied to remove heavy fouling. The low and high pressure spray nozzles are about 18 to 24 inches apart. The screen rotation rate is kept slow during high impingement events.

Impinged fish are washed into a seamless concrete fish-return sluiceway and usually returned to the intake embayment approximately 300 feet east of the intake structure. The original wet sluiceway, newly designated in this permit as Outfall 012, was installed in 1972 and was connected to the discharge canal. In 1979, the east sluiceway was installed and connected to the intake embayment. This discharge is designated as Outfall 003. During storms, some of the wash water may be discharged via the original sluiceway to the discharge canal through Outfall 012.

See Figure 7 for a schematic showing the two (2) fish return locations associated with these outfalls. An interchangeable baffle plate is utilized to divert the flow to one sluiceway or the other from the screenhouse. The baffle plate directs organisms and debris; however, some water flows over this structure and into the alternate sluiceway. The east sluiceway (Outfall 003) was designed to maintain a minimum 6-inch depth and a water velocity of less than 8 fps, is covered with galvanized wire screen, and has no sharp turns. The discharge point of the east sluiceway is at the mean low water (MLW) level. On occasion, the end of the east sluiceway has been seen above the water level, causing any organisms present to experience a “free fall” scenario. The west sluiceway discharge is above the MLW level in the discharge canal.

2.5 Thermal Backwash

Three to five times each year, the plant’s output is reduced to about 50 percent of its maximum capacity and a thermal backwash is conducted to control biological fouling. The backwash procedure involves heating non-chlorinated seawater from the condensers up to about 105 °F and then pumping this water to flow back through the traveling screens and out to the intake embayment. The treatment is maintained for up to one (1) hour at each intake bay separately. Scheduling of the thermal backwash treatments is coordinated with the highest tide to achieve maximum coverage, preventing mussels from growing in the upper elevations of the intake structure. There are also occasional non-thermal backwashes conducted as necessary, which do not use heated water. This discharge is designated as Outfall 002 and the monitoring requirements are described below in Section 6.2. See Figure 8 for a schematic of the thermal backwash configuration.

2.6 Liquid Radioactive Waste Processing Systems and Effluent Controls

The liquid radioactive waste system collects, treats, stores, and/or disposes of all radioactive liquid wastes. Liquid waste is collected in sumps and drain tanks at various locations throughout the plant and is then transferred to the appropriate receiving tank for processing. The liquid radioactive waste (radwaste) control system is designed to segregate and then process liquid radioactive waste from various sources separately. The liquid radioactive waste is classified, collected, and processed as either clean (liquids having low concentrations of radioactive impurities and high conductivities), or miscellaneous radwastes (liquids having a high detergent or contaminant level, but with a low radioactivity concentration).

Clean liquid radioactive waste is collected from the equipment drain sumps located onsite. The liquid wastes are then transferred to the clean waste receiver tank for processing. The clean waste receiver tank also receives resin transfer water and ultrasonic resin cleaner flush water. Flatbed filters and/or radwaste filter demineralizers are used to treat the clean liquid radioactive waste prior to its collection in the treated water holding tanks. Liquid waste within the holding tanks is sampled and analyzed and usually returned to the condensate storage tanks or the main condenser hot well for reuse within the facility. If the analysis of the clean liquid waste indicated high waste with abnormally high contaminants or high radioactivity, the clean liquid waste may be reprocessed. Clean liquid waste with abnormally high conductivity may be reprocessed in the chemical waste system or evaluated for controlled release into the circulating water discharge canal through the liquid radioactive waste header.

Chemical liquid radioactive wastes are collected from the facility's floor drain sumps. Collected liquid wastes are primarily from minor equipment leaks, tank overflows, equipment drains, and floor drainage. The liquid wastes are automatically transferred to the chemical waste receiver tanks when the sump is filled to a preset level. After decay and storage, the chemical liquid wastes are evaluated for discharge or reprocessing. Miscellaneous liquid radioactive wastes are collected from floor drains within the turbine washdown area, personnel decontamination areas, fuel cask decontamination area, reactor head washdown area, truck decontamination area, machine shop wastes, and retube building decontamination area. Miscellaneous liquid radioactive wastes primarily consist of water collected from equipment washdown and decontamination solution wastes, radiochemistry laboratory solution wastes, miscellaneous water waste, and personnel decontamination waste. The wastes are sampled and analyzed for radioactivity to evaluate them for controlled release or for transfer to the chemical waste receiver tank for reprocessing.

If the liquid radioactive waste meets the facility's Offsite Dose Calculation Manual (ODCM) criteria for controlled release, it can be discharged on a controlled basis into the circulating water discharge canal through the liquid radioactive waste discharge header. As the liquid waste passes through the discharge header, the radioactivity level is continuously monitored. The discharge is automatically terminated if the activity exceeds preset levels. The facility's ODCM is used in accordance with the facility's USNRC operating license.

Drainage of liquid radioactive wastes from the Turbine and Reactor Building closed-cycle cooling water systems (TBCCW & RBCCW) as a result of plant outages are discharged through Outfall 011, as described in detail below.

3.0 Receiving Water Description

PNPS is located on the northwest shore of Cape Cod Bay in the Town of Plymouth, MA, as shown in Figure 2. Cape Cod Bay is a circular embayment of the Atlantic Ocean off the coast of eastern Massachusetts. All discharges from PNPS discharge to Cape Cod Bay, which is designated as Class SA High Quality Waters by the MassDEP under the Commonwealth of Massachusetts Surface Water Quality Standards (SWQS). *See* 314 CMR 4.06(4).[5]

Class SA waters are described in the SWQS (314 CMR 4.05(4)(a)) as:

> These waters are designated as an excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. In certain waters, excellent habitat for fish, other aquatic life and wildlife may include, but is not limited to, seagrass. Where designated in the tables to 314 CMR 4.00 for shellfishing, these waters shall be suitable for shellfish harvesting without

[5] http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf

depuration (Approved and Conditionally Approved Shellfish Areas). These waters shall have excellent aesthetic value.

The Massachusetts Division of Marine Fisheries (DMF) has identified Cape Cod Bay in the vicinity of the PNPS discharge as approved for shellfishing. The only exception is the shoreline area bordering the PNPS facility and extending to the edge of this designated area (CCB41), in which shellfishing is prohibited.

4.0 LIMITATIONS AND CONDITIONS

The effluent limitations and all other requirements described herein may be found in the draft permit. The basis for the limits and other permit requirements are described below. The Discharge Monitoring Report (DMR) data for the period of January 2008 through December 2014 were reviewed as part of developing the Draft Permit. This time period is referred to in this Fact Sheet as the "monitoring period." This DMR data is summarized in Attachment A and includes data for process and cooling water from Outfalls 001, 002, 003, 010 and 011. The limited monitoring data from the stormwater outfalls is discussed below in Section 6.4.

5.0 PERMIT BASIS: STATUTORY AND REGULATORY AUTHORITY

5.1 General Requirements

The Clean Water Act (CWA) prohibits the discharge of pollutants to waters of the United States without authorization from a National Pollutant Discharge Elimination System (NPDES) permit unless such a discharge is otherwise authorized by the statute. The NPDES permit is the mechanism used to implement technology-based and water quality-based effluent limitations and other requirements, including monitoring and reporting, at the facility-specific level. This draft NPDES permit was developed in accordance with various statutory and regulatory requirements established in or pursuant to the CWA and any applicable 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. Subpart A of 40 C.F.R. Part 125 establishes criteria and standards for the imposition of technology-based treatment requirements in permits under Section 301(b) of the CWA, including the application of EPA-promulgated effluent limitations and case-by-case determinations of effluent limitations under Section 402(a)(1) of the CWA. *See* 40 C.F.R. § 125.3. The development of water quality-based standards is governed by a variety of legal requirements, including CWA §§ 301(b)(1)(C), 303, 401 and 510, as well as 40 C.F.R. § 122.44(d) and Part 131. Permit limits must, at a minimum, satisfy federal technology standards, but also must satisfy any more stringent water quality-based requirements that may apply. Put differently, between technology-based and water quality-based requirements, whichever is more stringent governs the permit. 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 a reissued permit 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

5.2.1 General

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. Part 125, Subpart 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), (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"); 122.29(a), discharges of pollutants must be limited to a degree corresponding to the "best available demonstrated control technology" (BADT), 33 U.S.C. §§ 1316(a), (b).

In general, the statute requires that facilities like PNPS 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 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.

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), (b); *see also* 40 C.F.R. §§ 122.43(a) and (b), 122.44(a)(1), 125.3. 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. 33 U.S.C. § 1342(a)(1)(B); *see also* 40 C.F.R. §§ 122.43(a), 122.44(a)(1), 125.3(c). 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 a variety of factors enumerated in the statute and regulations for each specific technology standard. 33 U.S.C. § 1314(b); *see also* 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. As one court has explained:

> [i]n what EPA characterizes as a "mini-guideline" process, the permit writer, after full consideration of the factors set forth in section 304(b), 33 U.S.C. § 1314(b), (which are the same factors used in establishing effluent guidelines), establishes the permit conditions "necessary to carry out the provisions of [the CWA]." § 1342(a)(1). These conditions include the appropriate ... BAT effluent limitations for the particular point source. ... [T]he resultant BPJ limitations are as correct and as statutorily supported as permit limits based upon an effluent limitations guideline.

NRDC v. EPA, 859 F.2d 156, 199 (D.C. Cir. 1988).

5.2.2 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 provisions of this part are applicable to discharges resulting from the operation of a generating unit by an establishment primarily engaged in the generation of electricity for distribution and sale which results primarily from a process utilizing fossil-type fuel (coal, oil, or gas) or nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium. *See* 40 C.F.R. § 423.10. Since the operations at PNPS fall within those defined in this industrial category, they are covered by these ELGs. Revised ELGs for the Steam Electric Category were proposed on June 7, 2013 and the Final Rule for these ELGs was published on November 3, 2015 and became effective on January 4, 2016. *See* 80 Fed. Reg. 67,838 (Nov. 3, 2015). EPA has applied the revised ELGs in the draft permit. 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, technology-based limits would instead be developed on a BPJ, case-by-case basis. *See* 40 C.F.R. § 125.3(c)(3).

The revised Steam Electric ELGs that apply to this facility are similar to the previous ELGs and include the following effluent limits based on BPT or BAT:

a. for low volume waste sources:
  (1) 100.0 mg/L as a maximum and 30.0 mg/L as a 30-day average for Total Suspended Solids (TSS), and
  (2) 20 mg/L as a maximum and 15 mg/L as a 30-day average for oil and grease (O&G);

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

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

d. for once-through cooling water: 0.2 mg/L as a maximum for total residual chlorine (or total residual oxidants for intake water containing bromides); and

e. for cooling tower blowdown: 0.5 mg/L as a maximum and 0.2 mg/L as an average for free available chlorine.

The Steam Electric ELGs, however, establish categorical effluent limitations under the various technology standards for only some of the pollutants discharged by facilities in this industry. The Steam Electric ELGs do not include effluent limitations on the discharge of heat. In the absence of technology-based effluent guidelines, the permit writer is authorized under Section 402(a)(1)(B) of the CWA to establish effluent limitations on a case-by-case basis using Best Professional Judgment (BPJ). Therefore, any technology-based thermal discharge limits would be based on a BPJ application of the BAT technology standard, which is applicable to non-conventional pollutants such as heat. As discussed further below, however, the permit's thermal discharges limits may, instead, be based on water quality-based requirements or a thermal discharge variance under CWA § 316(a)). 33 U.S.C. § 1326(a).

In addition to the Steam Electric ELGs, Sector O of the 2015 Multi-Sector General Permit (MSGP) (Steam Electric Generating Facilities) contains Stormwater Pollution Prevention Plan (SWPPP) components, along with a benchmark monitoring concentration of 1.0 mg/L total iron. *See* 2015 MSGP, Part 8.O.7. Since PNPS is engaged in the activities covered by this sector, EPA has included technology-based permit conditions for stormwater discharges from these MSGP provisions in the SWPPP requirements of the draft permit in Section 9.0 below.

5.3 Water Quality-Based Requirements

Water quality-based limitations 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). CWA § 301(b)(1)(C), 33 U.S.C. § 1311(b)(1)(C). 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. The Massachusetts Surface Water Quality Standards (MA SWQS), found at 314 CMR 4.00, include these elements. These standards 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 apply for pollutants not otherwise listed in the MA SWQS, unless MassDEP has established a site-specific criterion. 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) and 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 may be established based on a calculated dilution factor derived from the available dilution in the particular receiving water at the point of discharge. In coastal and marine waters, Massachusetts SWQS require the State to "establish the extreme hydrologic conditions at which aquatic life criteria must be applied on a case-by-case basis. In all cases, existing uses shall be protected and the selection shall not interfere with the attainment of designated uses." 314 CMR 4.03(3)(c).

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 will cause, have "reasonable potential" to cause, or contribute to an excursion above any WQS. 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.

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. With regard to water quality requirements, state WQS typically include numeric temperature criteria, and may also include narrative criteria and designated uses that apply to particular water body classifications and could necessitate restrictions on thermal discharges.

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. Furthermore, the Massachusetts SWQS provide that:

> alternative effluent limitations established in connection with a variance for a thermal discharge issued under [CWA § 316(a)] and 314 CMR 3.00 are in compliance with 314 CMR 4.00. As required by [CWA § 316(a)] and 314 CMR 3.00, for permit and variance renewal, the applicant must demonstrate that alternative effluent limitations continue to comply with the variance standard for thermal discharges.

314 CMR 4.05(4)(a)(2)(c) (for Class SA waters). Therefore, thermal discharge limits set pursuant to a variance under CWA § 316(a) are deemed by the state to satisfy Massachusetts SWQS.

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. 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), (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. 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. More specifically, "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 base its variance request on a demonstration that "the desired alternative effluent limitations (or appropriate modifications thereof) will nevertheless assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife in an on the body of water into which the discharge is made." *Id.* § 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. *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490, 500 & n.13, 534 n.68, 552 n.97 (EAB 2006). As part of its March 2000 section 308 letter submittal to EPA, Entergy included material that was considered a demonstration in support of extending the previously granted 316(a) variance from the 1991 permit. (AR #81, 384, and 393) See Section 7 below for a discussion of the thermal limits and the 316(a) variance and Fact Sheet Attachments B and C, which support these limits and the continuation of the variance.

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

PNPS withdraws water from Cape Cod Bay through one cooling water intake structure (CWIS); this water is used both for cooling at the main condenser and supported systems for producing electricity and for cooling safety-related equipment, including facility shut-down systems. The withdrawal of seawater through PNPS' CWIS is subject to the requirements of CWA § 316(b). 33 U.S.C. § 1326(b). Section 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 and it is discussed in more detail in Section 8.0, below and in Attachment D.

5.6 Anti-backsliding

A permit may not be renewed, reissued or modified with less stringent limitations or conditions than those contained in the previous permit unless in compliance with the anti-backsliding requirements of the CWA. *See* 33 U.S.C. § 1342(*o*); 40 C.F.R. § 122.44(*l*). EPA's anti-backsliding provisions prohibit the relaxation of permit limits, standards, and conditions except under certain circumstances. Effluent limits based on BPJ, water quality, and state certification requirements must also meet the anti-backsliding provisions found at Section 402(*o*) and 303(d)(4) of the CWA. The draft permit does not contain permit limits or conditions that are less stringent than the existing permit. Therefore, the anti-backsliding provisions are met.

5.7 Antidegradation

Federal regulations found at 40 C.F.R. § 131.12 require states to develop and adopt a statewide antidegradation policy that maintains and protects existing instream water uses and the level of water quality necessary to protect the existing uses, and maintains and protects the quality of the waters that exceed levels necessary to support propagation of fish, shellfish, and wildlife and to support recreation in and on the water. The Massachusetts Antidegradation Regulations, found at 314 CMR 4.04, apply to any new or increased activity that would lower water quality or affect existing or designated uses, including increased loadings to a waterbody from an existing activity. All existing instream uses and the level of water quality necessary to protect the existing uses of the receiving waters shall be maintained and protected.

There are no new or increased discharges being proposed with this permit reissuance. Therefore, EPA believes that the MassDEP is not required to conduct an antidegradation review regarding this permit reissuance.

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). EPA permits typically 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).

6.0 EXPLANATION OF PERMIT'S EFFLUENT LIMITATIONS

In Sections 5.2 and 5.3 above, EPA explained in general terms the technology-based and water quality-based requirements of the CWA. In this Section, EPA explains how it has applied these requirements in developing the draft NPDES permit for PNPS. As a whole, the draft permit's conditions are based on a combination of technology-based and water quality-based requirements, as well as a CWA §316(a) variance for thermal discharges.

The discussion below, and the draft permit itself, address PNPS's many outfalls as well as its many different types of pollutant discharges and its withdrawals of Cape Cod Bay water for cooling uses. Monitoring requirements are also addressed, as are individual permit changes requested by PNPS.

6.1 Outfall 001

The circulating water (CW) system discharges condenser non-contact cooling water through Outfall 001. The CW system withdraws salt water from Cape Cod Bay which is chlorinated with sodium hypochlorite on an intermittent basis (up to 2 hours/day) before entering the cooling system. Chlorine is the only biocide approved for use at PNPS; no other biocide shall be used without prior EPA approval. The permittee currently adds sawdust to the CW system to find and seal condenser leaks as necessary.

Sampling for Outfall 001 is conducted in the discharge canal, below the footbridge, downstream from where the flow from Outfall 001 commingles with flows from Outfalls 003, 004, 005, 010, 011, and 014. Since the majority of water in the discharge canal (greater than 95% under most conditions) consists of flow from Outfall 001, this sampling point is believed to be representative of the Outfall 001 discharge. The permittee believes that the structural changes that would be necessary to sample Outfall 001 (installation of a sample pump in the outfall) prior to commingling with other flows would be significant in relation to the benefits achieved, since the majority flow volume in the discharge canal consists of cooling water flow.

Due to the announced shutdown of the PNPS as discussed in Section 1.0 above, which is expected to occur no later than June 1, 2019, this permit has developed two sets of conditions for Outfalls 001 and 010, to reflect the significant reduction in intake and effluent flows which will occur after the shutdown. The effluent limits pages of the draft permit are separated into three (3) specific sections. The first, Part I.A, lists the effluent limits that apply up through the date of the termination of electricity generation (shutdown), while Part I.B applies from the date of shutdown and through expiration, and Part I.C applies to certain outfalls prior to and after shutdown, such as those for stormwater.

6.1.1 Flow

The current permit includes an effluent limitation at Outfall 001 for monthly average flow of 447 MGD and daily maximum flow of 510 MGD. The monthly average flow limit reflects the design intake flow at PNPS of the 2 CW pumps and is based on pump capacity curves. Review of DMR data (January 2008 through December 2014) reveals that these flow limitations have not been exceeded on any occasion. The monthly average flow rate has ranged from 217.7 – 446.4 MGD and daily maximum flow has been recorded consistently at 446.4 MGD. The daily maximum limit of 510 MGD is not achievable by the facility based on the design capacity of the CW pumps. Therefore, the monthly average flow limit for Outfall 001 has been maintained at 447 MGD and the daily maximum flow limit has been reduced to 447 MGD, to reflect the maximum design flow of the intake.

In its permit reapplication, the permittee requested removal of the effluent limitations for flow. However, volumetric flow rate is analogous to capacity in terms of the criteria for best technology available (BTA) in § 316(b) of the CWA. Volumetric flow rate is a significant parameter in § 316(b) demonstration studies as well as in determining heat loadings to the receiving water. Heat is considered to be a nonconventional pollutant. Accordingly, EPA will retain the effluent limitations on circulating cooling water flow rate for Outfall 001 in the draft permit as described above.

After shutdown, the permittee will need to operate one of the 2 CW pumps occasionally to support shutdown operations. The permittee believes that this intake would be used for a few hours at a time and for not more than 5% of the time. (Joe Egan – email of 10/28/15) Therefore, the flow limits for Outfall 001 post-shutdown, as shown in Part I.B.1 of the permit, have been reduced to a monthly average of 11.2 MGD with a daily maximum of 224 MGD. The monthly average flow represents one CW pump being used for up to 5% of the time, whereas the 224 MGD represents the cooling water rate of the pump.

6.1.2 pH

The current permit requires that the pH shall not vary by more than 0.5 standard units from that of the intake water. However, there were no specific monitoring requirements established for pH in the current permit.

The Steam Electric Power Generating Point Source Category (40 C.F.R. Part 423) requires that the pH of all discharges, except for those of once through cooling water, shall be in the range of 6.0 – 9.0 SU. The Massachusetts SWQS (314 CMR 4.05(4)(a)(3)) require that for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range.

To be consistent with the State WQS, the draft permit limits pH to the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range. The draft permit requires weekly monitoring of the discharge.

6.1.3 Total Residual Oxidants (TRO)

The current permit restricts biocide use at the facility to chlorine only. The current permit also requires that the chlorination cycle for the circulating cooling water systems shall not exceed two (2) hours in any one day for one cooling water point source unless the discharger demonstrates to the EPA and the State that discharge for more than two hours is required for macroinvertebrate control. In the current permit, the TRO concentration was limited to 0.1 mg/l as a monthly average and daily maximum in the discharge to Cape Cod Bay. Since the intake water contains bromides (i.e., saline water), the sampling parameter is expressed as TRO instead of total residual chlorine (TRC), in accordance with the Steam Electric Power Generating Point Source Category effluent guidelines (see 40 C.F.R. § 423.11).

The Steam Electric ELGs at 40 C.F.R. § 423.13 require that for any plant with a total rated electric generating capacity of 25 megawatts or greater, the quantity of pollutants discharged in once through cooling water from each discharge point shall not exceed 0.2 mg/L of total residual chlorine (TRC) as a maximum. The term total residual chlorine (or total residual oxidants for intake water with bromides) means the value obtained using the amperometric method for total residual chlorine described in 40 C.F.R. Part 136. Additionally, 40 C.F.R. § 423.13(b)(2) states that "total residual chlorine may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control. Simultaneous multi-unit chlorination is permitted." As discussed above, however, the current permit imposes more stringent TRO limits - 0.1 mg/L as both a monthly average and daily maximum. Review of DMR data reveals that this daily maximum TRO limit has been exceeded on 3 occasions during the monitoring period, with a maximum concentration of 0.19 mg/L TRO. However, the monthly average limit has not been exceeded on any occasion, ranging between 0 and 0.07 mg/l.

Consistent with 40 C.F.R. Part 423, the draft permit maintains the two (2) hour daily maximum dosing requirement noted above.

In this draft permit, EPA must consider the applicable water quality criteria in setting TRO limits for this outfall. For the purposes of this permit, all TRO discharges are believed to be predominantly comprised of TRC, therefore, the limits based on the TRC criteria will be expressed as TRO limits. TRO limits would typically be calculated by multiplying the water quality criteria by the dilution available to the discharge. To EPA's knowledge, there has not been any prior hydrodynamic modeling conducted that would provide an estimate of dilution for the discharge from the discharge canal. The fact sheet to the 1991 permit notes in the section discussing the boron limits:

"The boron discharge is further diluted by the passive entrainment of the jet from the cooling water canal into Cape Cod Bay. Nominally such shoreline discharges entrain about 5 times the jet flow rate in the receiving water."

The source of this statement could not be found and it is not clear if this is the dilution that would be available to pollutants in the discharge canal once they are discharged to Cape Cod Bay. The chronic and acute, marine water quality criteria for TRC are 7.5 ug/l and 13 ug/l, respectively.

Therefore, this draft permit establishes TRO limits of 7.5 and 13 ug/l, as a monthly average and daily maximum, respectively. EPA will consider any comments during the public comment period regarding the applicability of any particular dilution that should be used to calculate a less stringent TRO limit for Outfall 001.

Post-shutdown, the permittee will be prohibited from chlorinating the water that is withdrawn with the CW pump to support shutdown operations. Therefore, the permit has included a prohibition on the chlorination of this intake water in Part I.B.1 and has removed the TRO monitoring requirement and limits for this outfall post-shutdown.

Post-shutdown, the only source of TRO, aside from that naturally occurring in sea water, will be the chlorinated water from the SW system at Outfall 010. The 1991 permit limited TRO at Outfall 010 at a monthly average of 0.5 mg/l and a daily maximum of 1.0 mg/l. For the 1991 permit, the permittee demonstrated that, with these limits set at Outfall 010, the concentration of TRO after mixing in the discharge canal with the flows from Outfall 001 would be below the limit of 0.10 mg/l set at Outfall 001. However, the condenser cooling water flow on which this demonstration for TRO limits was based, will be terminated, with the exception of flows from one of the two CW pumps which may be operated up to 5% of the time. As described in Section 6.6.5 below, criteria based limits for TRO have been established at Outfall 010 post-shutdown.

6.1.4 Temperature & Temperature Rise

The current permit requires a daily maximum effluent limitation for temperature of 102°F, monitored continuously. The current permit also requires that the temperature rise, or delta T, not exceed 32°F. These temperature limits were based on the CWA § 316(a) variance that was granted in the current permit. Review of DMR data reveals that the daily maximum effluent temperature has ranged from 69 – 101.6 °F and the effluent limit has not been exceeded on any occasion during the monitoring period. The DMR data also reveal that the maximum rise in temperature was 31.6°F on two occasions and that the temperature rise limit has not been exceeded during the monitoring period.

The draft permit includes a maximum daily temperature limit of 102°F and maximum daily rise in temperature (delta T) limit of 32°F. These temperature limits and the associated § 316(a) variance are explained in detail in Section 7.0, below, and in Attachments B and C. The permittee requests that “Sample Type” for thermal parameters be changed to “Resistance Temperature Detector” (RTD), which is a type of electronic temperature monitoring device. This type of device is acceptable for temperature monitoring and the sample type of “recorder” on the permit limits page is an appropriate description for this device.

Post-shutdown, since the water withdrawn with the CW pump will no longer be used for condenser cooling, but to support other operations, the draft permit limits the effluent temperature to a maximum daily limit of 85°F and a monthly average of 80°F, which are the temperature limits consistent with the MA SQWS for Class SA waters. *See* 314 CMR 4.05(4)(a)(2)(a). The permittee has estimated the delta T of this effluent will be up to 3°F above the intake temperature, presumably due to fact that even after the shutdown there will be some ongoing equipment cooling discharges associated with the SSW system. (Joe Egan email of

10/28/15, AR#519). Although not specified in the email, it is assumed that this delta T is associated with the remaining cooling water flows within the SW system post-shutdown. Therefore, it is necessary to establish temperature limits for Outfall 010, which will be the sole continuous remaining discharge in the discharge canal post-shutdown Although the MA SWQS generally limit any delta T to 1.5 °F, they also provide that temperature effluent limitations established pursuant to a § 316(a) variance "are in compliance with" MA SWQS. *Id.* Since the EPA concludes in Section 7.3 below that a continued § 316(a) variance for temperature allowing a delta T of 32°F during normal (pre-shutdown) operations will 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, EPA concludes that a delta T of 3°F will likewise assure the protection and propagation of the BIP after shutdown, since the majority of the thermal component of the condenser cooling discharge will have been eliminated. Accordingly, the draft permit includes a maximum delta T of 3°F post-shutdown.

6.1.5 Oil and Grease

The current permit does not include O&G limits or monitoring at Outfall 001, and EPA is not aware of any existing O&G data for Outfall 001. Nor do the Steam Electric ELGs establish O&G limits for the discharge from Outfall 001 (*i.e.*, once-through cooling water). See 40 C.F.R. Part 423. The current permit does, however, include O&G limits for Outfalls 004 and 005, as discussed below in Section 6.4, and the draft permit proposes new technology-based limits for O&G at Outfalls 010, 011, and 014 based on the Steam Electric ELGs, as discussed below in Sections 6.6 and 6.7. All of these discharges commingle with the discharge from Outfall 001 prior to sampling for Outfall 001, which is conducted, as noted earlier, below the footbridge over the discharge canal. In order to ascertain O&G levels in the combined flows in the discharge canal, the draft permit establishes a monitoring requirement for O&G at Outfall 001, which will apply during both pre- and post-shutdown operations. The draft permit specifies a test method to be used to analyze for O&G and the minimum level (ML) of detection for this method of 5 mg/l.

6.1.6 Addition of biodegradable material

Due to occasional condenser leaks, the current permit provided that the addition of "a reasonable quantity of biodegradable and non-toxic material may be used to the extent necessary to find and/or seal the leak." The current permit further required the permittee to report the duration and estimated amounts of such material used.

The facility currently uses wood flour (sawdust) to find and/or seal condenser leaks and the draft permit includes a condition allowing the use of sawdust to seal condenser leaks to the extent necessary. The permittee shall report the type and approximate amount of material used on the DMR cover letter. The permittee shall be limited to using only sawdust or similar wood-based products for this purpose. If the permittee determines that another substance is required for this purpose, it shall request and receive approval from EPA prior to using such substance.

6.2 Outfall 002

Thermal backwashes are necessary to control biological growth (biofouling) in the intake structures. Outfall 002 consists of thermal backwash water, which is heated water taken from the CW system. Outfall 002 flows back through the intake structure to the intake channel (also called the intake embayment). Chlorination is not conducted during backwashes, which cannot be performed at full power. The CW system (condenser) backwashes occur 4-5 times per year and consists of a pair of backwashes (one for each CW pump bay), lasting approximately 60 minutes for each bay; during 45 minutes of which the permittee raises the reactor power level so that the water temperature reaches at least 105°F.

6.2.1 Flow

The current permit includes a daily maximum flow limit of 255 MGD, specified as “estimated when in use.” This flow is based on the capacity of one of the CW pumps (155,500 gpm). The permittee backwashes one intake bay at a time, for a duration of about one hour each. The current permit also requires that the discharge shall not be more frequent than three hours a day twice a week for those periods when required to operate the plant most efficiently. The draft permit continues to limit thermal backwashes to once per week and for a maximum of three (3) hours for both intake bays. Although the typical backwash for each intake bay is completed within one (1) hour, under certain conditions, this time would need to be increased, so the three (3) hour maximum for the backwashing of both intake bays allows for such conditions.

The current permit notes that in addition to the thermal backwashes performed 4-5 times per year, non-thermal backwashes are performed 3-4 times per year. Although the current permit does not require monitoring of non-thermal backwashes, the draft permit requires monitoring of all backwashes through Outfall 002, whether they are thermal or non-thermal.

In a September 4, 2014 email from Joe Egan of PNPS to George Papadopoulos of EPA, the permittee proposed to reduce the maximum daily flow limit to 28 MGD, as opposed to the prior limit of 255 MGD, which was based on the flow rate of one circulating water pump. The draft permit includes a maximum daily flow limit of 28 MGD, as requested by the permittee. This permit limit is equivalent to the use of one CW pump (at 155,500 gpm) for a maximum of 3 hours per day.

Post-shutdown, the permittee has noted that it will no longer conduct thermal backwashes, but may need to conduct non-thermal backwashes. (Joe Egan – phone call of 12/21/15). Therefore, as shown in Part I.B.3 of the permit, there continue to be limits on the frequency and flows of such backwashes, as well as a limited pH range. This Part also prohibits the use of thermal backwashes after shutdown.

6.2.2 pH

The current permit requires that the pH of the discharge shall not vary by more than 0.5 standard units from that of the intake water.

The Steam Electric Power ELGs (40 C.F.R. Part 423) requires that the pH of all discharges, except for those of once through cooling water, shall be in the range of 6.0 – 9.0 SU. The Massachusetts SWQS (314 CMR 4.05(4)(a)(3)), however, require that, for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range. The draft permit limits pH to the range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range to be consistent with the State WQS.

6.2.3 Total Residual Oxidants (TRO)

The CW system is typically chlorinated 2 hours per day; however, during thermal backwash chlorination of the CW system is not conducted. The draft permit requires monitoring of TRO once during each backwash to ensure the discharge does not contain any detectable TRO, as there may be some residual TRO in the cooling water system. Post-shutdown, since the intake water from the CW pump will no longer be chlorinated, there will not be expected to be any TRC contributing to TRO in the discharge. Therefore, there will no longer be any monitoring required for TRO post-shutdown.

6.2.4 Temperature

The current permit requires a daily maximum temperature limit of 120°F, measured continuously during each thermal backwash procedure. During the monitoring period, this limit has not been exceeded, with a high temperature of 114.9°F. In a September 4, 2014 email from Joe Egan of PNPS to George Papadopoulos of EPA, the permittee proposed to reduce the daily maximum temperature limit for Outfall 002 from 120°F to 115°F. The draft permit includes the more stringent maximum discharge temperature of 115°F, as requested by the permittee. Since this temperature is higher than that allowed by the MA SWQS, a variance from the MA SWQS has been granted as discussed in Section 7.3 below.

The permittee requests that “Sample Type” for thermal parameters be changed to “Resistance Temperature Detector” (RTD). As noted in Section 6.1.4. above, this type of sample is acceptable for temperature, therefore the draft permit shall require a “recorder” sample type, which is the generic term used for electronic device monitoring.

Post-shutdown, since the permittee is prohibited from conducting thermal backwashes and no heat will be added to the water for non-thermal backwashes, the effluent temperature limit has been eliminated.

6.3 Outfalls 003 and 012

The source of the screen wash water (Outfall 003) is service water (SW) which has been dechlorinated, and possibly fire water in emergency conditions, which is not dechlorinated. Under normal operating conditions, the majority of this screen wash water is discharged to Outfall 003 to the intake embayment via a sluiceway added in 1980, but some also discharges to the discharge canal. During storm conditions, the majority of screen wash water is discharged to the discharge canal, mainly to prevent re-impingement of seaweed. The outfall to the discharge canal, which was previously not identified as a separate outfall, has been designated as Outfall 012 in the draft permit. (See Figure 7, also noted earlier in Section 2.4)

The current permit allows sampling at a representative point of the screen wash water flow. The draft permit specifies that screen wash water be sampled from the fish return sluiceway at Outfall 003, since this is where the majority of this flow is discharged. The draft permit also requires that the permittee document when routing of screen wash water to the discharge canal (Outfall 012) occurs along with the reason for such occurrence.

The permittee has requested that dechlorination be discontinued when screen wash water is discharged to Outfall 012. The permittee reasoned that during storm conditions when both circulating (seawater) pumps are in operation, dechlorination of screen wash water sent to the discharge canal via Outfall 012 could be discontinued due to increased discharge canal dilution, assuring that residual oxidants released to Cape Cod Bay are within permit limits. However, EPA does not agree, as it is expected that chlorinated screen wash water would be detrimental to the organisms washed from the screen that may survive during transit back to the receiving water. Although the mix of fragile vs. non-fragile species varies over time, there are periods when more non-fragile species are washed off the screens and survive the return to the receiving water. Therefore, the draft permit requires that all screen wash water be dechlorinated prior to use, with the exception of fire water that is used under emergency conditions.

Post-shutdown, the permittee believes that Outfall 012 will be the default flow path for the traveling screen washwaters. (Joe Egan email of 10/28/15). Therefore, Part I.B.4 of the permit allows this water to only be discharged to Outfall 012, including sampling from the fish return sluiceway at Outfall 012, with the same conditions as during normal operations as described below.

6.3.1 Flow

The current permit (as modified) requires both a monthly average and daily maximum flow limitation of 4.1 MGD for Outfall 003. In the 1992 permit modification, the permitted flow for Outfall 003 was raised to 4.1 MGD to account for the possible amount of 0.9 MGD of screen wash water that would come from potable Station Fire water. This water shall be used only under emergency conditions when traveling screen operation is impeded by the accumulation of algae or other biological material and when approved by the NRC.

Review of DMR data reveals that these limits have not been exceeded on any occasion, as neither monthly average nor daily maximum flow has exceeded 4.1 MGD. This flow limit of 4.1 MGD is based on the capacity of the booster pumps on 2 of the 5 service water bay pumps (1,100 gpm each for 24 hours per day, or 3.2 MGD) as well as 0.9 MGD for emergency fire water (at 500 gpm), which equals 4.1 MGD. The draft permit continues this flow limitation.

In its 1999 letter (Administrative Record (AR) #81), the permittee requested that flow be a monitor only parameter for this outfall, noting that this flow is intermittent. Although the total daily flow of 4.1 MGD may not be exceeded, this flow rate may be experienced if the permittee uses the fire water for screen wash water. Therefore, this limit has been maintained in the draft permit.

6.3.2 pH

The current permit requires that the pH of this discharge shall not vary more than 0.5 s.u. from the intake.

The Steam Electric Power ELGs (40 C.F.R. Part 423) require that the pH of all discharges, except once through cooling water, shall be in the range of 6.0 – 9.0 SU. The Massachusetts Water Quality Standards (WQS) (314 CMR 4.05(4)(a)(3)) require that for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range. The draft permit limits pH to a range of 6.5 to 8.5 standard units and not more than 0.2 standard units outside of the natural background range to be consistent with the State WQS.

6.3.3 Total Residual Oxidants (TRO)

The current permit, as modified, requires that the screen wash water, with the exception of Station Fire water, shall be dechlorinated when in use and that the wash water shall contain no detectable TRO. The current permit does not, however, require that the permittee monitor TRO. To ensure that the screen wash water does not contain detectable levels of TRO, the draft permit requires monitoring of TRO once per month.

6.3.4 Temperature

The current permit requires that the temperature of the discharge shall at no time exceed the temperature of the intake water used for this discharge. The permittee has requested removal of this condition, since the process of screen washing does not add heat to the wash water. By removing the condition entirely, however, the draft permit would be less stringent than the current permit, which would not be consistent with anti-backsliding requirements at CWA § 402(o), 33 U.S.C. § 1342(o), and 40 C.F.R. § 122.44(*l*)(1). Part I.A.3.a. of the draft permit requires that the water used for screenwashing shall not have been used for any cooling purpose at the facility.

6.4 Stormwater Outfalls (004, 005, 006, 007, and 013)

Outfalls 004, 005, 006, and 007 discharge untreated stormwater. In addition to stormwater, Outfall 005 also discharges a portion of the flows from Outfall 011 (and rarely, emergency discharge from the heating boiler blowdown via a floor drain), and Outfall 006 discharges water from fire water storage tanks (municipal water). Outfalls 004 and 005 discharge to the discharge canal and Outfalls 006 and 007 discharge to the intake embayment. As described in Section 6.7 below, the permittee is rerouting a portion of the Outfall 011 flows directly to the discharge canal at times, thereby bypassing Outfall 005 as its connection point to the discharge canal.

The 1991 permit required monitoring of these four (4) outfalls twice per year and during significant storm events, a term which was not defined in the 1991 permit. The last few years of DMR indicate very limited sampling from these outfalls.

During the 1995 permit renewal application process, a miscellaneous storm drain located at the boat launch area between storm drain outfalls 006 and 007 was identified. It drains a small portion of the facility which is similar in characteristics to the drainage areas for Outfalls 004, 005, 006, and 007, consisting mainly of roadways and other impervious surfaces. Since that notification, the permittee has installed additional security fencing and a concrete wall around portions of the perimeter of the property, including the point beyond where this storm drain discharge occurs through a conduit. The permittee reported that, at this point, the stormwater infiltrates in sandy soil prior to the intake embayment. The permittee also noted that sampling of stormwater through this storm drain is not feasible, due to its location between two security fences. (email from Joe Egan to George Papadopoulos of 2/10/16, AR#516). The permittee believes that this miscellaneous storm drain does not discharge directly to the intake embayment and that, even prior to the installation of the fencing and concrete wall, this outfall was only expected to discharge to the intake embayment in the event of extreme weather conditions. The draft permit recognizes and authorizes the outfall of this storm drain, designating it as Outfall 013, but establishes no monitoring requirements for this location, since the outfall is inaccessible, is not expected to discharge directly to Cape Cod Bay except under extreme storm events, and drains a relatively small area similar in character to the drainage area for Outfall 006.

The draft permit requires monthly sampling for the four stormwater outfalls. Sampling requirements have been more clearly defined in the footnotes of Part I.C.1 of the draft permit. The permittee has stated that some of its stormwater outfalls are difficult to access for monitoring purposes and that it is often unclear whether a particular storm event triggers the current monitoring requirement. (email from Joe Egan to George Papadopoulos of 8/8/14, AR# 517). Therefore, the draft permit allows for sampling of these outfalls to be conducted at the first accessible upstream manhole hydraulically connected to each stormwater outfall, if the discharge outfall at end-of-pipe is not accessible. Due to the limited stormwater sampling conducted pursuant to the current permit, the draft permit has increased the monitoring frequency for these outfalls from two per year to monthly and has provided a definition of storm events that trigger sampling requirements and a description of when stormwater sampling during such events must occur, so as to assure that more storms are eligible to be sampled.

EPA reviewed the 2015 Multi-Sector General Permit's (MSGP) provisions for "Industrial Sector O, Steam Electric Generating Facilities" to determine whether there are any applicable monitoring requirements or other conditions for these stormwater discharges. The only applicable condition is a benchmark monitoring concentration of 1.0 mg/l for total iron. *See* MSGP, Part 8.O.7, *available at* http://go.usa.gov/cEMaQ. In the MSGP, pollutant benchmark concentrations are applicable to certain sectors or subsectors. Benchmark monitoring data are primarily used to determine the overall effectiveness of the control measures (BMPs) and to assist facilities in determining when additional corrective action(s) may be necessary to comply with the conditions of the MSGP. *See* MSGP, Part 6.2.1.

During the permit term, PNPS informed the Region that stormwater discharged from these outfalls includes stormwater that has accumulated in various electrical vaults on the property and that is periodically pumped out to the closest stormwater outfall in order to assure proper working condition of electrical cables and associated equipment in the vaults. The permittee indicated that the NRC requires the inspection of these vaults on a regular basis to assure that electrical equipment and wires are not submerged in water for extended periods of time. *See* United States Nuclear Regulatory Comm'n, *NRC Information Notice 2010-26: Submerged Electrical Cables* (Dec. 2, 2010). Consequently, facility personnel must routinely inspect these vaults, especially after storm events. PNPS identifies 25 electrical vaults on the property where it performs such pumping, nine (9) of which are outfitted with automated pumps, which are activated when waters reach a pre-determined level.

In order to assess the constituents of the water in these vaults, EPA sent PNPS a CWA Section 308 letter on March 24, 2015 requiring water sampling from seven (7) of the electrical vaults on the property for a variety of pollutants that could possibly be found. The results of this sampling, which were submitted with a letter of June 30, 2015 by PNPS, found that the sampled pollutants were either often not detected or detected at low levels. TSS was detected in two (2) of the vaults at 4.4 and 4.8 mg/l. Cyanide was detected in one vault at an estimated concentration of 5.3 ug/l. Total phenols and phthalates were detected in four (4) vaults and polychlorinated biphenyls (PCBs) were detected in one vault. Among the metals sampling, antimony, iron, copper, zinc, lead, nickel, cadmium, and hexavalent chromium were detected in 1 or more vaults. When comparing these results to the marine water quality criteria, it was found that the lead samples exceeded the chronic criterion of 8.1 ug/l on five (5) occasions, the chronic and acute criteria for copper of 3.1 ug/l and 4.8 ug/l, respectively, were exceeded three (3) times each, and the chronic and acute criteria for zinc of 81 ug/l and 90 ug/l, respectively, were also exceeded three (3) times each.

Based on the results of this sampling, the draft permit establishes regular monitoring requirements to assess the need for effluent limitations. Although some of the parameter values were above water quality criteria levels, this does not take into account the dilution that would be present when these discharges mix with the cooling water flows and other stormwater flows as they get discharged to Cape Cod Bay. In the draft permit, quarterly monitoring is required for water that has collected in five (5) separate electrical vaults, which are spread throughout the property and considered representative of the discharges from the twenty five (25) electrical vaults. Since each of these 5 vaults discharge to a nearby, permitted stormwater outfall, they have been designated as internal outfalls and numbered 004A, 005A, 005B, 007A and 007B, reflecting the stormwater outfall to which they are discharged. This sampling is required quarterly and does not need to be conducted during wet weather, since the addition of the water from the vaults can occur in wet or dry conditions. The parameters to be sampled include TSS, total phenols, total PCBs, total phthalates, total cadmium, total copper, total iron, total lead, total zinc, and pH. This parameter listing reflects those that were detected in at least one (1) of the vaults.

In addition, the draft permit establishes a one-time sampling requirement for all of the electrical vaults which were not sampled for the March 2015 Section 308(a) letter. These samples shall be analyzed for the same parameters which were required by that letter and listed in Permit

Attachment C. EPA believes that a characterization of water collected in all of the vaults is warranted because these vaults are located throughout the property and the initial sampling showed the presence of several pollutants.

6.4.1 Flow

The current permit does not require reporting of flow from Outfalls 004, 005, 006, and 007. On its permit reapplication, the permittee reported the following flows through these storm water outfalls based on a gallons per minute (GPM) peak runoff rate for a ten (10) year storm of 1.5 inches per hour for one (1) hour: Outfall 004 = 2,379 GPM, Outfall 005 = 1,212 GPM, Outfall 006 = 812 GPM, and Outfall 007 = 5,819 GPM.

Although the 1991 permit listed flow as a parameter, it did not specify any monitoring frequency or limits for flow. The draft permit requires the permittee to estimate stormwater discharges from all outfalls associated with the storm events which are sampled.

The draft permit requires the permittee to estimate the discharge through Outfall 005 without the contribution of flow from Outfall 011, which is monitored separately. As noted in Section 6.7 below, the permittee has redirected Outfall 011 flows directly to the discharge canal. The draft permit also requires the permittee to estimate the flow from Outfall 006 without the contribution of flow from the fire water storage tanks. For a month when there is flow from the fire water storage tanks to Outfall 006, the permittee shall estimate this flow and report it in an attachment to the DMR.

6.4.2 Total Suspended Solids (TSS)

Massachusetts WQS at 314 CMR 4.05(4)(a)(5) require that waters "shall be free from floating, suspended and settleable solids in concentrations or combinations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom." The current permit includes monthly average and daily maximum TSS limits of 30 mg/l and 100 mg/l, respectively, at Outfalls 004, 005, 006, and 007, measured twice per year. These limits were based on BPJ. Review of DMR data reveals that these limits have been exceeded on a few occasions.

Due to the lack of recent stormwater sampling data, EPA looked back to the period from 1998 to 2007, when more frequent stormwater sampling and analysis was conducted. At Outfall 004, the reported TSS concentration for this period ranged from 0.8 – 10.7 mg/l. At Outfall 005, the TSS concentration ranged from 1.0 – 133.3 mg/l; the monthly average concentration was exceeded on four occasions and the daily maximum concentration was exceeded once. At Outfall 006, the TSS concentration ranged from 0.8 – 30.4 mg/l; the monthly average concentration was exceeded on one occasion. At Outfall 007, the TSS concentration ranged from 1.3 – 100.3 mg/l, with three exceedances of the monthly average limit and one exceedance of the daily maximum limit.

To ensure that the narrative WQS for solids is maintained, the draft permit includes the TSS limits of 30 mg/l monthly average and 100 mg/l daily maximum from the current permit. Inclusion of these numeric, water quality-based limits is also consistent with anti-backsliding provisions of 40 C.F.R. § 122.44(*l*)(1). Due to the exceedences measured under the current permit and the lack of sampling data over roughly the last 10 years, the sampling frequency has been increased to quarterly, to more accurately characterize the discharges through these outfalls. Samples shall be taken during the first flush of wet weather, defined as during the first hour of the start a storm event greater than 0.1 inches in magnitude that occurs at least 24 hours from the previously measurable (greater than 0.1inch rain fall) storm event. If this is not feasible, then sampling shall be conducted as soon as possible after the first hour and the permittee shall provide a brief explanation of why a first flush sample was not taken. The permittee has noted that some required stormwater sampling over the last few years was not conducted due to the difficulty in accessing stormwater outfalls (email from Joe Egan to George P of 8/8/14). Therefore, the draft permit allows for sampling to be conducted in a manhole hydraulically connected to a particular stormwater outfall, if feasible and in particular if more easily accessible than the actual outfall during a storm event.

6.4.3 Oil and Grease (O&G)

The current permit includes a daily maximum O&G limitation of 15 mg/l, measured twice per year, at Outfalls 004, 005, 006, and 007.

Massachusetts WQS at 314 CMR 4.05(4)(a)(7) provide that SA waters “shall be free from oil and grease and petrochemicals,” which EPA and MassDEP interpret as requiring no detection of oil and grease in SA waters. DMR data indicate, however, that O&G has ranged from non-detect (ND) – 6.5 mg/l at Outfall 004, from ND – 10.0 mg/l at Outfall 005, from ND – 5.3 mg/l at Outfall 006, and from ND – 13.0 mg/l at Outfall 007 during the monitoring period. All four of these stormwater outfalls discharge directly to SA waters of Cape Cod Bay and prior monitoring data reveal that O&G is or may be discharged at levels that will cause, have the reasonable potential to cause, or contribute to an excursion above the water quality standard, which, as noted above, provides that SA waters “shall be free from oil and grease and petrochemicals.” Therefore, the draft permit establishes a daily maximum O&G limitation of non-detect for Outfalls 004, 005, 006 and 007. The draft permit specifies a test method that shall be used to analyze for O&G, and the minimum level (ML) of detection for this method of 5 mg/l will be the level at which compliance with this limit is determined. Essentially, to be in compliance with this limit, samples must be non-detect for O&G using the test method specified in the draft permit. In addition, the draft permit has established an O&G monitoring requirement at Outfall 001 which is monitored below the foot bridge over the discharge canal, to assure that O&G is not detected at the point of discharge to Cape Cod Bay. These conditions will ensure that WQS in the receiving water are satisfied.

Samples must be taken during the first flush of wet weather, as defined above and in the permit. In addition to the numeric maximum daily limits for O&G, the Storm Water Pollution Prevention Plan (SWPPP) includes best management practices (BMPs) to address potential contributions of O&G (see discussion in Section 9, below). In its SWPPP, the permittee must describe measures it will take to assure that any sources of oil and grease in all areas contributing to these outfalls are identified and minimized.

6.4.4 pH

The current permit requires that the pH shall not be less than 6.0 standard units nor greater than 8.5 standard units or not more than 0.2 standard units outside the naturally occurring range. This permit requirement did not require monitoring and reporting of the effluent pH, therefore no pH data is available. The current permit limit range is slightly less stringent than the Massachusetts WQS, 314 CMR 4.05(4)(a)(3), which require that for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range.

The draft permit limits pH to a range of 6.0 to 8.5 standard units (SU) and not more than 0.2 SU outside of the natural background range for Outfalls 004, 005, 006, and 007. Although the lower end of the pH range is below that of the MA WQS limit of 6.5 s.u., the dilution available to these discharges is such that the range of 6.5 to 8.5 s.u. is expected to be met instream. Inclusion of these limits is consistent with anti-backsliding provisions at 40 C.F.R. 122.44(*l*)(1). Samples shall be taken during the first flush of wet weather, as defined above and in the permit.

6.5 Outfall 008

The modification to the current permit, which was effective in August of 1994, authorized the discharge of untreated sea foam suppression water from Outfall 008. Entergy informed EPA that sea foam suppression water was not used during the current permit period and will not be used in the future. (PNPS Trip Report, 1/24/2013, AR# 518). Accordingly, discharge of sea foam suppression water and use of Outfall 008 is not authorized by the draft permit.

6.6 Outfall 010

Outfall 010 discharges plant service non-contact cooling water [Salt Service Water (SSW) System] which undergoes continuous chlorination with sodium hypochlorite. Water for the SSW system is withdrawn from Cape Cod Bay through the CWIS. Service water is the ultimate heat sink for critical nuclear cooling systems within the plant, including the turbine building closed-cycle cooling water (TBCCW) system and the reactor building closed-cycle cooling water (RBCCW) system. Both the SSW and RBCCW systems are safety related and are subject to U.S. NRC regulatory requirements. The discharge through Outfall 010 is classified as a low volume waste source pursuant to 40 C.F.R. § 423.11.

Outfall 010 is sampled downstream of the heat exchangers, via grab sample valves. Outfall 010, discharges into the discharge canal and combines with once-through cooling water from the main condensers (Outfall 001). The SSW system is not chlorinated during refueling outages because the CW pumps are shut down and there is not adequate dilution to allow continuous release of effluent water with detectable residual chlorine from the SSW system into Cape Cod Bay.

6.6.1 Flow

The current permit includes a monthly average flow limitation of 19.4 MGD, which may be estimated from pump capacity curves and approximate time of discharge. Review of DMR data reveals that the flow limitation has not been exceeded on any occasion, with the highest recorded flow of 14.5 MGD during the monitoring period. This flow limitation is based on 5 pumps operating at 2,700 gpm each, discharging continuously (24 hours/day). However, the permittee typically operates a maximum of 4 of the 5 pumps at a time under most conditions. The draft permit includes a monthly average flow limitation of 19.4 MGD and a daily maximum flow of 19.4 MGD, reflecting the actual capacity of the 5 SSW pumps.

The current permit requires that the discharge through Outfall 010 be sampled "at the heat exchanger before this stream mixes with any other stream going to the discharge." According to the permittee, the current sampling location is via grab sample valves downstream of the heat exchangers but prior to being discharged to the discharge canal where it mixes with other flows. The draft permit requires that samples be taken at a representative location of the discharge exiting from the heat exchangers and prior to mixing with any other flows.

After shutdown, the flow limits for Outfall 010 shown in Part I.B.2 of the permit reflect the reduced use of intake water for the SSW. These limits, which will take effect no later than June 1, 2019, will be a monthly average limit of 7.8 MGD and a daily maximum limit 15.6 MGD. The monthly average limit is based on the permittee's expected use of up to two (2) SSW pumps for the majority of time post-shutdown for safety and reliability purposes. The daily maximum limit of 15.6 MGD represents the capacity for 4 of the 5 SSW pumps, which may be needed under some scenarios. (Joe Egan phone call of 12/21/15)

6.6.2 Total Suspended Solids (TSS)

The current permit does not include TSS requirements for this outfall. The discharge through Outfall 010, however, is classified as a low volume waste source pursuant to the ELGs, meaning that the technology-based limits for TSS in the ELGs are applicable to this discharge. Therefore, the draft permit has established the technology-based numeric limits for low volume waste in the ELGs at Outfall 010, including a daily maximum TSS concentration of 100 mg/l and a monthly average TSS concentration of 30 mg/l.

6.6.3 Oil and Grease (O&G)

The current permit does not include O&G requirements for this outfall. As stated above, since this discharge is classified as a low volume waste source pursuant to the ELGs, technology-based limits for O&G in the ELGs are applicable to this discharge. The draft permit applies the limits in the ELGs for low volume waste, including a daily maximum O&G concentration of 20 mg/l and a monthly average O&G concentration of 15 mg/l. As noted in Section 6.1.5 above, the draft permit also establishes a monitoring requirement for O&G at Outfall 001 for pre and post-shutdown conditions to provide data to enable the agencies to assess whether there are detectable levels of O&G at a point after which the discharges from all of the outfalls to the discharge canal have combined.

6.6.4 pH

The current permit does not include monitoring requirements for pH. The Steam Electric ELGs require that the pH of all discharges, except once through cooling water, shall be within the range of 6.0 – 9.0 SU. The Massachusetts Water Quality Standards (WQS) [314 CMR 4.05(4)(a)(3)] require that for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range. The draft permit includes a technology-based numeric pH range of 6.0 to 9.0 standard units consistent with the Steam Electric ELG. This range is less stringent than the range required for discharges to Class SA waters of 6.5 to 8.5 s.u. However, as discussed in Section 6.1.2 above, the draft permit requires that the discharge at Outfall 001, which is sampled at a point after commingling with Outfall 010, among others, has the pH range required for Class SA waters, that is, 6.5 to 8.5 s.u.

6.6.5 Total Residual Oxidants (TRO)

The current permit allows use of continuous chlorination of SW system cooling water for macroinvertebrate control. The ELGs prohibit chlorination for more than two hours per day unless the permittee can demonstrate that such discharge is required for macroinvertebrate control. PNPS had previously demonstrated that macroinvertebrate fouling occurs in the SSW System and that continuous chlorination of the SSW system is required to be in conformance with the U.S. NRC Generic Letter 89-13. As detailed in the fact sheet of the 1991 permit, the permittee demonstrated that, with a daily maximum TRO concentration of 1.0 mg/l for the SSW system, the maximum TRO concentration after the SSW mixes with the condenser cooling water would be 0.04 mg/l at the end of the discharge canal. For these reasons, the draft permit authorizes continuous chlorination of the SSW system.

The current permit requires a monthly average and daily maximum TRO limitation of 0.5 mg/L and 1.0 mg/L, respectively, monitored continuously and prior to mixing with the condenser cooling water discharge through Outfall 001, or any other flows. The permittee has determined these levels are necessary for adequate macroinvertebrate control in its cooling equipment. The current permit also allows the permittee to submit manual grab samples taken four times per day in lieu of the continuous monitoring data if the continuous TRO monitoring equipment should become inoperative.

Review of DMR data reveals that daily maximum TRO, in the form of TRC, has been exceeded on five (5) occasions, with a highest recorded daily maximum TRO concentration of 2.4 mg/L. The monthly average TRO effluent limitation has not been exceeded on any occasion. The draft permit continues to require a monthly average TRO limit of 0.50 mg/l and a daily maximum limit of 1.0 mg/l at Outfall 010 until the shutdown occurs.

Post-shutdown, the condenser cooling water flow on which the original demonstration for these TRO limits was based will be terminated, with the exception of flows from one of the two CW pumps which may be operated up to 5% of the time The draft permit will set WQB limits for total residual oxidants (TRO) based on WQC for total residual chlorine (TRC) as explained in Section 6.1.3 above. The chronic and acute, marine water quality criteria for TRC are 7.5 ug/l and 13 ug/l, respectively. End-of-pipe TRC limits would typically be calculated by multiplying the water quality criteria by the dilution available to the discharge. To EPA's knowledge, there has not been any prior hydrodynamic modeling conducted that would provide an estimate of dilution for the discharge from the discharge canal. In addition, the permittee may choose to demonstrate to EPA and the MassDEP that discharge of TRC levels above criteria are required for macroinvertebrate control post-shutdown and shall include any dilution estimates based on an acceptable dilution model of Cape Cod Bay in the vicinity of the discharge. EPA and MassDEP would consider whether to establish less stringent limits for TRO based on review of any such demonstration.

6.6.6 Temperature

The current permit did not establish any temperature limits for Outfall 010. Effluent temperature and delta T limits that were established for Outfall 001, which comprised more than 95% of the flow in the discharge canal, the rest being the continuous flow from Outfall 010 in addition to other flows which were intermittent. As noted earlier, the condenser cooling water flow will terminate from the shutdown and beyond, with only one CW pump that must be operated for up to 5% of the time to support decommissioning activities. (See Joe Egan email of 10/28/15, AR#519) Therefore, it is necessary to establish temperature limits for Outfall 010, which will be the sole continuous remaining discharge in the discharge canal post-shutdown. Although some of the flows through the SW system are cooling water, the permittee believes that a delta T of no greater than 3°F would be expected. (See Joe Egan email of 10/28/15, AR #519). The draft permit has established effluent temperature limits at a maximum daily limit of 85°F and a monthly average of 80°F, which are the temperature limits consistent with the MA SQWS for Class SA waters. *See* 314 CMR 4.05(4)(a)(2)(a). In addition, there has been delta T limit of a maximum daily of 3°F, as discussed in Section 6.1.4 above.

6.7 Outfall 011 and new Outfall 014

Outfall 011 is an internal outfall which is sampled prior to commingling with any flow at Outfall 005, a storm drain, which ultimately is routed to the discharge canal. Discharges through Outfall 011 are intermittent, batch discharges directly from the "waste neutralizing sump" or from other source(s). Water released from Outfall 011 may be radiologically contaminated, in which case it would be coming from the waste neutralizing sump. Otherwise, it would originate from what is characterized as a "clean" system (e.g., demineralized water, service water, or station heating water).

The station heating system utilizes demineralized water that is discharged during heating system outages, which occur 1-2 times per year. Tolyltriazole and sodium nitrite are added as corrosion inhibitors to the TBCCW, RBCCW, and station heating systems.

The discharge from the demineralizer system consists of reject water, which is purified city water which does not meet the requirements of the condenser makeup water. This water is pumped from the demineralizer to the demineralizer storage tank, which is used as makeup water for several plant systems (condensate/feedwater, closed cooling water, station cooling water, station heating system, etc.) as dictated by inventory requirements.

Discharges from the waste neutralizing sump consist of drainage from heat exchanger process water [turbine building closed-cycle cooling water (TBCCW) system and the reactor building closed-cycle cooling water (RBCCW) system], station heating system water, drainage from the floor drains in the boiler room (station heating water), various sumps throughout the building (service water system chlorinated salt water), and reject water from the emergency standby liquid control system. This reject water is from the demineralizer, with sodium pentaborate added and which does not meet the plant's technical specifications.

Due to detected levels of tritium in groundwater samples in the vicinity of Outfall 005, the permittee conducted an investigation to determine its source and concluded that water from the waste neutralizing sump that was being discharged through the storm drain at Outfall 005 was the likely source of this tritium. The permittee believes that the storm drain associated with Outfall 005 is not watertight and leaks water from the Outfall 011 discharges. In order to avoid groundwater contamination from this discharge through this storm drain, the permittee has rerouted the flow from the waste neutralizing sump only, directly to the discharge canal with a hose, thereby bypassing the storm drain associated with Outfall 005 (See Figure 4). Since this is a discrete outfall to the discharge canal, it has been designated in this permit as a new Outfall, #014. The other discharges from Outfall 011, including demineralized water, service water, and station heating water will not need to bypass the storm drain and will continue to be discharged through the storm drain at Outfall 005. (12/17/15 email from J. Egan to G. Papadopoulos)

The low level radioactive effluent associated with Outfalls 011 and 014 shall continue to meet all the Nuclear Regulatory Commission (NRC) requirements as specified in 10 C.F.R. Part 20. These limits are detailed in the PNPS Technical Specifications which define facility operational conditions. EPA and the NRC, in the past, have signed a Memorandum of Understanding (MOU) which specifies that EPA will be responsible for the water quality aspects of the discharge in concert with the State, and the NRC will be responsible for the levels of radioactivity in the discharge. Thus, the draft permit addresses only the chemical aspects of water quality and does not regulate radioactive materials encompassed within the Atomic Energy Act's definitions of source, byproduct, or special nuclear materials. *See Train v. Colorado Public Interest Research Group*, 426 U.S. 1, 25 (1976) (holding that "the 'pollutants' subject to regulation under the [CWA] do not include source, byproduct, and special nuclear material."). All NRC radioactive discharge requirements will continue to be in effect, as required, in 10 C.F.R. Part 20 and plant technical specifications.

The current permit (at Part I.A.1.n) allows discharge of sodium nitrite (corrosion inhibitor) from the closed loop cooling water systems and heating systems through Outfall 011 and new outfall 014. In its letter to EPA dated May 22, 1995, the permittee requested that Tolyltriazole (a corrosion inhibitor) be added to the station heating, RBCCW, and TBCCW systems. These flows discharge through Outfalls 011 and 014 only during scheduled plant outages.

The discharges through Outfalls 011 and 014 are classified as low volume waste sources pursuant to the Steam Electric ELGs at 40 C.F.R. §423.11. As noted above, Outfall 011 is an internal outfall, because the point of discharge to the receiving water is at Outfall 005. Applying limits at Outfall 011 is consistent with 40 C.F.R. § 122.45(h), which allows for such limits when the wastes associated with the internal outfall may be so diluted as to make monitoring at the point of discharge (Outfall 005) impracticable. In this case, certain pollutants expected to be present in the discharge from Outfall 011, including tolyltriazole, sodium nitrite, and boron, could, depending on the storm event, be so diluted by the stormwater discharge from Outfall 005 as to make monitoring at Outfall 005 impracticable. Moreover, the draft permit requires monitoring at Outfall 005 during the first flush of wet weather of triggering storm events, whereas discharges from Outfall 011 are generally independent of storm events.

6.7.1 Flow

The current permit requires monthly average and daily maximum flow limitations of 0.015 MGD and 0.06 MGD, respectively, for Outfall 011. Review of DMR data indicates that these effluent limitations have not been exceeded. The highest monthly average flow recorded was 0.0104 MGD and the highest daily maximum flow recorded was 0.0122 MGD.

The permittee requested removal of the flow limits at Outfall 011, however, the limits have been retained based on anti-backsliding requirements. The discharges through Outfalls 011 and 014 are expected to meet these flow limits, since they have been consistently met in the past under the current permit. Flow is required to be measured at these outfalls prior to combining with any other wastewater or with stormwater that drains to Outfall 005.

6.7.2 Total Suspended Solids (TSS)

The current permit requires monthly average and daily maximum TSS limitations of 30 mg/l and 100 mg/l, respectively. Review of DMR data from 2008 through 2014 indicates that these effluent limitations have not been exceeded, with a maximum concentration of 26.4 mg/l.

The discharges through Outfalls 011 and 014 include low volume waste sources pursuant to the Steam Electric ELGs 40 C.F.R. § 423.12, which requires effluent limitations for TSS of 100 mg/l as a maximum and 30 mg/l as an average. Therefore, the draft permit includes an average monthly TSS limit of 30 mg/L and a maximum daily TSS limit of 100 mg/L consistent with the ELGs requirement for low volume waste sources. The monitoring frequency at Outfall 011 remains at once per month but Outfall 014 is required to be sampled whenever it discharges because this discharge is expected to occur less frequently than Outfall 011.

6.7.3 Oil & Grease

The current permit does not include oil and grease (O&G) limitations at Outfall 011. However, since this discharge is classified as a low volume waste source, it must meet effluent limitations for O&G of 20 mg/l as a maximum and 15 mg/l as an average, pursuant to 40 C.F.R. § 423.12.

Therefore, the draft permit establishes a maximum daily O&G limit of 20 mg/l and an average monthly limit of 15 mg/l at Outfall 011 (monthly), as well as Outfall 014 (quarterly, when discharging).

6.7.4 pH

The current permit requires that the discharge through Outfall 011 shall not be less than 6.1 standard units nor greater than 8.4 standards units. The current permit did not specify any monitoring frequency or reporting requirements for effluent pH for this outfall, therefore no pH data are available.

The current permit limit is slightly more stringent than the NELG requirement for low volume wastes (40 C.F.R. § 423.12) that require the pH of all discharges, except once through cooling water, shall be within the range of 6.0 – 9.0 SU. The State WQS (314 CMR 4.05(4)(a)(3)) require that for Class SA waters, the pH of the receiving water shall be in the range of 6.5 through 8.5 standard units and not more than 0.2 standard units outside of the natural background range. A water quality-based pH limitation would be more stringent than the technology-based effluent limitation. In this case, however, Outfall 011 is an internal, low volume waste stream that combines with stormwater at Outfall 005 prior to reaching the receiving water through the discharge canal. The only exception is water from the waste neutralization sump, which as noted above, is discharged directly to the discharge canal through new Outfall 014. The draft permit establishes a water quality-based pH limitation at Outfall 001 downstream of where Outfalls 005 and 011 merge and prior to discharging to Cape Cod Bay that will ensure the effluent meets WQS. Therefore, the draft permit maintains the limit for pH ranging from 6.1 to 8.4 at these outfalls. This permit limit range is slightly less stringent than the WQS (but which will be met prior to discharging to the receiving water) but more stringent than the technology-based limits in the Steam Electric ELGs. EPA is carrying forward the pH limit from the current permit consistent with the anti-backsliding regulations at 40 C.F.R. § 122.44(*l*)(1) which require a re-issued permit to establish limits at least as stringent as the current permit with limited exceptions, none of which apply to the pH limit in this case.

6.7.5 Sodium nitrite

PNPS uses sodium nitrite as a corrosion inhibitor in its TBCCW, RBCCW, and station heating systems. The current permit (at Part I.A.1.n) limited the discharge of sodium nitrite as it mixed with the Outfall 001 effluent in the discharge channel, to a concentration of 2.0 mg/L, by calculation. These discharges are generally associated with periods of maintenance, modifications, or equipment repair.

The permittee is required to monitor the discharge through Outfalls 011 (monthly) and 014 (quarterly, when discharging) for sodium nitrite and provide the calculated concentration in the discharge canal upon mixing with the cooling water discharges of Outfalls 001 and 010, as described below, to assure that the sodium nitrite limit of 2.0 mg/l is not exceeded. To calculate the estimated concentrations of sodium nitrite in the discharge canal, the permittee shall divide the concentration of this parameter in the Outfall 011 internal discharge by the dilution factor derived by dividing the flow rate of the cooling water flow being used from the combination of CW and SSW pumps that are operating at the time of the batch discharge of these waters by the flow rate of this discharge. These discharges may be made directly to the discharge canal.

EPA's Gold Book (Quality Criteria for Water, 1986: EPA Publication No. 440/5-86-001 dated May 1, 1986) does not establish any marine water quality criteria for sodium nitrite. Rather it notes that... "In oxygenated natural waters systems, nitrite is rapidly oxidized to nitrate." The Gold Book provides no marine organism toxicity data or stream criteria for nitrites, but does indicate that a nitrite nitrogen level at or below 5 mg/L should be protective of most warm water fish. Therefore, the current permit established a maximum daily concentration of 2.0 mg/L nitrite as calculated in the discharge canal, based on the reported rapid reaction of nitrite to nitrate in oxygenated waters and the protective level of 5.0 mg/L for warm water species.

6.7.6 Copper

EPA's National Recommended Water Quality Criteria for Saltwater include a CMC (acute) copper concentration of 4.8 ug/L and a CCC (chronic) copper concentration of 3.1 ug/L. The permit application submitted by the permittee indicated a copper concentration at Outfall 011 of 49.8 ug/L.

As noted, Outfalls 011 and 014 combine with the discharge from Outfall 001 in the discharge canal, where a significant amount of dilution is provided. Dilution provided from the Outfall 001 discharge is approximately 1:1,000 (using the lowest recorded monthly average flow of 65.6 MGD for Outfall 001 and the daily max flow limit at Outfall 011 of 0.06 MGD). Assuming this dilution, the concentration of copper in the discharge from Outfall 011 would be diluted from 49.8 ug/L to approximately 0.05 ug/L in the discharge canal. Post-shutdown, the worst case condition for low flow would be represented by the operation of one SSW pump. Under this scenario, the dilution available to this flow would be about 65:1, and the corresponding copper concentration would be 0.77 ug/l, assuming the same level of 49.8 ug/l at the internal location.

The estimated concentration at the discharge canal is not expected to approach the level that would cause or contribute to a WQS violation and this is based on one sampling result. Therefore, the draft permit does not require a limit or monitoring specific to copper. However, the draft permit does establish whole effluent toxicity (WET) testing requirements at Outfalls 011 and 014, described below, which includes monitoring for a suite of metals and will provide twice yearly effluent copper data.

6.7.7 Tolyltriazole

In a letter to EPA dated May 22, 1995 (AR #164), the permittee requested the authorization to use tolyltriazole (a corrosion inhibitor) as an additive to its station heating, RBCCW, and TBCCW systems. By letter of June 30, 1995 (AR #154), EPA approved the use of tolyltriazole. Flow from Outfall 011 and 014 containing tolyltriazole would typically occur only during scheduled plant outages. Initial conditioning of the cooling systems would require a maximum tolyltriazole concentration of 20 mg/l, after which concentrations would be maintained at 2.0

mg/l. The maximum concentration would be in the neutralization sump. With one SW pump operating, a worst case condition, corresponding to a flow of 2700 gpm (3.88 MGD), the tolyltriazole concentration would be expected to be about 1.48 mg/l in the discharge canal. Below are calculations of estimated tolyltriazole concentration in the discharge canal under two scenarios using the maximum flow rate of 200 gpm out of the neutralization sump:

Dilution with 1 SW pump operating:

$$\frac{2700 \text{ gpm}}{200 \text{ gpm}} = 13.5$$

Dilution with 1 SW pump and 1 CW pump operating:

$$\frac{155{,}000 \text{ gpm} + 2700 \text{ gpm}}{200 \text{ gpm}} = 790$$

Maximum Tolyltriazole concentration after mixing in discharge canal under both scenarios:

20 mg/l tolyltriazole / 13.5 = **1.48 mg/l** 20 mg/l / 790 = **0.025 mg/l**

Therefore, the concentration of tolyltriazole under the worst case condition of one SW pump operating of 1.48 mg/l would be below the acute and chronic toxicity levels of this chemical, which is a 96 hour LC_{50} for rainbow trout of 23.7 mg/l and a 21 day LC_{50} for *Daphnia magna* of 5.8 mg/l. Based on a more typical operating scenario of one SW pump and one CW pump operating, the discharge concentration of tolyltriazole at Outfall 001 would be expected to be about 0.025 mg/l.

The draft permit includes a maximum daily limit of 1.48 mg/l of tolyltriazole at Outfalls 011 and 014. Consideration has been given to the use of multiple chemicals that combine in the effluent from these outfalls, resulting in the establishment of WET testing requirements as described below.

6.7.8 Boron

The standby liquid control (SLC) wastewater which drains to Outfall 014 via the neutralizing sump consists of reject water from the SLC system. This low volume wastewater is characterized as demineralizer water with sodium pentaborate added, containing approximately 8% boron, and is therefore discharged as reject water.

Sodium pentaborate is commonly used and discharged from most nuclear power plants in the United States. The wastewater source is boronated water used in the reactor’s main coolant system. Boron in the form of highly soluble boric acid or sodium pentaborate is added to the water surrounding the active fuel elements for neutron moderation. This boronated water and the movable control rods are used to maintain a constant power output between refueling operations. In practice, the boronated water is steadily reduced in boron content from a maximum concentration of 16,500 mg/l, after refueling, in order to maintain a suitable neutron flux.

According to EPA’s Gold Book, boron is an essential element for growth of plants but there is no evidence that it is required by animals. The maximum concentration found in 1,546 samples of river and lake waters from various parts of the United States was 5.0 mg/L; the mean value was 0.1 mg/L (Kopp and Kroner, 1967). Groundwaters could contain substantially higher concentrations in certain locations. The concentration in seawater was reported as 4.5 mg/L in the form of borate (NAS, 1974). Naturally occurring concentrations of boron should have no effects on aquatic life.

According to Ambient Water Quality Guidelines for Boron, 1992, Province of British Columbia, Canada (S.A. Moss, N.K. Nagpal):

> Many jurisdictions have not set boron guidelines for the protection of marine aquatic life. According to the EPA (1988), Guam, the Mariana Islands and Trust Territories have set criteria for the protection of marine aquatic life at 5.0 mg/L. Puerto Rico has set the guideline at 4.8 mg/L for coastal waters for use in propagation, maintenance and preservation of desirable marine species.
>
> Taylor et al. (1985) studied the effects of boron on *Limanda limanda* (Dab) and found a 24h-LC_{50} concentration of 88.3 mg B/L. Thompson et al. (1976) performed static renewal studies using seawater and sodium metaborate on underyearling and alevin coho salmon (*Oncorhynchus kisutch*) (1.8-3.8 g in weight). This study was performed on the west coast of British Columbia. They found the 96h-LC_{50} was 40.0 mg B/L and the 283h-LC_{50} was 12.2 mg/L. Hamilton and Buhl (1990) conducted static acute toxicity tests on coho salmon in brackish water using boric acid to find the 24h-LC_{50} at greater than 1,000 mg B/L and the 96h-LC_{50} at 600 mg B/L. They found similar results when tests on chinook salmon (*O. tshawytscha*) were performed. Studies performed on coho salmon by British Columbia MELP found a 96h-LC_{50} of 122.6 mg/L (MELP, 1996).
>
> It was recommended that the maximum concentration of boron for the protection of marine aquatic life should not exceed 1.2 mg B/L. This guideline was based on study by Thompson noted above that found the most sensitive species was coho salmon (*Oncorhynchus kisutch*), with a 283h-LC_{50} of 12.2 mg B/L. A safety factor of 0.1 was used to derive the guideline (1.2 mg/l) in the marine environment.

Marine waters normally contain a natural background concentration of boron of about 4.6 mg/l. The current permit limits the concentration of boron in the discharge to the discharge canal to 1.0 mg/l above the natural background concentration, to be shown by calculation. According to the permittee, sodium pentaborate may be discharged in 20,000 gallon batches at a maximum concentration of 16,500 mg/l calculated as boron. The boron concentration shall not exceed 1.0 mg/l, by calculation, above background in the discharge from the discharge canal, with the assumption that background concentration is 4.6 mg/l. Therefore, the actual effluent limit will be 5.6 mg/l. Sufficient water from a combination of CW and SW pumps must be available during each sodium pentaborate release to ensure adequate dilution prior to discharge. Each release of boron will be reported in the appropriate DMR providing the concentration of boron in the tank before release, and the calculated boron concentration in the discharge canal before mixing with Cape Cod Bay water. In addition, at the time of discharge, the permittee must sample the ambient water and analyze it for boron to confirm that the background levels are approximately 4.6 mg/l.

6.7.9 Whole Effluent Toxicity (WET) Testing

EPA's Technical Support Document for Water Quality-Based Toxics Control, March 1991, EPA/505/2-90-001, recommends using an "integrated strategy" containing both pollutant-specific (chemical) approaches and whole effluent (biological) toxicity approaches to better control toxics in effluent discharges. Pollutant-specific approaches, such as those in EPA's Gold Book (ambient water quality criteria) and state regulations, address individual pollutants, whereas whole effluent toxicity (WET) approaches evaluate, in effect, interactions between pollutants, i.e., the "additive," "antagonistic" and/or "synergistic" effects of combinations of pollutants. In addition, WET analyses can reveal the presence of an unknown toxic pollutant. Region I adopted this "integrated strategy" on July 1, 1991, for use in permit development.

Section 101(a)(3) of the CWA states a nation goal of prohibiting the discharge of toxic pollutants in toxic amounts. The Massachusetts SWQS, in effect, prohibit such discharges, by stating that "all surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife." 314 CMR 4.05(5)(e). The NPDES regulations at 40 C.F.R. § 122.44(d)(1)(v) require whole effluent toxicity (WET) limits in a permit when the permitting authority determines that a discharge causes, has the "reasonable potential" to cause, or contributes to an instream excursion above the State's narrative criterion for toxicity.

Sections 402(a)(2) and 308(a) of the CWA authorize EPA to establish toxicity testing requirements and toxicity-based permit limits in NPDES permits. Section 308 specifically states that biological monitoring methods may be required when needed to carry out the objectives of the Act. Under certain narrative State water quality standards and Sections 301, 303, and 402 of the CWA, EPA and the States may establish toxicity-based limits to implement the narrative "no toxics in toxic amounts" criterion.

The regulations at 40 C.F.R. § 122.44(d)(ii) state that:

> [w]hen determining whether a discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above a narrative or numeric criteria within a State water quality standard, the permitting authority shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water.

The complexity of the wastewater from various sources associated with Outfalls 011 and 014 is such that whole effluent toxicity testing is required to identify, evaluate and address any potential water quality impacts. There are limited data on the individual chemical characteristics of waste streams discharging to internal Outfalls 011 and 014. These discharges are likely to be variable in quality and could potentially contain metals and other pollutants that individually could be toxic to aquatic life. However, it is not possible based on current information to determine whether or not the combination of these pollutants, and their subsequent dilution with other internal streams, would result in toxic effects upon discharge. WET testing is conducted to assess whether an effluent contains a combination of pollutants which produces toxic effects. WET testing and WET limits are used in conjunction with pollutant specific effluent limits to control the discharge of toxic pollutants.

EPA has included a WET testing requirement in the Draft Permit for Outfalls 011 and 014, in addition to the chemical-specific limitations described above, to assess the effects of the combination of pollutants on aquatic life. This approach is consistent with that recommended in *Technical Support Document for Water Quality-based Toxics Control*, March 1991, EPA/505/2-90-001, p. 60. The permittee shall report the results of acute WET tests twice per year using the Mysid shrimp, *Americamysis bahia* and the Inland Silverside *Menidia beryllina*. A 24-hour composite sample is the required "sample type" for WET testing. Pursuant to EPA Region 1 policy and MassDEP's Implementation Policy for the Control of Toxic Pollutants in Surface Waters (February 23, 1990), discharges having a dilution ratio of greater than 100:1 require acute toxicity testing two times per year. With two or more SSW pumps operating, the dilution factor is about 130 for this discharge.

If the WET tests indicate toxicity, the Regional Administrator and the Commissioner may decide to modify the permit. Any such modifications may include the addition of WET limits and/or additional pollutant limits to adequately protect receiving water quality during the remainder of the permit term. WET test results under the new permit will be considered "new information not available at the time of permit development." Therefore, the permitting authority would be allowed to use this information as a potential basis for modifying the existing permit. *See* 40 C.F.R. § 122.62(a)(2).

6.8 Additional Permit Conditions

6.8.1 Radiological Wastewater ("radwaste") Effluents

The discharge of radiological waste water ("Radwaste Effluents") directly into the discharge canal occurs via a diffuser pipe submerged at the upstream (proximal) end of the canal, adjacent to the discharge structure. It consists of demineralized water contaminated with radioactive species [plant makeup water (contact cooling water)] which is normally recycled within the radwaste processing system. In the event of a discharge, it is sampled, analyzed and pumped to the diffuser pipe in the discharge canal. Radioactive materials that fall within the Atomic Energy Act's definitions of source, byproduct, or special nuclear materials are not subject to regulation under the CWA. *Train v. Colorado Public Interest Research Group*, 426 U.S. 1, 25 (1976); *see also* 40 C.F.R. § 122.2 (defining "pollutant"). Thus, the NRC, not EPA, regulates this discharge, which typically occurs 1-2 times per year, usually during refueling outages.

6.8.2 Groundwater

Recent studies regarding groundwater onsite have indicated low levels of tritium ranging from 1,000-3,100 picocuries/liter (pCi/L). EPA's drinking water standard for tritium is 20,000 pCi/L – the average annual amount assumed to produce a dose of 4 mrem/year. From 2007 to 2013, PNPS worked with the Massachusetts Department of Public Health (DPH) to resolve the issue, citing weekly phone calls and quarterly meetings to determine the source of contamination. The permittee has determined that the storm line draining to Outfall 005 likely is not watertight and is a source of ongoing contamination of the groundwater from the demineralizer waste associated with internal Outfall 011. See discussion for Outfalls 011 and 014 in Section 6.7 above for the remedy that the permittee is proposing to implement.

6.8.3 Gas Bubble Disease

Two occurrences of fish mortality during the spring of 1973 and 1975 prompted a study in 1986 of "gas bubble disease" (see AR#419 and discussion of available literature and PNPS studies in Attachment C to this fact sheet pp. 30-33). As a result, the current permit included a provisions at Parts I.A.2.e and I.A.2.f meant to address fish mortality caused by gas bubble disease. In its supplemental permit application letter of 12/1/99 (AR #81), the permittee has requested that the conditions in the current permit pertaining to the barrier net at the end of the discharge canal (Part I.A.2.e.) and dissolved nitrogen saturation level (Part I.A.2.f.) be deleted from the draft permit, because gas bubble disease has only been documented on two separate occasions in the 1970's. EPA has reviewed the dissolved gas saturation measurements made from 2003 to 2012. Although limited, the data indicates that dissolved nitrogen has exceeded 115% (the value representing a critical threshold for adult menhaden; see Clay, et al., 1976) once in June 2005 and once in September 2009, both collected during low tide when contact with the bottom limits the extent of the plume outside of the discharge canal.

Under the current permit, PNPS employed a fish barrier until 1995 to prevent fish from entering the discharge canal. Specifically, the barrier was intended to protect Atlantic menhaden, which are particularly vulnerable to mortality from supersaturation of dissolved nitrogen in the discharge and which experienced the mortality events in the early 1970's. Use of the barrier net was discontinued in 1995 because there had been "no evidence of any significant thermal discharge related incidents for the past several years such as Menhaden being attracted to the thermal plume, collecting outside the net, and/or attempting to gain entry into the canal itself." November 23, 1994 letter from EPA to E.T. Boulette of PNPS (AR #351).

The lack of thermal discharge related mortality events and recent dissolved gas saturation data demonstrate that gas bubble disease is unlikely to occur at the PNPS discharge and the permit conditions specific to these events are no longer necessary. Furthermore, PNPS will cease generating electricity no later than June 1, 2019, at which time the heated discharge from the main condenser will be terminated and the rise in temperature at the discharge from Outfall 001 will be a maximum of 3°F, compared to the current permit limit of 32°F. The draft permit does not include permit conditions requiring a barrier net or a maximum average dissolved nitrogen saturation level.

7.0 ANALYSIS OF THERMAL DISCHARGE LIMITS FOR OUTFALL 001

As discussed above, in developing thermal discharge limits for this permit, EPA and MassDEP must consider applicable technology-based requirements, water quality-based requirements, and the applicant's CWA § 316(a) demonstration submitted in support of its request for a § 316(a) variance. Specifically, the permittee requested an extension of its § 316(a) variance in its supplemental application letter (AR #292) that was submitted on October 25, 1995 and with its 316 demonstration report submitted in March of 2000 (AR# 233).

7.1 Technology-Based Requirements

Turning first to technology standards, the statute classifies heat as a "nonconventional" pollutant subject to BAT standards. *See* 33 U.S.C. §§ 1311(b)(2)(A) and (F), 1311(g)(4), 1314(a)(4), 1362(6). As noted above, the ELGs for the Steam Electric Power Generating Point Source Category, which are found at 40 C.F.R. Part 423, apply to PNPS because this facility meets the ELG's definition of a steam electric power plant. This definition covers facilities that, among other things, utilize a nuclear fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium. 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 thermal discharges from a facility like PNPS. Therefore, thermal discharge limits based on this technology would be substantially more stringent than the limits based on the open-cycle cooling system that characterizes PNPS' present operation. EPA has considered closed-cycle cooling in the Assessment of Cooling Water Intake Structure Technologies and Determination of Best Technology Available (Attachment D).

In setting a BAT effluent limit on a BPJ basis, EPA considers the relative capability of available technological alternatives and seeks to identify the best performing technology for reducing pollutant discharges (*i.e.,* for approaching or achieving the national goal of eliminating the discharge of pollutants). In addition, before determining the BAT, EPA also considers the following factors: (1) the age of the equipment and facilities involved; (2) the process employed; (3) the engineering aspects of the application of various control techniques; (4) process changes; (5) the cost of achieving such effluent reduction; and (6) non-water quality environmental impacts (including energy requirements); as well as the appropriate technology for the category or class of point sources of which the applicant is a member based upon all available information; and any unique factors relating to the applicant. 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. § 125.3(c)(2), (d)(3).

"Open-cycle" (or "once-through") cooling systems typically produce the highest levels of thermal discharges (and water withdrawals), as compared to closed-cycle or partially closed-cycle systems. PNPS currently operates with an open-cycle cooling system and, as a result, 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). In a closed-cycle system, cooling water is used to condense the steam, but rather than discharge the heated water, a cooling system is used to remove most of the waste heat from the cooling water – typically dissipating the heat to the atmosphere through a cooling tower of some type – so that the water can be reused for additional cooling.

Given that PNPS is an existing facility that would require retrofitting to achieve technologically-driven improvements, EPA has looked to the existing steam electric facilities that have achieved the greatest reductions in thermal discharges through technological retrofits. As a general matter, the best performing facilities in terms of reducing thermal discharges at existing open-cycle cooling power plants are those facilities that have converted from open-cycle cooling to closed-cycle cooling using some type of “wet” cooling tower technology. Converting to closed-cycle cooling can reduce heat load to the receiving water by 95% or more. 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, #MA0003654, at pp. 7-37 to 7-38; Responses to Comments for Brayton Point Station NPDES Permit, at p. IV-115.

As part of its determination of the BTA for PNPS’s CWISs under CWA § 316(b), EPA evaluated alternative cooling system technologies in light of their feasibility and the various factors listed above (e.g., cost, engineering considerations). *See* Attachment D. EPA relies upon and incorporates by reference that analysis here. EPA determined that closed-cycle cooling was not the best technology available for minimizing entrainment at PNPS, because the permittee has determined that, no later than June 1, 2019, it will cease generating electricity and, therefore, withdrawing and discharging once-through cooling water for the main condenser. EPA concludes in Attachment D that a closed-cycle cooling system could not be installed and operational prior to the planned termination of electricity generation and the associated once-through cooling water discharges for the main condenser. When PNPS ceases generating electricity, however, it will achieve a 96% reduction in flow, which exceeds the flow reductions that could have been achieved by retrofitting the existing system with closed-cycle cooling.

In addition to reducing flow, the elimination of withdrawals to cool the main condenser will achieve a roughly 91% reduction in the maximum delta T of the discharge. By comparison, retrofitting PNPS for closed-cycle cooling would reduce the maximum delta T of the discharge by a similar percentage. As discussed in Attachment D, these reductions in volume and temperature via closed-cycle cooling would come at a significant cost to install a technology that could be obsolete even before it is completed, given the permittee’s announcement to cut its withdrawals drastically by June 2019 and to begin decommissioning in preparation for closing the facility completely. Thus, in light of Entergy’s decision to close PNPS no later than June 1, 2019, EPA concludes that retrofitting PNPS for closed-cycle cooling would not be the BAT for thermal discharges. EPA considers several other technologies in Attachment D and their impacts on entrainment and impingement, but none of these would appreciably lower the delta T or the absolute temperature of the discharge. (VFDs, for one, would likely raise the temperature of the discharge even further).

For these reasons, EPA has determined that, in light of the impending closure of the facility, continuing to operate the plant with the existing technology and controls in the near term and then eliminating water withdrawals for the main condenser and reducing cooling water and other miscellaneous water withdrawals on or before June 1, 2019, resulting in a 96% reduction in flow, would be the BAT for the reduction of thermal discharges at the facility. The draft permit includes conditions and requirements consistent with prohibiting the discharge of thermal effluent from the main condenser once the facility ceases generating electricity. In the interim, EPA has concluded that a less stringent set of limits – namely, the thermal discharge limits in the existing permit – would satisfy CWA § 316(a) and support the renewal of PNPS' existing § 316(a) variance.

7.2 Water Quality-Based Requirements

Water quality-based requirements would be based on the Massachusetts SWQS's numeric and narrative temperature criteria, consideration of designated and existing uses, and the State's antidegradation and mixing zone policies. The state's SWQS classify Cape Cod Bay as a Class SA water and, accordingly, prohibit discharges from causing ambient water temperatures to exceed 85°F (29.4°C) or a maximum daily mean of 80°F (26.7°C), and the rise in temperature due to a discharge shall not exceed 1.5°F (0.8°C). *See* 314 CMR 4.05(4)(a)(2)(a). The SWQS further provide that "there shall be no [temperature] change from natural background that would impair any uses assigned to this class including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms." *Id.* 4.05(4)(a)(2)(b). In addition, 314 CMR 4.05(4)(a)(2)(c) states that "alternative effluent limitations established in connection with a variance for a thermal discharge issued under 33 U.S.C. § 1251 (FWPCA, § 316(a)) and 314 CMR 3.00 are in compliance with 314 CMR 4.00. As required by 33 U.S.C. § 1251 (FWPCA, § 316(a)) and 314 CMR 3.00, for permit and variance renewal, the applicant must demonstrate that alternative effluent limitations continue to comply with the variance standard for thermal discharges."

At the current level of operation, PNPS's thermal discharge cannot always meet the numeric temperature criteria of the MA SWQS throughout the receiving water (see MIT modeling – 2000 316 demonstration, AR#233).

The data and analysis to support these determinations are presented in Attachment C: Assessment of Impacts to Marine Organisms from Thermal Discharge and Thermal Backwash. Although PNPS's thermal discharge would not satisfy the above-discussed temperature criteria of the Massachusetts SWQS, the state's SWQS also provide that thermal effluent limits established pursuant to a CWA § 316(a) variance will satisfy SWQS. Also see the discussion in Section 5.4 of this fact sheet. Thus, as explained below, EPA's decision to grant a thermal discharge variance from technology- and water quality-based standards authorized under CWA § 316(a) variance is deemed to satisfy the SWQS. *See* 314 CMR 4.05(4)(a)(2)(c) (for Class SA waters).

7.3 CWA § 316(a) Variance-Based Limits

As described above, discharges of heat must satisfy both technology-based standards and any more stringent water quality-based requirements that may apply. According to CWA §316(a) and 33 USC §1326(a), however, thermal discharge effluent limits in permits may be less stringent than those required by technology-based and water quality-based requirements, if the discharger demonstrates that such limits meeting those requirements 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 water body receiving the thermal discharge. EPA regulations define the term "balanced, indigenous population"—and its synonym, "balanced, indigenous community"—in the following way:

> . . . 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 to section 316(a).

40 C.F.R. § 125.71(c).

The demonstration "must show that the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of the BIP." *Id.* § 125.73(a); *see also* 33 U.S.C. § 1326(a).

As part of the permit renewal process, the permittee must reapply for the § 316(a) variance. A permittee can make a case for a variance retrospectively, by showing that monitoring data collected during plant operation show no evidence of appreciable harm to the BIP attributable to the thermal discharge. 40 C.F.R. § 125.73(c). Permittees may also present a prospective analysis. *Id.* This approach generally requires extensive modeling of the thermal plume and is usually undertaken when a facility is requesting a change to its operation and its thermal limits. Regardless of the method chosen, the demonstration must show that the requested variance, "considering the cumulative impact of [the permittee's] thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a [BIP]." *Id.* § 125.73(a). PNPS has opted for a retrospective analysis, with some data collection to confirm prior modeling efforts.

The § 316(a) variance in the current PNPS NPDES permit allows the station to have a maximum daily discharge temperature of 102^{o} F with a delta T (change in temperature from intake to discharge) of 32^{o} F. These discharge limits are required to be met in the discharge canal prior to release into Cape Cod Bay. These limits were proposed based on the consideration of the operational characteristics of the reactor unit. In addition, this draft permit has established an effluent temperature limits for thermal backwashes at Outfall 002 of 115^{o} F as discussed in Section 6.2.4 above, which replaces the 120 ^{o} F limit in the 1991 permit.

For its evaluation of PNPS's § 316(a) demonstration, EPA considered the suite of available information including 1) PNPS' § 316(a) demonstration materials submitted in March of 2000, specifically Sections 5.3.1 to 5.3.7 – thermal impacts to "representative important species" ("RIS"); 2) 1974 investigations conducted by MIT (Pagenkopf et al.,1974); 3) an investigation by EG&G, in 1995, and (4) information on the assemblage of fish and invertebrate species in the affected area of the Cape Cod Bay and their thermal sensitivities.

EPA's evaluation of the § 316(a) variance for PNPS is provided in Attachments B and C. EPA and MassDEP considered the temperature effects and tolerances on representative important species (RIS) and other biological data that have been collected and evaluated. EPA concludes that the thermal plume from PNPS is relatively small compared to the receiving water, dissipates rapidly, and is predominantly a surface plume that moves with the tides and the wind. Minor impacts to the macroalgal community have been documented that can be attributed to the thermal plume, but this area is only roughly one acre in size. Thus, from a retrospective analysis, the past forty (40) years of operation of PNPS—during which the thermal component of the discharge has remained the same—have been protective of the balanced indigenous population of fish, shellfish and wildlife, in the context of § 316(a). Based on this information, EPA concludes that no appreciable harm has resulted from the current variance-based thermal limits in the PNPS discharge permit and that the continuation of the variance-based limits will assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife.

Although the thermal backwash temperature limit is higher than the Outfall 001 effluent temperature of 102^{o} F, the thermal backwashes occur less than ten times per year, are for a short duration of typically one to two hours, and occur one intake bay at a time, representing about 50% of the typical condenser cooling water flow. On Page 33 of Fact Sheet Attachment C, MassDEP considered the thermal backwash and its potential effects to aquatic life and concluded that these backwash events are not a cause for appreciable harm to the fish populations in the environs of the intake. Therefore, the continuation of the lower, variance-based thermal limit for the thermal backwash discharges will also assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife.

In Part I.A.1.g of the current permit, there were additional delta T limits which applied over sixty (60) minute periods during steady state and load cycling operations. These delta T limits have been carried over into the draft permit at Part I.A.11 and apply through the date of shutdown of electricity generation.

8.0 SECTION 316(b): DETERMINATION OF BEST TECHNOLOGY AVAILABLE (BTA) FOR COOLING WATER INTAKE STRUCTURES (CWIS)

With any NPDES permit issuance or reissuance, EPA is required to evaluate or re-evaluate compliance with applicable standards, including the technology standard specified in Section 316(b) of the CWA for cooling water intake structures (CWIS). Section 316(b) requires that:

> [a]ny standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

33 U.S.C. § 1326(b). 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"). The operation of CWISs can cause or contribute to a variety of adverse environmental effects, such as killing or injuring fish larvae and eggs entrained in the water withdrawn from a water body and sent through the facility's cooling system, or by killing or injuring fish and other organisms by impinging them against the intake structure's screens. CWA § 316(b) applies to facilities with point source discharges authorized by a NPDES permit that also withdraw water from waters of the United States through a CWIS for cooling purposes. CWA § 316(b) applies to this permit due to the operation of a CWIS withdrawing water from Cape Cod Bay and used for cooling at the Pilgrim Nuclear Power Station (PNPS).

On August 15, 2014, EPA published the Final Rule establishing requirements for existing facilities under § 316(b) of the CWA. *See* 79 Fed. Reg. 48,300 (Aug. 15, 2014) ("Final 316(b) Rule for Existing Facilities" or "Final Rule").[6] The Final Rule's requirements reflect the BTA for minimizing adverse environmental impact, applicable to the location, design, construction, and capacity of cooling water intake structures for existing power generating facilities and existing manufacturing and industrial facilities. The Final Rule applies to all existing power generating facilities and existing manufacturing and industrial facilities that have the design capacity to withdraw more than 2 MGD of cooling water from waters of the United States and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes. The Final Rule, which became effective on October 14, 2014, applies to this permit because PNPS is an existing power generating facility that withdraws more than 2 MGD from waters of the United States and uses at least 25 percent of that withdrawal exclusively for cooling purposes.

In the Final Rule, EPA also sought to address ongoing permitting proceedings like the reissuance of the PNPS NPDES permit. Specifically, EPA recognizes that, in some cases, a facility may already be in the middle of a permit proceeding at the time the new regulations were promulgated. *See* 40 C.F.R. § 125.98(g). The Final Rule makes clear that for an ongoing proceeding, when sufficient information has already been collected, the permitting authority may proceed to a site-specific BTA determination for entrainment and impingement mortality. It is evident that 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 Final Rule where sufficient information has been submitted upon which to base a site-specific BTA determination. *See also* 79 Fed. Reg. at 48,358 ("… 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)."). The Final Rule 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).

PNPS was first issued a NPDES permit in 1975 and has been collecting and submitting information to EPA and MassDEP about its CWIS for more than 30 years. Region 1 was working on the permit prior to promulgation of the Final 316(b) Rule for Existing Facilities and had gathered substantial additional information from the permittee as required under its current, administratively-continued permit through the use of information request letters (sent pursuant to CWA § 308(a)) and site visits. In this case, the Region has determined that the information

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[6] EPA notes that following its promulgation, multiple petitions challenging the Final 316(b) for Existing Facilities have been filed in federal court. Nonetheless, the rule is in effect as of this writing.

already submitted by the Facility is sufficient. The BTA determination for controlling impingement mortality and entrainment at PNPS has been developed on a site-specific basis, consistent with EPA's Final 316(b) Rule for Existing Facilities and under the ongoing permit proceeding provision at 40 C.F.R. § 125.98(g). In addition, EPA has considered any conditions necessary to meet Massachusetts surface water quality standards at 314 CMR 4.00 as they apply to the effects of CWISs on the State's waters. This determination is set forth in Attachment D, *Assessment of Cooling Water Intake Structure (CWIS) Technologies and Determination of Best Available Technology (BTA) under Section 316(b)*, to this fact sheet. The draft permit at Part I.C requires the facility to implement the following changes to the current CWISs to reflect the BTA to minimize the adverse environmental impacts associated with impingement and entrainment:

1. Upon termination of generation of electricity and no later than June 1, 2019 the permittee shall:

    a. Operate the traveling screens with a maximum through-screen intake velocity no greater than 0.5 feet per second. Limited exceedances of the maximum through-screen velocity are authorized for the purposes of maintaining the CWIS and when the circulating water pumps are required to withdraw water to support decommissioning activities not to exceed five (5) percent of the time on a monthly basis.

    b. Monitor the through-screen velocity at the screen at a minimum frequency of daily. Alternatively, the permittee shall calculate through-screen velocity using water flow, depth, and screen open area. For this purpose, the maximum intake velocity shall be calculated during minimum ambient source water surface elevations and periods of maximum head loss across the screens. The average monthly and maximum daily through-screen intake velocity shall be reported each month on the DMR. See Part I.B.1. of the draft permit.

    c. Cease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD. Cooling water withdrawals at the salt service water pumps shall be limited to a maximum daily flow of 15.6 MGD.

    d. Withdrawal of seawater using a single circulating water pump not to exceed five (5) percent of the time on a monthly basis is authorized to support decommissioning activities.

    e. Continuously rotate the traveling screens when operating the circulating water pumps.

2. From the effective date of the permit until termination of generation of electricity, no later than June 1, 2019, the permittee shall continuously rotate the traveling screens.

3. Any change in the location, design, or capacity of any CWIS except as expressed in the above requirements must be approved in advance and in writing by the EPA and MassDEP.

EPA has determined on a site-specific, BPJ basis that the requirements in Part I.F of the draft permit will ensure that the facility's CWIS reflects the BTA for this specific facility and will minimize entrainment and impingement of all life stages of fish. Attachment B to the draft permit ("Biological Monitoring Plan") requires monitoring impingement and entrainment at the CWIS and in Cape Cod Bay to confirm EPA's evaluation of the likely environmental impact on the aquatic community resulting from the operation of the CWIS through June 1, 2019, at which time the facility will shutdown and water withdrawals through the CWIS will be substantially reduced. Part I.F of the draft permit and the Biological Monitoring Plan also include reduced biological monitoring requirements to ensure that impingement and entrainment are minimized during decommissioning activities.

9.0 Storm Water Pollution Prevention Plan (SWPPP)

PNPS stores and handles numerous chemicals on its property which could result in the discharge of pollutants to Cape Cod Bay either directly or indirectly through storm water runoff. Operations include the following activities from which there is, or could be, site runoff: materials handling and storage; chemical handling and storage; fuel handling and storage. To control these and other activities and operations, which could contribute pollutants to waters of the United States, potentially violating the MA SWQS, the Draft Permit requires that the permittee implement and maintain a SWPPP containing best management practices (BMPs) appropriate for this facility See Sections 304(e) and 402(a)(1)(B) of the CWA.

The goal of the SWPPP is to reduce or prevent the discharge of pollutants through the storm water drainage system. The SWPPP requirements in the draft permit are intended to provide a systematic approach by which the permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) it uses to achieve compliance with the conditions of the 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 storm water discharges associated with industrial activity at the facility. The SWPPP supports the permit's numerical effluent limitations and is an enforceable element of the permit.

Implementation of the SWPPP involves the following four main steps:

1) Forming a team of qualified facility personnel who will be responsible for developing and updating the SWPPP and assisting the plant manager in its implementation;
2) Assessing potential storm water pollution sources;
3) Selecting and implementing appropriate management practices and controls for these potential pollution sources; and
4) Periodically re-evaluating the SWPPP effectiveness at preventing storm water contamination and complying with the various terms and conditions of the permit.

To minimize preparation time, the permittee's SWPPP may reflect pertinent requirements from other environmental management or pollution control plans, such as, for example, a Spill Prevention Control and Countermeasure (SPCC) plan under Section 311 of the CWA and 40 C.F.R. Part 112 or a Corporate Management Practices plan. The permittee may incorporate any part of such a plan into the SWPPP by reference, but any provision from another plan that is being incorporated by reference into the SWPPP must be attached to the SWPPP so that it is immediately available for review and inspection by EPA and MassDEP personnel. Although relevant portions of other environmental plans, as appropriate, can be built into the SWPPP, ultimately however, it is important to note that the SWPPP must be a comprehensive, stand-alone document. Thus, to repeat, any provision from another plan that is being incorporated by reference into the SWPPP must be physically attached to the SWPPP.

A copy of the most recent SWPPP shall be kept at the facility and be available for inspection by EPA and MassDEP. The draft permit requires the permittee to develop and implement a SWPPP no later than one hundred and eighty (180) days after the permit's effective date. The SWPPP supports the permit's numerical effluent limitations and the SWPPP will be equally as enforceable as those numerical limits and other requirements of the permit. See Part I.H. of the draft permit.

The permit requires that the permittee incorporate into its SWPPP all specific pollution control activities and other requirements found in the 2015 Multi-Sector General Permit's (MSGP) provisions for "Industrial Sector O, Steam Electric Generating Facilities." *See* MSGP, Part 8.0.7, *available at* http://go.usa.gov/cEMaQ.

The SWPPP specifically requires the permittee to address the storm water that accumulates in various electrical vaults on the property as explained in Section 6.4 above.

10.0 BIOLOGICAL MONITORING PROGRAM

The draft permit includes a continuation of some of the biological monitoring which has been conducted by the permittee during this permit term. In the 1991 permit, there was a Marine Ecology Monitoring program that was established as described in Attachment A to the permit. The draft permit includes requirements for impingement and entrainment monitoring as well as periodic fish trawling in the vicinity of the discharge for as long as the facility continues to generate electricity with the associated once-through cooling water withdrawals for the main condenser. The specific methodologies for the biological monitoring requirements are based on the existing methodology employed by PNPS and described in its annual monitoring reports. The Biological Monitoring Plan is included as Attachment B of the draft permit.

11.0 ENDANGERED SPECIES ACT (ESA)

Section 7(a) of the Endangered Species Act of 1973, as amended (ESA), grants authority to and imposes requirements upon Federal agencies regarding the conservation of endangered and threatened species of fish, wildlife, or plants ("listed species"), and the habitat of such species that has been designated as critical ("critical habitat"). The ESA requires Federal agencies, in consultation with and with the assistance of the Secretary of Interior, to insure that any action that they authorize, fund, or carry out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. The United States Fish and Wildlife Service (USFWS) typically administers Section 7 consultations for birds and terrestrial and freshwater aquatic species, while the National Marine Fisheries Service (NMFS) administers Section 7 consultations for marine species and anadromous fish.

As described in this fact sheet, EPA is proposing to reissue the NPDES permit for PNPS authorizing the withdrawal of once-through cooling water and the discharge of process water and storm water through multiple outfalls. PNPS currently operates a single reactor unit with a boiling water reactor and turbine generator. Seawater is withdrawn from Cape Cod Bay through an intake embayment formed by two breakwaters. Seawater, primarily used for condenser cooling water, is pumped from the cooling water intake structure (CWIS) by two circulating water pumps and five salt service water pumps at a maximum volume of 447 MGD. Once-through condenser cooling water (Outfall 001), combined with plant service cooling water (Outfall 010) are discharged to Cape Cod Bay via the discharge canal. In addition, PNPS discharges effluent for thermal backwash, intake screen wash water, neutralizing sump waste commingled with demineralizer reject water, station heating water, and storm water, through various outfalls on an intermittent basis. A more detailed description of each of these waste streams and outfalls is provided in Section 2.0 of this fact sheet. A more detailed description of the receiving water is provided in Section 3.0 of this fact sheet.

NMFS, in consultation with the NRC, completed an assessment of the potential effects of the ongoing operation of PNPS on listed species as part of the renewal of the facility's operating license in 2012. *See* May 17, 2012 letter from Daniel S. Morris (NMFS) to Andrew S. Imboden (NRC) (AR# 465) ("2012 ESA Consultation letter"). In its letter, NMFS concludes that effects of the continued operation of PNPS to listed species will be insignificant and discountable, and that the renewal of PNPS' operating license is not likely to adversely affect any listed species under NMFS jurisdiction and will have no effect on right whale critical habitat. In other words, effects would not be meaningfully measured or detected ("insignificant"), or effects would be extremely unlikely to occur ("discountable").[7] NMFS specified that re-initiation of this consultation would likely be necessary when EPA reissues a revised NPDES permit for this facility.

On October 13, 2015, Entergy announced that PNPS will cease generation of electricity at the facility no later than June 1, 2019. Based on a recent press release, EPA expects that operation of the facility to support electrical generation will continue until May 31, 2019. Beginning June 1, 2019, EPA expects that seawater withdrawal and effluent discharge will be dramatically altered as a function of entering the decommissioning phase. To the best of its ability based on available

[7] According to USFWS and NMFS, a "not likely to adversely affect" conclusion is appropriate when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are "contemporaneous positive effects without any adverse effects," insignificant effects "relate to the size of the impact and should never reach the scale where takes occurs," and discountable effects are "those extremely unlikely to occur." Glossary of Terms used in Section 7 Consultations in the joint USFWS and NMFS *Endangered Species (Section 7) Consultation Handbook* (March 1998).
http://www.fws.gov/endangered/esa-library/pdf/esa_section7_handbook.pdf

information, EPA has taken this into account and has tailored the permit to reflect post-shutdown operations and discharges as appropriate. However, since the permittee cannot fully anticipate all changes in permitted flows that will take place post-shutdown, this permit may be modified post-shutdown if warranted by any new or increased discharges.

The draft permit establishes technology- and water quality-based effluent limitations and conditions designed to ensure the protection of designated uses of Cape Cod Bay, including as an excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions consistent with the Massachusetts surface water quality standards at 314 CMR 4.05(4)(a). In this section, EPA identifies listed species that may be present in the vicinity of PNPS and evaluates the potential impacts of the action on listed species as authorized under the draft permit. EPA agrees with NMFS' 2012 evaluation of the potential impacts to ESA listed species and the conclusion that continued operation of PNPS is not likely to adversely affect any listed species. The conditions of the draft permit are as stringent as or more stringent than the conditions evaluated in the 2012 consultation. In particular, the permit conditions that take effect upon termination of electrical generation at PNPS are substantially more stringent, and will result in fewer effects on listed species, than the conditions assessed during the 2012 consultation.

11.1 Listed Species in the Vicinity of the Federal Action

As the federal agency charged with authorizing the discharges from this facility, EPA has reviewed available habitat information developed by USFWS and NMFS (collectively, "the Services") to see if one or more of the federal endangered or threatened species of fish, wildlife, or plants may be present within the influence of the discharge. The following federally listed species may potentially inhabit (seasonally) Cape Cod Bay in the area of the facility discharge:

Common Name	Species Name	Status
Atlantic Sturgeon	*Acipenser oxyrinchus oxyrinchus*	Threatened
North Atlantic Right Whale	*Eubalaena glacialis*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Fin Whale	*Balaenoptera physalus*	Endangered
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	Endangered
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered
Loggerhead Sea Turtle	*Caretta caretta*	Threatened
Green Sea Turtle	*Chelonia mydas*	Threatened*

*Population of Green Sea Turtle present in action area listed as threatened. Breeding populations in Florida and Mexico's Pacific Coast listed as Endangered.

Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) is a species of sturgeon distributed along the eastern coast of North America from Hamilton Inlet, Labrador, Canada to Cape Canaveral, Florida, USA. NMFS has delineated U.S. populations of Atlantic sturgeon into five distinct population segments (DPSs): the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs. *See* 77 Fed. Reg. 5880 (Feb. 6, 2012); 77 Fed. Reg. 5914 (Feb. 6, 2012). NMFS has listed the Gulf of Maine DPS of Atlantic sturgeon as a threatened species and extended the prohibitions under section 9(a)(1) of the ESA to this DPS. *See* 78 Fed. Reg. 69,310 (Nov. 19, 2013). The primary factors responsible for the decline of the Gulf of Maine DPS include the destruction, modification, or curtailment of habitat due to poor water quality, dredging and the presence of dams; overutilization due to unintended catch of Atlantic sturgeon in fisheries; lack of regulatory mechanisms for protecting the fish; and other natural or manmade factors including loss of fish through vessel strikes. *See* 77 Fed. Reg. at 5905.

After emigration from the natal estuary, subadults and adults travel within the marine environment, typically in nearshore waters less than 50 meters in depth characterized by gravel and sand substrate, including Massachusetts Bay (Stein *et al.* 2004). According to the *Status Review of Atlantic Sturgeon*, Atlantic Sturgeon Status Review Team Report to National Marine Fisheries Service, Northeast Regional Office (Feb. 23, 2007 p. 61):

> Stein et al. (2004b) examined bycatch of Atlantic sturgeon using the NMFS sea sampling/observer 1989-2000 database. The bycatch study identified that the majority of recaptures occurred in five distinct coastal locations (Massachusetts Bay, Rhode Island, New Jersey, Delaware, and North Carolina) in isobaths ranging from 10 to 50 m, although sampling was not randomly distributed…Fisheries conducted within rivers and estuaries may intercept any life stage, while fisheries conducted in the nearshore and ocean may intercept migrating juveniles and adults.

Based on the Status Review document and the information summarized by NMFS in its 2012 consultation, subadult and adult Atlantic sturgeon may be present in nearshore habitat in Cape Cod Bay. As NMFS provides, the Kennebec and Hudson rivers are the closest rivers to Pilgrim in which Atlantic sturgeon are known to spawn. Given the distance from those rivers to Cape Cod Bay, early life stages (eggs, larvae, and juvenile) of Atlantic sturgeon are not likely to occur in the action area.

North Atlantic Right Whale

The Northern right whale (*Eubalaena glacialis*) was listed as endangered in 1970 prior to the passage of the ESA. In 2006, the North Atlantic, North Pacific, and southern right whale were listed as three separate endangered species under the ESA based on their unique lineages. *See* 71 Fed. Reg. 77,704 (Dec. 27, 2006); 73 Fed. Reg. 12,024 (Mar. 6, 2008). The North Atlantic right whale primarily occurs in coastal or shelf waters with calving and nursery areas off the Southeastern U.S. and summer feeding grounds extending from New England waters north to the Bay of Fundy and Scotian Shelf (NMFS 2005). The distribution of right whales seems linked to the distribution of their principal zooplankton prey, calanoid copepods (Baumgartner and Mate 2005; Waring et al. 2012). The largest threat to recovery of the population is ship collisions and entanglements. Other threats include habitat degradation, noise, contaminants, and climate and ecosystem change (NMFS 2005).

New England waters include important foraging habitat for right whales and individuals have been sighted off Massachusetts in most months (Watkins and Schevill 1982, Winn et al. 1986, Hamilton and Mayo 1990). Peak occurrence falls between February and May, particularly in Cape Cod and Massachusetts bays (Hamilton and Mayo 1990, Payne et al. 1990). In recent years, however, right whales have been sighted on Jeffreys and Cashes Ledges, Stellwagen Bank, and Jordan Basin during December to February (Khan et al. 2011 and 2012). On multiple days in December 2008, congregations of more than 40 individual right whales were observed in the Jordan Basin area of the Gulf of Maine, leading researchers to believe this may be a wintering ground (NOAA 2008). Calving is known to occur in the winter months in coastal waters off of Georgia and Florida (Kraus et al. 1986). Right whale sightings from May 1997 to the present have been mapped (http://www.nefsc.noaa.gov/psb/surveys/). Since the last consultation in May 2012, there have been multiple sightings of right whales in the action area (particularly spring of 2013 and 2015), including sighting of a mother and calf pair sighted near the northern embayment wall in January 2013 and south of the facility in April 2013. In addition, a large aggregation of North Atlantic right whales spotted in western Cape Cod Bay (near PNPS) in early April of 2013 prompted MassDMF to issue an advisory for vessel operators to proceed with caution when traveling in that area (Attachment C to this fact sheet, p.9).

Humpback whale

The Humpback Whale (*Megaptera novaeangliae*) has been listed as endangered under the ESA since its passage in 1973. Humpback whales inhabit all major ocean basins from the equator to subpolar latitudes. With the exception of the northern Indian Ocean population, they generally follow a predictable migratory pattern in both southern and northern hemispheres, feeding during the summer in the higher near-polar latitudes and migrating to lower latitudes in the winter where calving and breeding take place (Perry et al. 1999). During the summer months, humpback whales foraging in the Gulf of Maine visit Stellwagen Bank and the waters of Massachusetts and Cape Cod bays. Small numbers of individuals may be present in this area, including the waters of Stellwagen Bank, year-round. They feed on small schooling fishes, particularly sand lance and Atlantic herring, targeting fish schools and filtering large amounts of water for their associated prey. Humpback whales may also feed on euphausiids (krill) as well as on capelin (Waring et al. 2010; Stevick et al. 2006). In winter, whales from waters off New England, Canada, Greenland, Iceland, and Norway migrate to mate and calve primarily in the West Indies, where spatial and genetic mixing among these groups occurs (Waring et al. 2014). Acoustic recordings made on Stellwagen Bank National Marine Sanctuary in 2006 and 2008 detected humpback song in almost all months, including throughout the winter (Vu et al. 2012). Changes in humpback whale distribution in the Gulf of Maine have been found to be associated with changes in herring, mackerel, and sand lance abundance associated with local fishing pressures (Stevick et al. 2006; Waring et al. 2014). Shifts in relative finfish species abundance correspond to changes in observed humpback whale movements (Stevick et al. 2006). According NFMS, the majority of humpback whale sightings are in the eastern portion of Cape Cod Bay with few sightings in the action area.

As with other large whales, the major known sources of anthropogenic mortality and injury of humpback whales occur from fishing gear entanglements and ship strikes. Humpback whales, like other baleen whales, may also be adversely affected by habitat degradation, habitat exclusion, acoustic trauma, harassment, or reduction in prey resources resulting from a variety of activities including fisheries operations, vessel traffic, and coastal development.

Fin Whale

The fin whale (*Balaenoptera physalus*) has been listed as endangered under the ESA since its passage in 1973. The fin whale is widely distributed in the North Atlantic and occurs from the Gulf of Mexico and Mediterranean Sea northward to the edges of the Arctic ice pack (NMFS 2010). Off the eastern U.S., fin whales are centered along the 100 m isobaths but with sightings well spread out over shallower and deeper water, including submarine canyons along the shelf break (Kenney and Winn 1987; Hain et al. 1992). Hain et al. (1992) identified Jeffrey's Ledge as a primary feeding area. Fin whales prey on both pelagic crustaceans and schooling fish (NMFS 2010). The overall distribution may be based on prey availability, as this species preys opportunistically on both invertebrates and fish (Watkins et al. 1984).

Like right and humpback whales, fin whales are believed to use North Atlantic waters primarily for feeding, and more southern waters for calving. This species is commonly found from Cape Hatteras northward. During the 1978-1982 aerial surveys, fin whales accounted for 24% of all cetaceans and 46% of all large cetaceans sighted over the continental shelf between Cape Hatteras and Nova Scotia (Waring et al. 2014). Underwater listening systems have also demonstrated that the fin whale is the most acoustically common whale species heard in the North Atlantic (Clark 1995). The single most important area for this species appeared to be from the Great South Channel, along the 50 meter isobath past Cape Cod, over Stellwagen Bank, and past Cape Ann to Jeffreys Ledge (Hain et al.1992).

The major known sources of anthropogenic mortality and injury of fin whales include entanglement in commercial fishing gear and ship strikes. Pollutants do not appear to be a major direct threat to fin whale populations, although the loss of prey base due to pollution and climate change could potentially impact populations (NMFS 2010).

Sea Turtles

The Loggerhead Sea Turtle (*Caretta caretta*) was listed as endangered through its range on July 28, 1978. Loggerhead turtles inhabit the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Nesting occurs from Texas to Virginia; eggs and hatchlings are not likely to occur in the action area (NMFS and USFWS 2008). Post-hatchling loggerhead enter neritic waters along the continental shelf and before transitioning to the oceanic zone, where juveniles are found particularly around the Azores and Maderia in the North Atlantic (Bolten 2003). Following the oceanic stage, juvenile loggerheads transition to the neritic zone where they are common along the eastern U.S. seaboard in continental shelf waters from Cape Cod Bay, MA to the Gulf of Mexico feeding primarily on benthic invertebrates. Adult, non-nesting loggerheads prefer shallow water habitats and are common in large, open bays (e.g., Florida Bay and Chesapeake Bay) and offshore waters from New York through the Gulf of Mexico (Schroeder et al. 2003). Major threats to loggerhead turtles include commercial fishery bycatch, legal and illegal harvest, habitat degradation (especially of nesting beaches), and predation by native and exotic species (NMFS and USFWS 2008).

The Leatherback Sea Turtle (*Dermochelys coriacea*) has been listed as endangered through its range since the passage of the ESA in 1973. Adult leatherbacks are highly migratory and are believed to be the most pelagic of all sea turtles. There is little information about the habitat requirements and distribution of adult leatherbacks beyond limited knowledge of nesting beaches, including those in the Gulf of Mexico and U.S. Caribbean islands (e.g., the U.S. Virgin Islands and Puerto Rico) (NMFS and USFWS 1992). Eggs and hatchlings are not likely to occur in the action area. Periodic sightings of leatherbacks have occurred in New England waters, particularly around Cape Cod during summer months (NMFS and USFWS 1992). One study tracking the movements of leatherback turtles captured off the coast of Cape Cod indicated that several of the tagged individuals remained near the Northeast U.S. continental shelf (and in Massachusetts Bay) during summer and fall before migrating to tropical or sub-tropical habitat (Dodge et al. 2014).

The Green Sea Turtle (*Chelonia mydas*) was listed as endangered for coastal breeding colonies in Florida and Mexico's Pacific coast and threatened through the rest of its range in 1978. The green turtle occurs in tropical and sub-tropical waters worldwide; in Atlantic waters green turtles are found around the U.S. Virgin Islands, Puerto Rico, and the continental U.S. from Texas to Massachusetts. Primary nesting beaches occur in east central and southeast Florida, and in smaller numbers in Puerto Rico and the U.S. Virgin Islands. Eggs and hatchlings are not likely to occur in the action area. After transitioning from pelagic habitat to shallow, benthic feeding grounds, herbivorous juvenile and adult green turtles forage in pastures of seagrasses and/or algae but can also be found over coral reefs, warm reefs, and rocky bottoms (NMFS and USFWS 1991). Primary threats include degradation of nesting habitat, dredging and coastal development, pollution, seagrass bed degradation, entanglement in commercial fishing gear, and fishery bycatch (NMFS and USFWS 1991).

The Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) has been listed as endangered through its range since the passage of the ESA in 1973. The species has a relatively limited distribution with nesting beaches primarily located in the western Gulf of Mexico; eggs and hatchlings are not likely to occur in the action area. Once hatchlings emerge, they swim offshore into deeper waters where some juveniles may be transported to the Northwest Atlantic by the Gulf Stream (NMFS et al. 2011). Juveniles in the Northwest Atlantic transition into shallow coastal habitats (including bays and sounds) extending from Florida to New England (Morreale et al. 2007). Both adult and juvenile Kemp's ridley turtle may use New England waters from June through October as seasonal feeding grounds with crabs as its primary prey (NFMS et al. 2011). Migration from coastal foraging areas to overwintering sites is likely triggered by temperature declines. By late fall, most are found south of Chesapeake Bay towards North Carolina (NMFS et al. 2011). Major threats to the recovery of the Kemp's Ridley sea turtle include the degradation of nesting habitat and commercial fishery bycatch (NMFS et al. 2011).

<u>Northern Right Whale Critical Habitat</u>

Critical habitat for right whales was initially designated for most of Cape Cod Bay (CCB), Great South Channel (GSC), and coastal Florida and Georgia (outside of the action area). The habitat features identified in this designation include copepods (prey), and oceanographic conditions created by a combination of temperature and depth that are conducive for foraging, calving and nursing. *See* 59 Fed. Reg. 28,805 (June 3, 1994). In its 2012 ESA Consultation, NMFS determined that, within critical habitat, the thermal plume is no longer detectable and that any pollutants discharged from PNPS would be fully mixed and no longer detectable from background levels. Therefore, there would be no direct effects to critical habitat. See 2012 ESA Consultation letter, 30.

The NMFS has recently replaced the 1994 critical habitat designation for the population of right whales in the North Atlantic. *See* 81 Fed. Reg. 4,838 (Jan. 27, 2016) The critical habitat, which contains physical and biological features of foraging habitat that are essential to the conservation of the North Atlantic right whale, encompasses a large area within the Gulf of Maine and Georges Bank region, including Cape Cod Bay and Massachusetts Bay and deep underwater basins (Wilkinson, Georges, and Jordan Basins). The area incorporates state waters and "includes the large embayments of Cape Cod Bay and Massachusetts Bay but does not include inshore areas, bays, harbors, and inlets." 81 Fed. Reg. 4,862. The newly expanded designated critical habitat does not include the inshore location of PNPS' CWIS and outfalls, due to the absence or rarity of foraging right whales and the likelihood that dense aggregations of preferred prey are not present in these areas, even as NMFS recognizes that there has been an increase in the concentration of right whales in Western Cape Cod Bay in recent years. NMFS received a comment requesting special management considerations of impacts associated with coastally-located industrial electric generators (including PNPS) during the comment period for the proposed critical habitat. NMFS responded that, while some copepods are likely lost to entrainment at PNPS, "the essential feature of dense aggregations of late stage *C. finmarchicus* does not require special management considerations or protection due to entrainment by the PNPS…" 81 Fed Reg. 4,855-56. EPA has considered direct and indirect effects to North Atlantic right whales below.

11.2 Effect of the Federal Action on Listed Species

Effects of this action on listed species of whales and turtles and their critical habitat primarily include impingement and entrainment of potential prey and effects to habitat, including the discharge of heated effluent. Effects of this action on Atlantic sturgeon include impingement, the discharge of heated effluent, and may also include direct impacts of the discharge of pollutants from PNPS. To date there has been no reported take of Atlantic sturgeon or sea turtles from impingement at PNPS.

11.2.1 Heated Thermal Discharge

EPA characterizes the potential impacts of the heated effluent discharged from PNPS in detail in Attachments B ("Outline of §316(a) Determination Decision Criteria") and C ("MassDEP Assessment of Impacts to Marine Organisms from the Pilgrim Nuclear Thermal Discharge and Thermal Backwash"). Based on this analysis, EPA determined that the temperature limits in the current permit are protective of the balanced, indigenous population and has granted PNPS a variance from technology- and water quality-based temperature limits. Under the draft permit, PNPS may discharge up to 447 MGD of non-contact condenser cooling water heated to a maximum daily temperature of 102°F and a maximum rise in temperature of 32°F from Outfall 001 to Cape Cod Bay. The draft permit also authorizes the discharge of heated backwash water from Outfall 002 to the intake bay and out to the embayment. Thermal backwashes are intermittent.

Attachment C to this Fact Sheet characterizes the thermal plume, which changes throughout the tidal cycle and with ambient temperature. The analysis provided in Attachment C is consistent with the evaluation of the thermal plume in the 2012 ESA Consultation Letter (p. 17). At high tide, the plume is confined to the surface layer (to a depth ranging from 3 to 8 feet below the surface) and spreads from the point of release. Studies on the shape and dimensions of the plume suggest that, under worst case conditions, the area where water temperatures are at least 1°C (1.8°F) above ambient could extend to 3,000 acres, or about 0.8% of the surface area of Cape Cod Bay. In November, when ambient temperatures are cooler, the extent of the plume at temperatures at least 3°C (5.4°F) above ambient is 56 acres; the plume extends to 138 acres in July when ambient temperatures are higher.

At low tide, elevated temperatures are present near the discharge canal and the plume contacts the bottom. The maximum areal extent of the plume at temperatures greater than 1°C (1.8°F) above ambient is 1.2 acres. The maximum linear extent of the 1°C isotherm in contact with the bottom is about 170 m (560 ft) and the bottom area with the maximum recorded rise in temperature (9°C or 16.2°F) was limited to less than 0.13 acres.

EPA concludes that the thermal plume from PNPS is relatively small compared to the receiving water and dissipates rapidly. It is predominantly a surface plume that moves with the tides and the wind. Minor impacts to the macroalgal community have been documented that can be attributed to the thermal plume, but this area is only roughly one acre in size. Thus, from a retrospective analysis, the past forty (40) years of operation of PNPS—during which the thermal component of the discharge has remained the same—has been protective of the balanced indigenous population of fish, shellfish and wildlife, including species listed under the ESA, in the context of § 316(a).

In addition, NMFS, in its 2012 ESA Consultation for the relicensing of PNPS, likewise concluded that, even during the warmest months of the year, the surface and bottom area of the plume is small and that threatened and endangered species of whales are expected to be able to swim around or under the plume throughout the year. As a result, any avoidance of the relatively small plume would not result in the disruption or delay in any essential behaviors that these species may be carrying out in the action area, including foraging, migrating, or resting. *See* 2012 ESA Consultation letter, 18-19. The dimensions of the plume do not extend into designated critical habitat for North Atlantic right whale, therefore, there will be no direct effects to critical habitat. Similarly, threatened and endangered species of sea turtles present in the action area would also be able to avoid the plume by swimming around or under it and the plume will not disrupt or delay any essential behaviors, including foraging, migrating, or resting. NMFS also considered the potential for the risk of cold-stunning of sea turtles, in which turtles attracted by the plume remain in the action area so long that they risk becoming incapacitated when the contact colder ambient temperatures outside the plume. *Id*. at 20. NMFS concluded that the thermal plume is limited sufficiently spatially and temporally that it is extremely unlikely that sea turtles would seek out and use the plume as refuge from falling temperatures such that it would increase vulnerability to cold stunning. *Id*.

NMFS also considered if the thermal plume would be likely to affect Atlantic sturgeon in the action area. At high tide, when the thermal plume is confined to the surface, the normal behavior of Atlantic sturgeon as benthic-oriented fish is likely to limit exposure to the plume and fish that may be near the surface are likely to be able to avoid the relatively small area where ambient temperature are warmest (11.25 acres). At low tide, Atlantic sturgeon are likely to be able to avoid bottom waters with elevated temperatures by swimming around it. NMFS also determined that it is extremely unlikely that Atlantic sturgeon would be exposed to temperatures that could result in mortality (33.7°C or greater) because fish would exhibit avoidance behavior at temperatures of 28°C and would avoid the small area where temperatures are greater than tolerable. NMFS concluded that there would be no avoidance-related effects to Atlantic sturgeon from the thermal plume, and that it is unlikely that the thermal plume would preclude any essential behaviors of Atlantic sturgeon present in the action area, including foraging, migrating, and resting or that the fitness of any individual will be affected. *See* 2012 ESA Consultation letter, 21-22.

Finally, NMFS considered any impacts to listed species as a result of the effect of the thermal plume on the preferred prey species of threatened and endangered species. NMFS concluded that benthic invertebrates, the preferred prey of sea turtles and Atlantic sturgeon, would be displaced from a small area and would likely be able to avoid temperatures that would result in injury or mortality. Effects to foraging sea turtles and Atlantic sturgeon would be insignificant and limited to the distribution of prey away from the thermal plume. *See* 2012 ESA Consultation letter, 23. Similarly, prey species for humpback and fin whales, including Atlantic herring, sand lance, Pollock, and mackerel, would be displaced from a small area and would not be injured or killed due to exposure to intolerable temperatures. As a result, effects to foraging humpback and fin whales would be insignificant and limited to the distribution of prey away from the thermal plume. *Id*. Finally, NMFS concluded that copepods, the preferred prey of North Atlantic right whales, would be able to avoid the small area in which temperatures would be intolerable, rather than be injured or killed and, as a result, effects to foraging right whales would be extremely unlikely. *Id*. at 24. Similarly, effects to designated critical habitat for North Atlantic right whales resulting from thermal effects on prey species are also extremely unlikely.

Based on the detailed analysis in the 2012 ESA consultation, NMFS concludes that the thermal plume is not likely to adversely impact threatened and endangered species in the action area. The temperature limits in the draft permit that apply during the period when PNPS will generate electricity are consistent with the conditions evaluated in the 2012 ESA consultation. EPA agrees that, under these conditions, the thermal plume is not likely to adversely impact threatened and endangered species in the action area.

Based on Entergy's proposal to terminate the generation of electricity at PNPS by June 1, 2019, the draft permit requires the permittee to cease discharging non-contact cooling water for the main condenser by this date. Elimination of this discharge will effectively eliminate the primary source of heated effluent from the facility. Without the need for condenser cooling water, both the maximum temperature and rise in temperature will be substantially reduced. The draft permit authorizes the discharge of up to 224 MGD (at an average monthly volume of 11.2 MGD) of cooling water to support decommissioning activities at a maximum temperature of 85°F, a monthly average temperature of 80°F, and a maximum rise in temperature of 3°F upon terminating electrical generation at PNPS. The maximum daily temperature of 85°F and monthly average temperature of 80°F are consistent with the water quality standards for Class SA waters at 314 CMR 4.05(4)(a)(2)(a). Based on the 2012 ESA Consultation and information reviewed and assessed in development of the draft permit, the effects of heated effluent from the continued operation of PNPS at the current temperature on listed species are likely to be insignificant. The substantial reduction in both maximum daily temperature and rise in temperature as a result of terminating electrical generation will further reduce any potential impacts to listed species from the discharge of heated effluent.

11.2.2 Operation of a Cooling Water Intake Structure

EPA characterizes the potential impacts of entrainment and impingement mortality from PNPS' CWIS in detail in Attachment D, Section 3.0 ("Biological Impact of Cooling Water Intake Structures"). Based on sampling conducted by the facility since 1980, EPA estimates that, on average, PNPS entrains about 2.8 billion eggs and 354 million larvae annually, and impinges about 42,800 fish annually. According to NMFS, because early life stages of listed species are either not present or too large to be entrained, and sub-adult and adults are likely strong enough swimmers to avoid becoming impinged, impingement or entrainment of any whales, sea turtles, or Atlantic sturgeon is extremely unlikely to occur. *See* 2012 NMFS ESA Consultation letter, 7-9. In 40 years of biological monitoring, PNPS has not observed the impingement or entrainment of any listed species. Any potential impacts to ESA listed species would be indirect, resulting from the impingement and entrainment of prey species.

In its 2012 ESA consultation with NRC, NMFS assessed the potential impacts of impingement and entrainment of prey on listed species as a result of the continued operation of PNPS. At the current levels of cooling water withdrawal and intake velocity, NMFS expects that reductions in prey on listed species as a result of PNPS' CWIS will be insignificant. Specifically, NMFS found that, while entrainment likely results in the loss of some copepods that would otherwise be available as forage for right whales, the reduction would be undetectable from natural variability and any effects to foraging right whales insignificant. *See* 2012 ESA Consultation letter, 12. Similarly, effects to designated critical habitat for North Atlantic right whales resulting from loss of prey are also insignificant. NMFS also expects that the effect of impingement and entrainment losses of Atlantic mackerel, Atlantic herring, and sand lance on foraging whales would be insignificant. *Id*. at 13. Finally, NMFS expects that the effects of the loss of benthic invertebrates as available forage for sea turtles and Atlantic sturgeon would be insignificant. *Id*. at 15. EPA is aware of no new information since 2012 that would alter these conclusions.

Based on Entergy's proposal to terminate the generation of electricity at PNPS by June 1, 2019, the draft permit requires the permittee to cease seawater withdrawals for the main condenser by this date. Elimination of seawater withdrawals for electrical generation will result in an average flow reduction of 96% beginning no later than June 1, 2019. By eliminating seawater withdrawals for the main condenser, PNPS will achieve an actual through-screen intake velocity of no more than 0.5 fps. This lower intake velocity would be even more protective by ensuring that listed species are not impinged and by allowing most prey species to avoid impingement. Together, EPA has determined that a 96% reduction in flow and 0.5 fps actual through-screen velocity are the "best technology available" to minimize the adverse environmental impacts from impingement and entrainment. This determination is explained in more detail in Sections 6.0 and 7.0 of Attachment D ("Assessment of Cooling Water Intake Structure Technologies and Determination of Best Technology Available Under CWA § 316(b)").

The draft permit requires a 96% reduction in cooling water withdrawals from Cape Cod Bay and prohibits cooling water withdrawals for the main condenser effective upon terminating electrical generation at the plant and no later the June 1, 2019. This reduction in cooling water will effectively reduce entrainment by 96%. In addition, the draft permit requires PNPS to achieve a through-screen velocity no greater than 0.5 fps at the traveling screens. Based on the 2012 ESA Consultation and information reviewed and assessed in development of the draft permit, the effects of the continued operation of PNPS at the current levels of seawater withdrawal and intake velocity on listed species are likely to be insignificant. The substantial reduction in both cooling water withdrawals and intake velocity as a result of terminating electrical generation will further reduce any potential impacts to listed species from entrainment and impingement.

11.3 Finding

It is EPA's opinion that the operation of this facility, as governed by this permit action, is not likely to adversely affect the listed species or any of their critical habitat occurring in the vicinity of the receiving water for the reasons discussed in the Attachments B, C, and D and the 2012 ESA Consultation letter and as summarized above.

Based on the analysis of potential impacts presented here, impacts to listed species from the withdrawal and discharge of cooling, process, and storm water at PNPS will be insignificant or discountable. EPA has made the preliminary determination that the renewal of the PNPS permit may affect, but is not likely to adversely affect, any species listed as threatened or endangered by NMFS or any designated critical habitat. This finding is consistent with the conclusion NMFS reached in 2012 during consultation with the NRC for relicensing PNPS. Because the draft permit includes effluent limitations and conditions that are as stringent as or more stringent than the conditions assessed in the 2102 consultation, the effects of the draft permit on threatened and endangered species and critical habitat, as described above, have already been considered and EPA has determined that re-initiation of consultation is not necessary at this time. EPA is seeking concurrence from NMFS regarding this determination through the information presented in this fact sheet.

Re-initiation 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.

During the public comment period, EPA has provided a copy of the draft permit and fact sheet to both NMFS and USFWS.

12.0 ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

Pursuant to section 305(b)(2) of 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 Services (NMFS) if EPA's action or proposed actions that it funds, permits, or undertakes, may adversely affect "essential fish habitat," *see also id.* § 1855(b)(2); 50 C.F.R. § 600.920(a)(1), which is defined 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 that reduces 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 fisheries management plans exist. 16 U.S.C. § 1855(b)(1)(A). EFH designations for New England were approved by the U.S. Department of Commerce on March 3, 1999. The following is a list of the EFH species and applicable life stage(s) for Cape Cod Bay including waters from Plymouth Harbor south to Lookout Point in Plymouth, MA:

Species	Eggs	Larvae	Juveniles	Adults
Atlantic cod *(Gadus morhua)*	X	X	X	X
haddock *(Melanogrammus aeglefinus)*	X	X		
pollock *(Pollachius virens)*		X	X	X
whiting *(Merluccius bilinearis)*	X	X	X	X
offshore hake *(Merluccius albidus)*				
red hake *(Urophycis chuss)*	X	X	X	X
white hake *(Urophycis tenuis)*	X	X	X	X
redfish *(Sebastes fasciatus)*	n/a			
witch flounder *(Glyptocephalus cynoglossus)*				
winter flounder *(Pseudopleuronectes americanus)*	X	X	X	X
yellowtail flounder *(Limanda ferruginea)*	X	X	X	X
windowpane flounder *(Scophthalmus aquosus)*	X	X	X	X
American plaice *(Hippoglossoides platessoides)*	X	X	X	X
ocean pout *(Macrozoarces americanus)*	X	X	X	X

Atlantic halibut *(Hippoglossus hippoglossus)*	X	X	X	X
Atlantic sea scallop *(Placopecten magellanicus)*	X	X	X	X
Atlantic sea herring *(Clupea harengus)*	X	X	X	X
monkfish *(Lophius americanus)*	X	X		
bluefish *(Pomatomus saltatrix)*			X	X
long finned squid *(Loligo pealeii)*	n/a	n/a	X	X
short finned squid *(Illex illecebrosus)*	n/a	n/a	X	X
Atlantic butterfish *(Peprilus triacanthus)*	X	X	X	X
Atlantic mackerel *(Scomber scombrus)*	X	X	X	X
summer flounder *(Paralichthys dentatus)*				X
scup *(Stenotomus chrysops)*	n/a	n/a	X	X
black sea bass *(Centropristis striata)*	n/a			
surf clam *(Spisula solidissima)*	n/a	n/a	X	X
ocean quahog *(Artica islandica)*	n/a	n/a		
spiny dogfish *(Squalus acanthias)*	n/a	n/a	X	
tilefish *(Lopholatilus chamaeleonticeps)*				
bluefin tuna *(Thunnus thynnus)*			X	X

12.1 Description of Federal Action

As described in this fact sheet, EPA is proposing to reissue the NPDES permit for PNPS authorizing the withdrawal of once-through cooling water and the discharge of process water and stormwater through multiple outfalls. PNPS currently operates a single reactor unit with a boiling water reactor and turbine generator. Seawater is withdrawn from Cape Cod Bay through an intake embayment formed by two breakwaters. Seawater, primarily used for condenser cooling water, is pumped from the cooling water intake structure (CWIS) by two circulating water pumps and five salt service water pumps at a maximum volume of 467 MGD. Once-through condenser cooling water (Outfall 001) is combined with plant service cooling water (Outfall 010) and discharged to Cape Cod Bay via the discharge canal. In addition, PNPS discharges effluent for thermal backwash, intake screen wash water, neutralizing sump waste commingled with demineralizer reject water, station heating water, and stormwater, through various outfalls on an intermittent basis. A more detailed description of each of these waste streams and outfalls is provided in Section 2.0 of this fact sheet.

On October 13, 2015, Entergy announced that PNPS will cease generation of electricity at the facility no later than June 1, 2019. EPA expects that operation of the facility to support electrical generation will continue until May 31, 2019. Beginning June 1, 2019, seawater withdrawal and effluent discharge will be dramatically altered as a function of entering the decommissioning phase. To the best of its ability based on available information, EPA has taken this into account and has tailored the permit to reflect post-shutdown operations and discharges as appropriate. However, since the permittee cannot fully anticipate all changes in permitted flows that will take place post-shutdown, this permit may be modified post-shutdown if warranted by any new or increased discharges.

The draft permit establishes technology- and water quality-based effluent limitations and conditions designed to ensure the protection of designated uses of Cape Cod Bay, including as an excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions consistent with the Massachusetts surface water quality standards at 314 CMR 4.05(4)(a).

12.2 Analysis of Potential Effects on EFH

The primary effects of PNPS on EFH and the managed species are related to the discharge of heated water, and the impacts of entrainment and impingement associated with the CWIS, either directly or indirectly (e.g., entrainment of prey species).

12.2.1 Impacts from Seawater Withdrawals at the CWIS

EPA characterized the potential impacts of entrainment and impingement mortality from PNPS' CWIS in detail in Attachment D, Section 3.0 ("Biological Impact of Cooling Water Intake Structures"). EPA briefly summarizes the impacts here. Based on sampling conducted by the facility since 1980, EPA estimates that, on average, PNPS entrains about 2.8 billion eggs and 354 million larvae annually, and impinges about 42,800 fish annually. PNPS has reported entrainment of early life stages of 17 EFH species and impingement of 20 EFH species. Additionally, entrainment likely impacts an unknown number of phytoplankton and zooplankton, as well as tens of thousands of macroinvertebrates (e.g., worms, shrimp, and crabs) that may be important prey for EFH species.

PNPS calculated equivalent adults for a subset of species using species- and life-stage specific survival rates from the scientific literature and the number of eggs and larvae entrained. Not all EFH species were included in this analysis because the species- and life-stage survival data are not available for every species. For those EFH species for which adequate data are available, the permittee estimates that entrainment likely results in the average annual loss of more than 17,000 age-3 winter flounder, 12,800 age-1 Atlantic herring, 1,800 age-2 Atlantic cod, and 1,400 age-3 Atlantic mackerel. Cumulatively over the life of the facility, impingement and entrainment at PNPS have likely resulted in the loss of millions of adult fish designated as EFH species.

Based on Entergy's proposal to terminate the generation of electricity at PNPS by June 1, 2019, the draft permit requires the permittee to cease seawater withdrawals for the main condenser by this date. Elimination of seawater withdrawals for electrical generation will result in an average flow reduction of 96% beginning no later than June 1, 2019. By eliminating seawater withdrawals for the main condenser, PNPS will achieve an actual through-screen intake velocity of no more than 0.5 fps. Together, EPA has determined that a 96% reduction in flow and 0.5 fps actual through-screen velocity are the "best technology available" to minimize the adverse environmental impacts from impingement and entrainment. This determination is explained in more detail in Sections 6.0 and 7.0 of Attachment D ("Assessment of Cooling Water Intake Structure Technologies and Determination of Best Technology Available Under CWA § 316(b)"). EPA believes that this flow reduction will effectively minimize any potential impacts from impingement and entrainment on species with designated EFH in Cape Cod Bay.

12.2.2 Impacts from Effluent Discharges

Discharge of heated effluent can have both lethal and sublethal effects on organisms in the vicinity of the thermal plume. Lethal thermal shock is most likely to occur closest to the discharge source. Sublethal effects may include reduced egg hatching success, larval developmental inhibition, or a change in the composition of the biotic community. Environmental responses to thermal effluent include avoidance of biota, scouring of vegetation and, in some cases, attraction to the thermal plume is possible.

The draft permit includes a maximum effluent temperature limit of 102°F and maximum rise in temperature of 32°F at Outfall 001 (heated non-contact cooling water from the main condenser), which is consistent with the limits in the current permit. The company's thermal discharge and its effects on ocean temperatures were modeled by Pagenkopf and others from MIT (Pagenkopf, *et al*., 1974; 1976). Field characterizations of the plume were also conducted by MIT in the early 1970's in part to validate the model. Additional field studies to characterize ocean-bottom plume dimensions were conducted by EG&G (1995). A detailed description of the thermal plume and its effects on aquatic organisms, including species for which EFH has been designated, are provided in Attachments B and C of this fact sheet.

The PNPS thermal discharge is released to Cape Cod Bay. The near-field shape of the plume and its degree of contact with the bottom are constantly changing throughout the tidal cycle. At stages near low-tide, the plume has its greatest effect on the bottom, but due to the slope of the bottom adjacent to the facility, the large tidal range (about 10'), and other variables, the most extensive measured plume effects (heat and velocity) to the bottom have been limited to about an acre or less, although, in theory, plume effects to the bottom could be greater. Due to its buoyancy, the bulk of the plume rises to the surface and its horizontal spread increases with distance from the point of release. In tidal periods around and including low tide, the plume can interact directly with the bottom to a distance of about 700 ft. (but changes with the degree of tidal fluctuation which varies over the course of each month and seasonally). As the tide progresses from low to high and the height of the water column increases, the plume lifts from the bottom but spreads to a much greater extent in the far-field. Because the shape of the plume is constantly changing throughout the day, from day to day and throughout the seasons, there is little consistency to the location of the impact of the far-field plume on water temperatures. Far-field delta temperatures of 1°C from background are typically found in only the top 3-8 feet of the water column. Heat in the plume is extracted both by surrounding water and by the atmosphere. The rate of release of plume heat to the atmosphere is greatly affected by wind velocity, the difference between ambient air temperature and water temperature, humidity, tidal stage (which affects the horizontal and vertical shape of the plume) and other factors.

EPA and MassDEP have concluded that the current permit limits will assure the protection and propagation of the balanced, indigenous population and that there are likely to be no adverse effects from the thermal plume on benthic flora, benthic fauna, and pelagic fish, including species for which EFH has been designated. See Section 7 and Attachments B and C of this fact sheet for further discussion of the potential impacts of the thermal plume. Moreover, upon termination of the generation of electricity at PNPS (no later than June 1, 2019), PNPS will no longer discharge non-contact cooling water from the main condenser after terminating electrical generation which will eliminate the primary source of heated effluent to Cape Cod Bay. As a result, PNPS will be able to meet more stringent temperature limits no later than June 1, 2019.

12.3 Conclusion

EPA has concluded that the limits and conditions in the draft permit minimize adverse effects to EFH for the following reasons:

- All permitted limits in the draft permit are as stringent as or more stringent than those in the current permit and consistent with Massachusetts surface water quality standards for the protection of fish and fish habitat.

- The draft permit prohibits the discharge of pollutants or combination of pollutants in toxic amounts.

- The draft permit includes numeric limitations for pH, oil and grease, total residual oxidants, tolyltriazole, sodium nitrate, and total suspended solids that are protective of state water quality standards.

- The thermal plume from PNPS is relatively small compared to the receiving water and dissipates rapidly. Over 40 years of biological monitoring data demonstrate that the variance-based limits will assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife.

- Following termination of electrical generation at PNPS, the facility will cease discharges of non-contact cooling water from the main condenser, which will drastically reduce the maximum effluent temperature and rise in temperature compared to the existing conditions.

- The draft permit establishes requirements related to the CWIS that reduce cooling water withdrawals from Cape Cod Bay by 96%, prohibit cooling water withdrawals for the main condenser, and require the facility to achieve a through-screen velocity no greater than 0.5 fps. These conditions become effective upon terminating electrical generation at the plant and no later the June 1, 2019 and are expected to reduce impingement and entrainment of all aquatic life by 96%. These conditions will also significantly reduce the temperature differential and extent of the thermal plume.

- To reduce impingement mortality, the draft permit requires PNPS to continuously rotate the traveling screens in the interim period from the effective date of the permit until termination of electrical generation.

It is the opinion of EPA that the conditions and limitations contained in the draft permit will adequately protect all aquatic life, including those with designated EFH in Cape Cod Bay, and that further mitigation is not warranted. If adverse impacts to EFH are detected as a result of this permit action, or if new information is received that changes the basis for our conclusion, NMFS will be notified and an EFH consultation will be initiated. NMFS has been notified of the permit action and has been provided with copies of the draft permit and fact sheet during the public comment period.

13.0 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 C.F.R. §§ 122.41(j), 122.44 (*l*), 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 MassDEP. The draft permit requires that, no later than three (3) 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 three 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 C.F.R. § 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 three (3) month time frame and opt-out provisions as identified for NetDMR. Certain exceptions are provided in the permit such as for the submittal of pre-treatment reports and 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 will no longer be required to submit hard copies of DMRs to MassDEP. However, permittees must continue to send hard copies of reports other than DMRs to MassDEP until further notice from MassDEP.

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.

14.0 STATE CERTIFICATION REQUIREMENTS

EPA may not issue a permit unless the Massachusetts Department of Environmental Protection (MassDEP) certifies that the effluent limitations included in the permit are stringent enough to assure that the discharge will not cause the receiving water to violate the Massachusetts Surface Water Quality Standards. The MassDEP has reviewed the draft permit and advised EPA that the limitations are adequate to protect water quality. EPA has requested permit certification by the State pursuant to 40 C.F.R. § 124.53 and expects the draft permit will be certified.

15.0 PUBLIC COMMENT PERIOD, PUBLIC HEARING, AND PROCEDURES FOR FINAL DECISION

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to George Papadopoulos, U.S. EPA, Office of Ecosystem Protection, Industrial Permits Section, Mailcode OEP 06-1, 5 Post Office Square, Suite 100, Boston, Massachusetts 02109-3912.

Prior to such date, any person may submit a written request 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. EPA will consider any request for a hearing and may decide to hold a public hearing 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 any public hearings that may be held, the EPA will issue a Final Permit decision and forward a copy of the final decision, including responses to any significant comments, 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.

16.0 EPA & MASSDEP CONTACTS

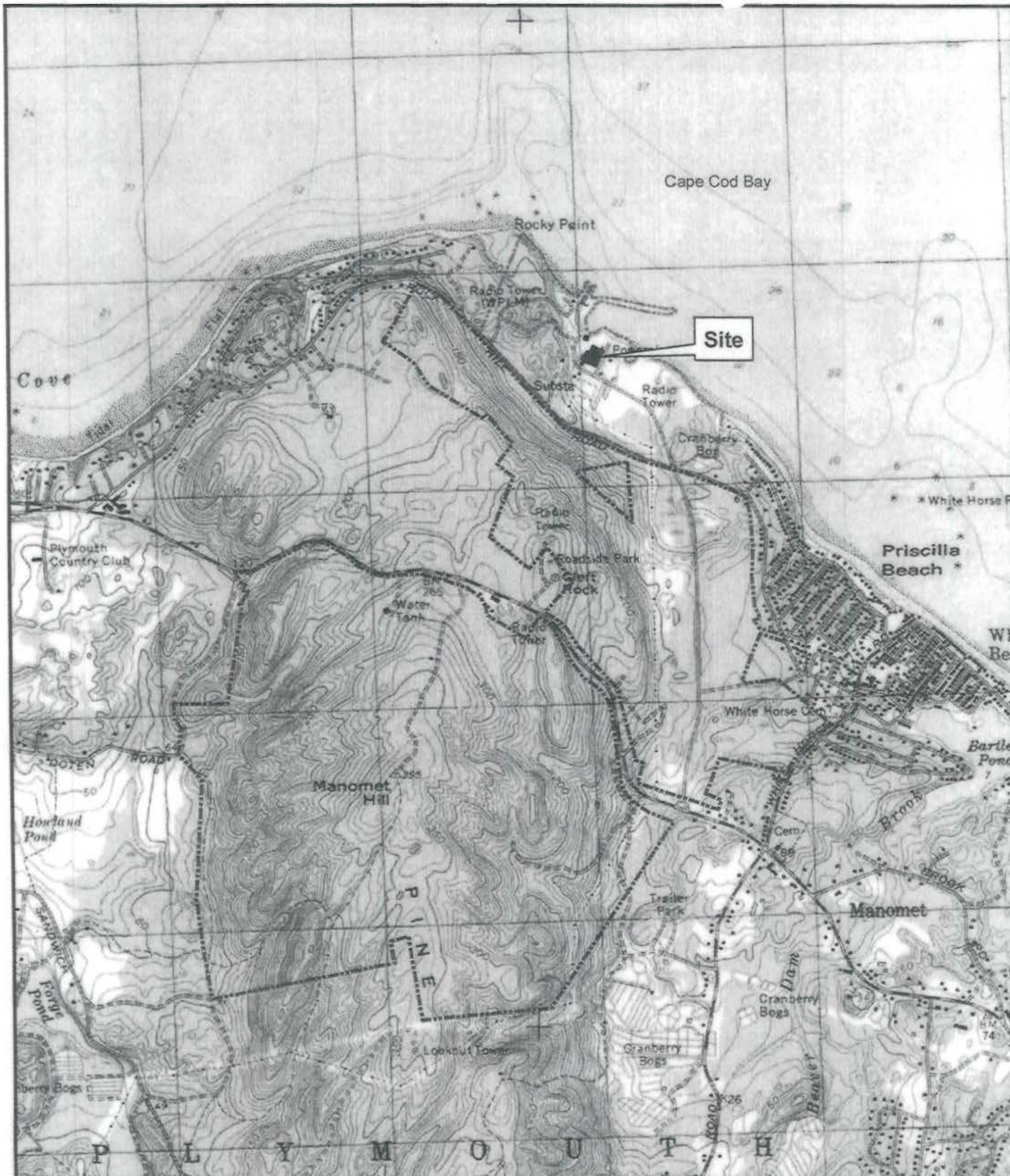
Additional information concerning the draft permit may be obtained between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday, excluding holidays, from the EPA and MassDEP contacts below:

George Papadopoulos, Industrial Permits Section
5 Post Office Square - Suite 100 - Mailcode OEP 06-1
Boston, MA 02109-3912
Telephone: (617) 918-1579 FAX: (617) 918-0579

Cathy Vakalopoulos, Massachusetts Department of Environmental Protection
Bureau of Water Resources
1 Winter Street, Boston, Massachusetts 02108
catherine.vakalopoulos@state.ma.us
Telephone: (617) 348-4026; FAX: (617) 292-5696

May 18, 2016
Date

Ken Moraff, Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency



Legend

Approximate Site Boundary

Power Block

1:24,000

0 500 1,000 2,000 3,000 4,000 Feet

Figure 1 - Site Locus Map

Pilgrim Nuclear Power Station
Plymouth, MA

ERM

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Figure 2 – Regional Site Locus Map

Map of Massachusetts Bay, showing location of Pilgrim Nuclear Power Station (PNPS) on the western side of Cape Cod Bay.

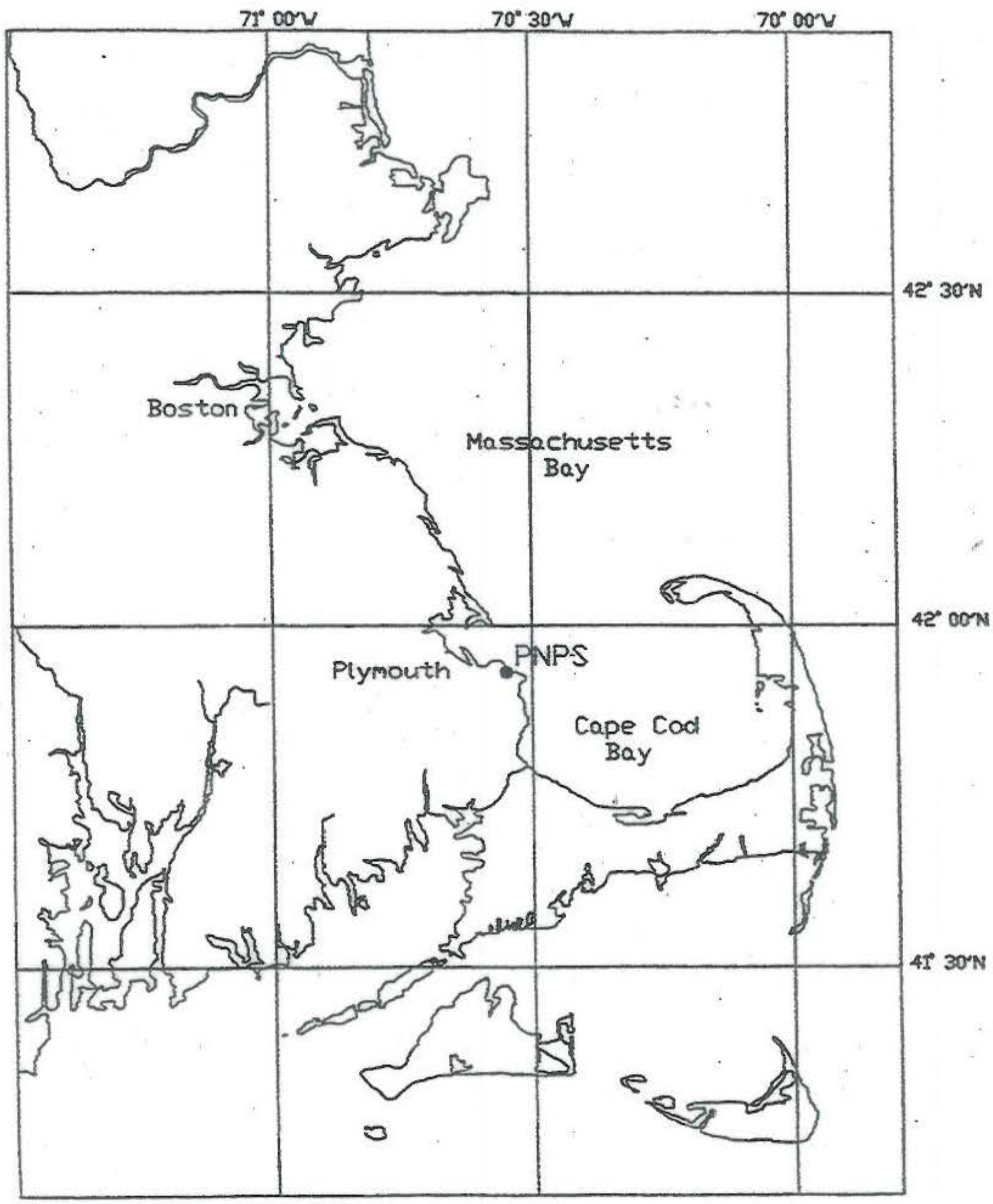


Figure 3 - Site Layout With Outfalls

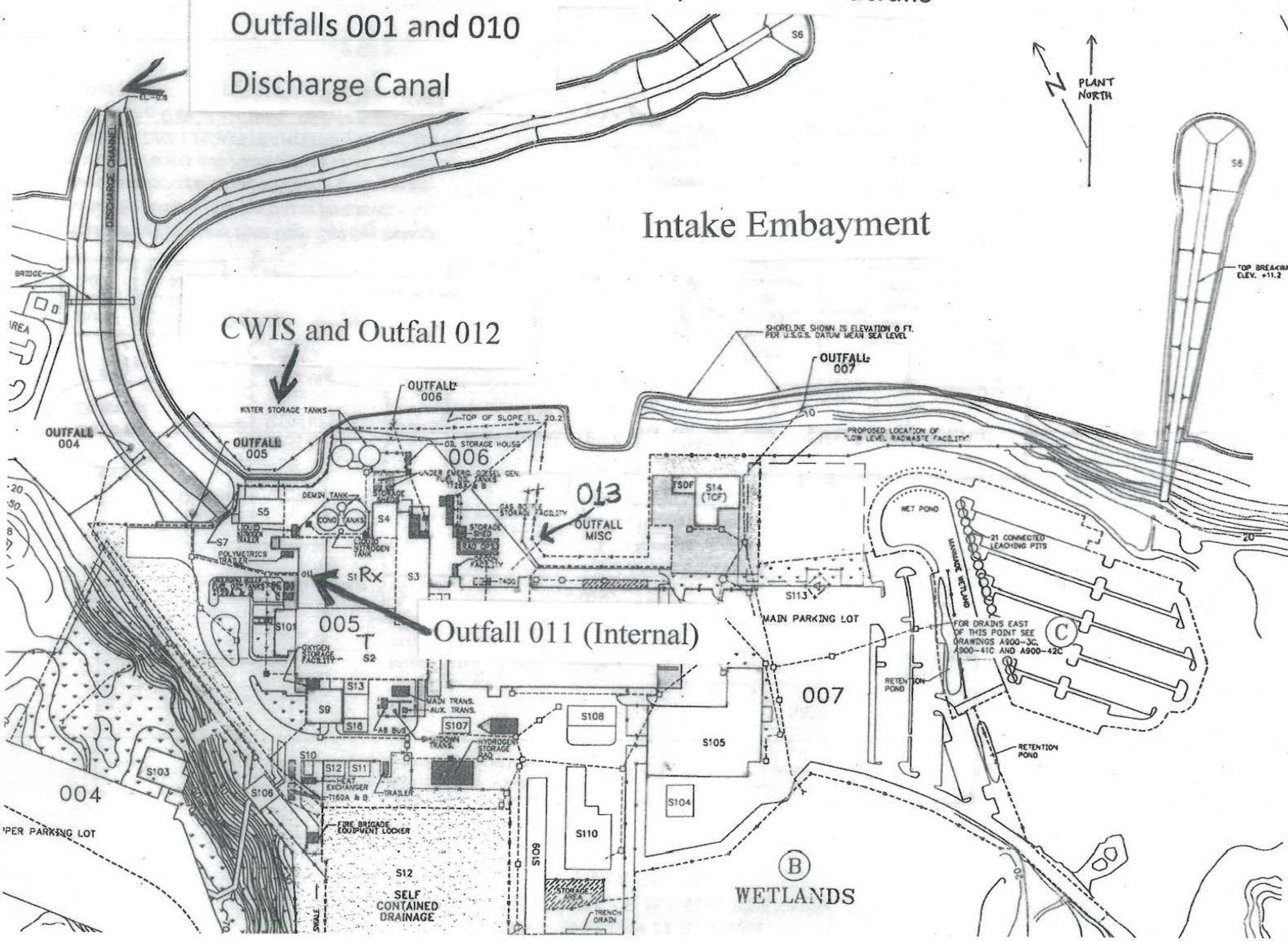
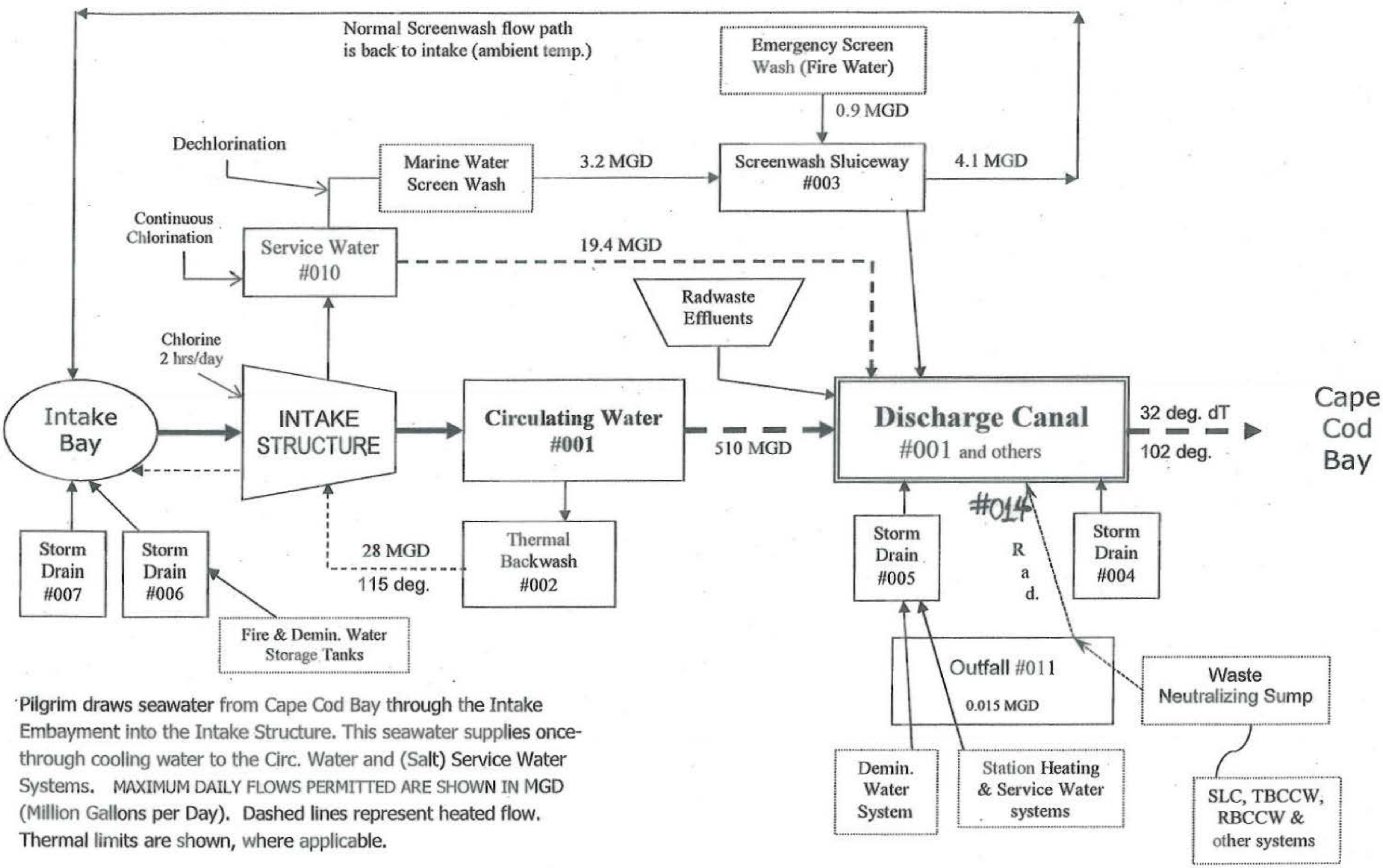


FIGURE 4

WATER FLOW DIAGRAM
PILGRIM NUCLEAR POWER STATION
PLYMOUTH, MA

This diagram shows the basic elements related to NPDES Permit outfalls for Pilgrim Station



Pilgrim draws seawater from Cape Cod Bay through the Intake Embayment into the Intake Structure. This seawater supplies once-through cooling water to the Circ. Water and (Salt) Service Water Systems. MAXIMUM DAILY FLOWS PERMITTED ARE SHOWN IN MGD (Million Gallons per Day). Dashed lines represent heated flow. Thermal limits are shown, where applicable.

Figure 5

Cross Section and Plan Views of Cooling Water Intake Structure (CWIS)

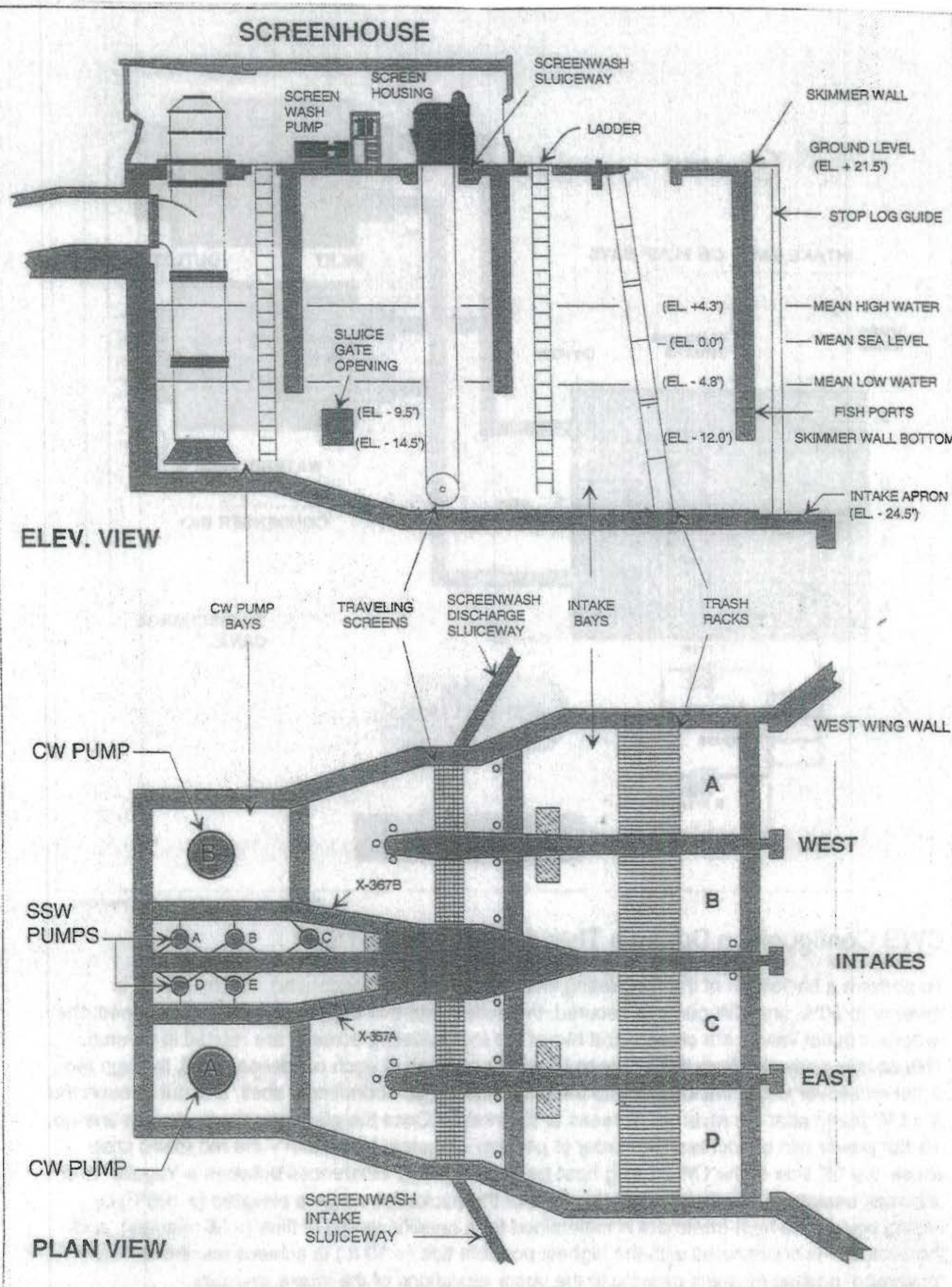
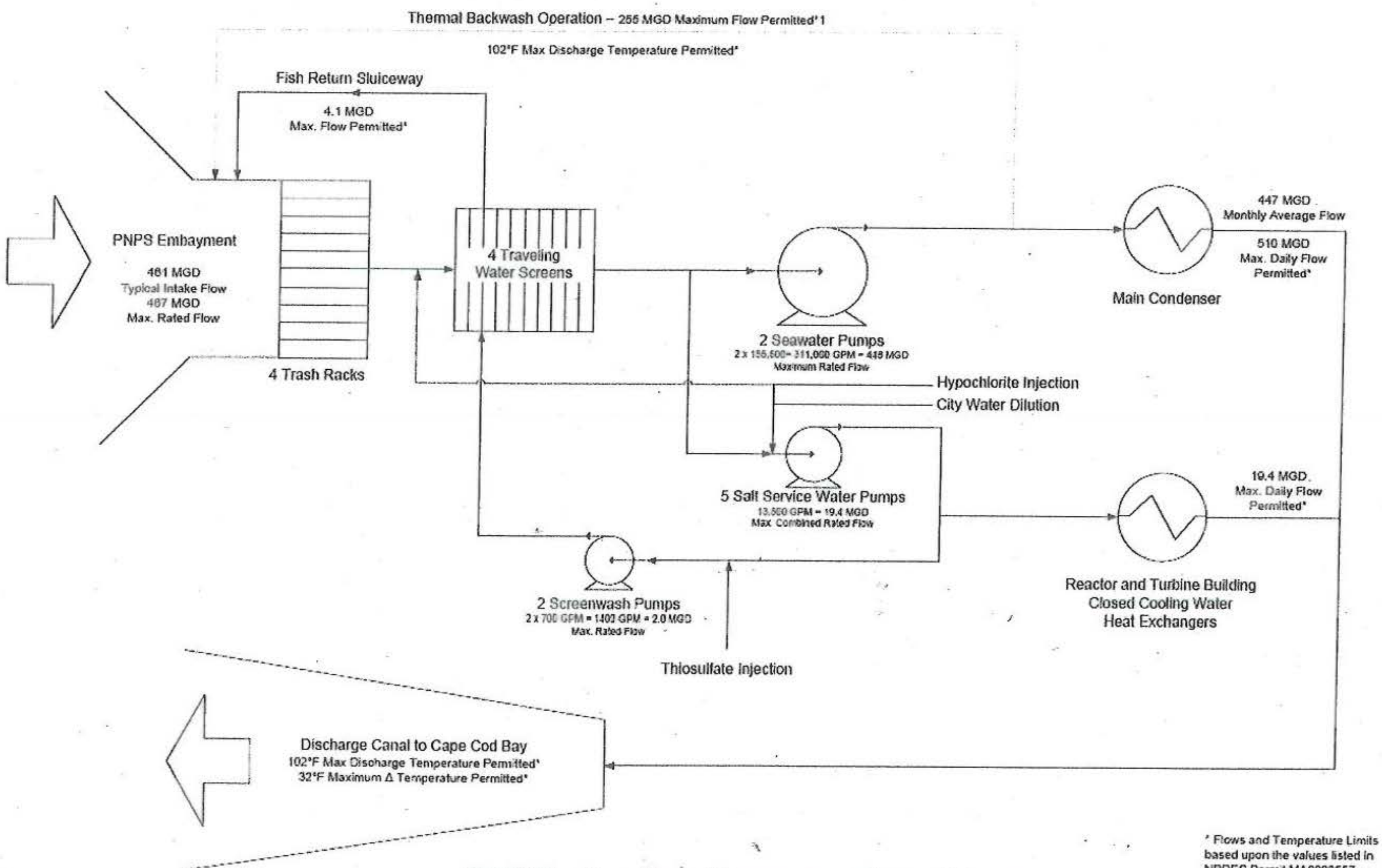


Figure: Intake Structure at Pilgrim Nuclear Power Station. *The top diagram is a cross sectional view of the intake, while the lower diagram is a plan view.*

Figure 6 - Cooling Process Flow Diagram



PNPS Cooling Process Flow Diagram

* Flows and Temperature Limits based upon the values listed in NPDES Permit MA0003557.

Figure 7 - Schematic of Fish Return System

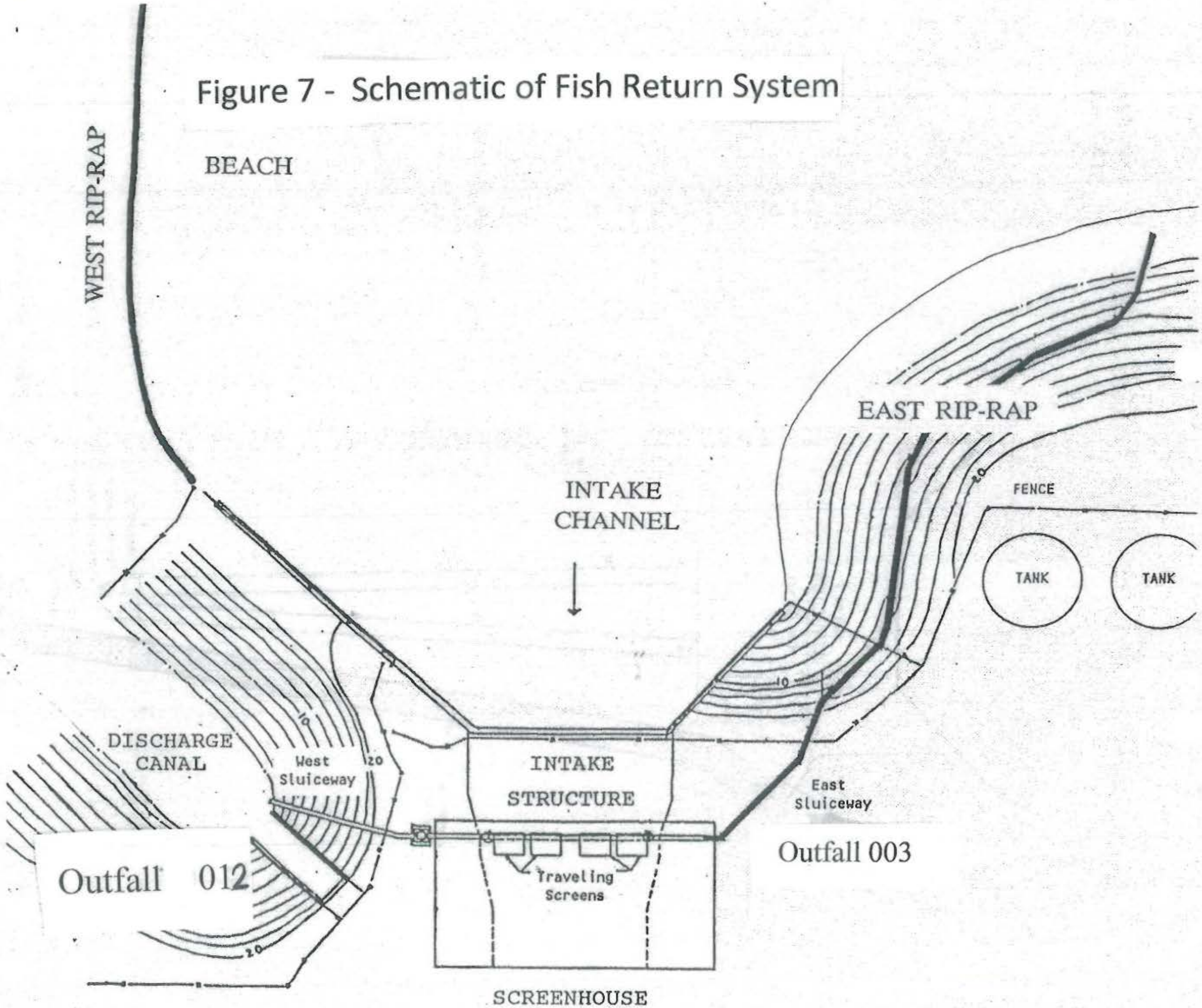
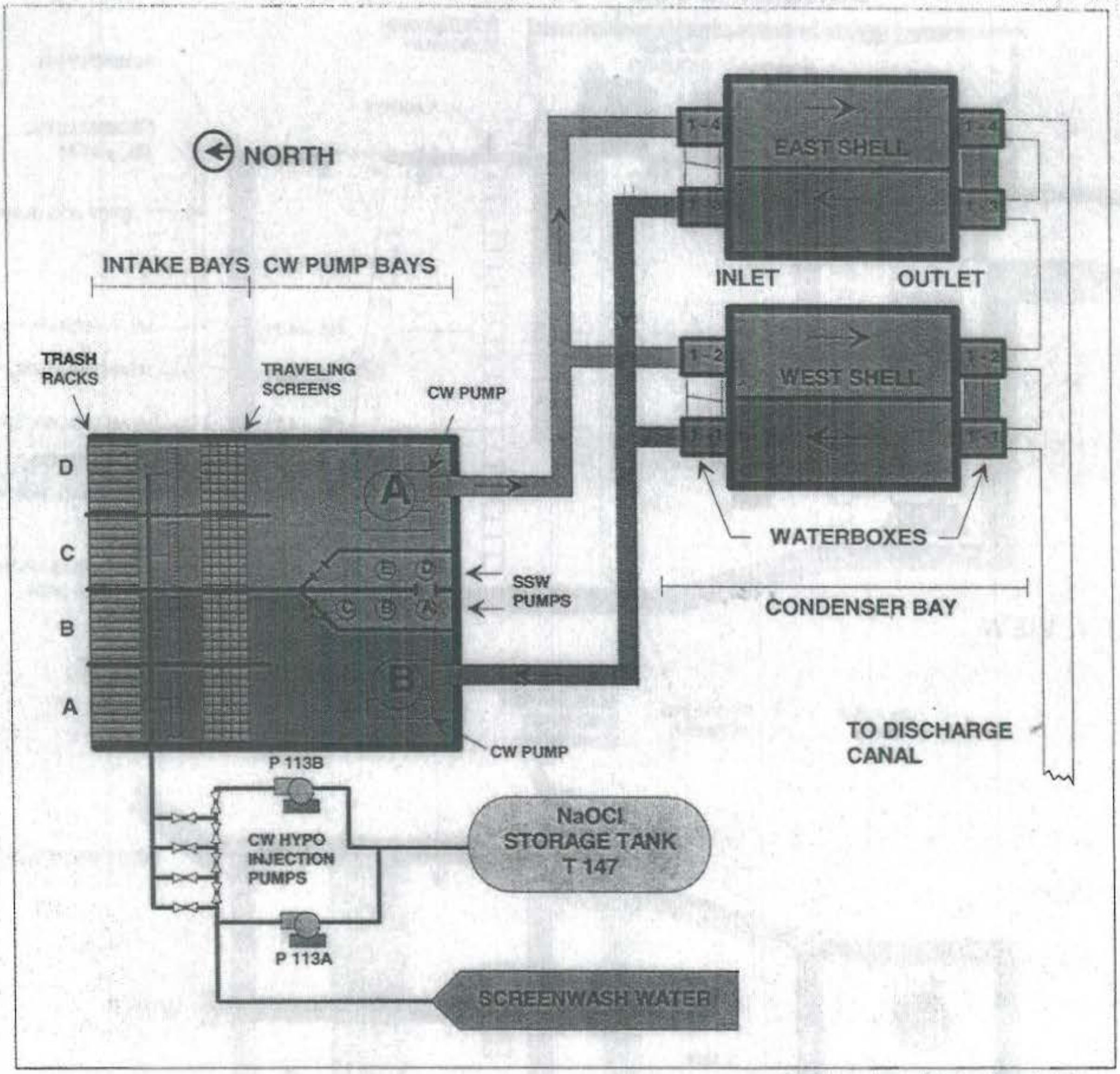


Figure 8 - Configuration of CWIS Thermal Backwash



Graphic courtesy of Marine Biocontrol Corp.

CWS Configuration During a Thermal Backwash (TBW)

To perform a backwash of the Circulating Water System (and condenser), reactor power is lowered to 50%, one CW pump is secured, the outlet waterbox crossover valves are opened, the waterbox outlet valves are closed, and two of the four traveling screens are rotated in reverse. This causes seawater from the intake to flow from one half of each condenser shell, through the outlet crossover valve, backwards into the other half of each condenser shell, and out through the idle CW pump past the reversed screens to the intake. Once the plant is in the backwash line-up, reactor power can be increased in order to perform a thermal backwash – the red (dark) area shows the "B" side of the CWS being heat-treated. The key differences between a "regular" and "thermal" backwash are that: the temperature of the backwash water is elevated (> 105°F) by raising power, the heat-treatment is maintained for a specific length of time (> 35 minutes), and the evolution is coordinated with the highest possible tide (> 10 ft.) to achieve maximum "coverage" against mussels growing in the upper elevations of the intake structure.

Attachment A: Discharge Monitoring Data

Pilgrim Nuclear Power Station - Outfall 001

Monitoring Period End Date	Flow		Total Residual Oxidants		Effluent Temperature	Delta T Intake – Effluent Temperature
	MGD	MGD	mg/l	mg/l	ºF	ºF
	Mon Avg	Daily Max	Mon Avg	Daily Max	Daily Max	Daily Max
Jan-08	446.4	446.4	0.04	0.07	77.2	28.7
Feb-08	446.4	446.4	0.04	0.06	72.5	28.7
Mar-08	446.4	446.4	0.04	0.06	73.5	28.7
Apr-08	427	446.4	0.04	0.08	80.1	29.8
May-08	445.5	446.1	0.05	0.08	84.3	28.5
Jun-08	444.3	446.4	0.06	0.08	94	28.6
Jul-09	446.4	446.4	0.06	0.08	90.9	27.9
Aug-08	444.3	446.4	0.04	0.08	99.2	27.9
Sep-08	446.4	446.4	0.05	0.08	99.4	28.2
Oct-08	444.2	446.4	0.05	0.08	90.3	28.1
Nov-08	446.4	446.4	0.05	0.07	82.2	27.9
Dec-08	441.9	446.4	0.05	0.07	78.7	29
Jan-09	446.4	446.4	0.03	0.06	69.9	29.1
Feb-09	446.4	446.4	0.05	0.08	70.9	28.8
Mar-09	446.4	446.4	0.05	0.08	74.2	28.7
Apr-09	262.2	446.4	0.04	0.05	77.4	28.3
May-09	243.1	446.4	0.03	0.05	85.1	28.6
Jun-09	446.4	446.4	0.03	0.06	92.9	28.1
Jul-09	444.2	446.4	0.03	0.08	95	29.1
Aug-09	444.2	446.4	0.05	0.09	97.1	28.9
Sep-09	446.4	446.4	0.05	0.09	95.6	27.6
Oct-09	444.1	446.4	0.04	0.09	88.3	28
Nov-09	446.4	446.4	0.05	0.09	83.9	27.6
Dec-09	446.4	446.4	0.05	0.09	82.4	27.9
Jan-10	446.4	446.4	0.05	0.08	71.7	28.3
Feb-10	446.4	446.4	0.05	0.08	71	28.4
Mar-10	445.8	446.4	0.05	0.08	76.3	28.3
Apr-10	446.4	446.4	0.04	0.07	81.2	28.4
May-10	444.2	446.4	0.04	0.08	88.3	28.6
Jun-10	446.4	446.4	0.04	0.08	91.8	27.5
Jul-10	444.2	446.4	0.04	0.09	99	28.2
Aug-10	443.3	446.4	0.04	0.09	97.1	27.8
Sep-10	446.4	446.4	0.04	0.09	100.3	28
Oct-10	444	446.4	0.05	0.09	95.3	28.1
Nov-10	445.8	446.4	0.05	0.09	88.7	31.6
Dec-10	444.8	446.4	0.04	0.08	77.2	29.1

Jan-11	446.4	446.4	0.04	0.05	69	28.1
Feb-11	445.8	446.4	0.05	0.06	69.6	27.5
Mar-11	446.4	446.4	0.04	0.06	72.8	27.6
Apr-11	276	446.4	0.03	0.03	72.2	24.1
May-11	343.7	446.4	0.04	0.06	87.3	29.5
Jun-11	446.4	446.4	0.04	0.08	97.7	30.5
Jul-11	444.1	446.4	0.05	0.09	101.2	29.8
Aug-11	446.4	446.4	0.03	0.08	98.6	30.5
Sep-11	444.2	446.4	0.04	0.09	94.5	30.2
Oct-11	446.4	446.4	0.05	0.08	93.6	31.5
Nov-11	441.1	446.4	0.05	0.08	87.7	30.7
Dec-11	434	446.4	0.06	0.14	82.5	30.3
Jan-12	446.4	446.4	0.06	0.09	73.3	30.3
Feb-12	442.9	446.4	0.03	0.06	73.7	29.9
Mar-12	446.4	446.4	0.04	0.06	77.2	30.4
Apr-12	446.4	446.4	0.04	0.06	83.7	30.5
May-12	444.3	446.4	0.03	0.06	90	30.7
Jun-12	444.4	446.4	0.02	0.04	95.7	30.5
Jul-12	446.4	446.4	0.02	0.08	98.2	29.9
Aug-12	444.3	446.4	0.04	0.09	99.3	29.8
Sep-12	446.4	446.4	0.03	0.19	96.5	30
Oct-12	446.4	446.4	0.03	0.07	88.3	30.1
Nov-12	443.1	446.4	0.04	0.08	86.8	30
Dec-12	446.4	446.4	0.03	0.05	78.5	29.8
Jan-13	446.4	446.4	0.04	0.07	72.5	29.4
Feb-13	385.7	446.4	0.07	0.16	73.8	28.9
Mar-13	446.4	446.4	0	0	73.1	27.5
Apr-13	217.7	446.4	0	0	76	26.3
May-13	287.9	446.4	0	0	71.2	15.8
Jun-13	443.1	446.4	0.02	0.05	93.9	31.1
Jul-13	446.4	446.4	0.02	0.04	101.6	31.6
Aug-13	444	446.4	0.02	0.08	98.6	31
Sep-13	445.8	446.4	0.02	0.04	92.9	29.9
Oct-13	426.7	446.4	0.02	0.04	95.1	29.9
Nov-13	443.7	446.4	0.04	0.07	86.7	30.3
Dec-13	446.4	446.4	0.05	0.07	76.1	30.7
Jan-14	446.4	446.4	0.05	0.08	76	31.6
Feb-14	446.4	446.4	0.04	0.05	70.9	30.6
Mar-14	443.4	446.4	0.03	0.05	75.5	30.6
Apr-14	446.4	446.4	0.03	0.07	79.4	31
May-14	445.8	446.4	0.03	0.06	88	30.8
Jun-14	444.1	446.4	0.03	0.06	95.7	30.2
Jul-14	446.4	446.4	0.03	0.05	94.7	30.4
Aug-14	439.3	446.4	0.03	0.06	99	30.3
Sep-14	446.4	446.4	0.02	0.07	99.5	30.4
Oct-14	443.9	446.4	0.03	0.05	95.2	30.4
Nov-14	446.4	446.4	0.04	0.06	89.6	29.8
Dec-14	444.7	446.4	0.04	0.06	80.4	30.8

Jan-15	389.6	446.4	0.03	0.04	73	30.4
Feb-15	428.6	446.4	0.07	0.08	71.7	30.3
Mar-15	446.4	446.4	0.03	0.05	72.1	30.4
Apr-15	282	446.4	0.03	0.05	76.9	30.8
May-15	221.7	446.4	0.02	0.02	83.1	29.5
Jun-15	444	446.4	0.04	0.07	91	30.9
Jul-15	446.4	446.4	0.03	0.05	95.8	30.5
Aug-15	444	446.4	0.03	0.05	101.4	30.6
Sep-15	446.4	446.4	0.03	0.05	99.2	30.4
Oct-15	444.1	446.4	0.03	0.04	95.6	30.3
Nov-15	446.4	446.4	0.04	0.07	91.1	30.6
Dec-15	443.7	446.4	0.04	0.05	83	29.9
Jan-16	446.4	446.4	0.02	0.02	76.2	30.1
Feb-16	438	446.4	0.03	0.05	77	
Mar-16	443.3	446.4	0.04	0.07	76.1	30.1

Outfall 001 Summary						
1991 Permit Limits	447	510	0.1	0.1	102	32
Minimum	217.7	446.1	0	0	69	15.8
Maximum	446.4	446.4	0.07	0.19	101.6	31.6
Average	433.4	446.4	0.038	0.068	85.5	29.3
# of violations	0	0	0	3	0	0
# of samples	99	99	99	99	99	98

Attachment A: Discharge Monitoring Data

Pilgrim Nuclear Power Station - Outfalls 002, 003, and 010

	Outfall 002		Outfall 003		Outfall 010		
Monitoring Period End Date	Flow, Daily Max	Eff. Temp.	Flow, Monthly Average	Flow, Daily Max	Flow, Monthly Avg	Total Residual Oxidants MA	DM
	MGD	°F	MGD	MGD	MGD	mg/l	mg/l
Jan-08			1.1	3.2	7.2	0.29	0.59
Feb-08			0.9	3.2	8.5	0.33	1.25
Mar-08			0.7	2.9	7.6	0.28	0.59
Apr-08			1	3.2	7.5	0.31	0.69
May-08	12.1	108.6	1.7	3.2	10.7	0.26	0.44
Jun-08	16.3	111.8	1	2.8	14.2	0.29	0.49
Jul-09			1.1	2.6	14.4	0.24	0.49
Aug-08	26.2	109.5	1.4	3.2	14.5	0.23	0.48
Sep-08			1.7	3.2	11.3	0.22	0.96
Oct-08	14.7	110.9	1.7	3.2	13.4	0.27	0.88
Nov-08			1.8	3.2	11.6	0.29	0.99
Dec-08			2.4	3.2	9.4	0.3	0.83
Jan-09			2.9	3.2	7.2	0.29	0.61
Feb-09			1.5	3.2	7.2	0.27	0.74
Mar-09			2.1	3.2	7.5	0.26	0.61
Apr-09			2	3.2	7.6	0.1	0.45
May-09			1.2	3.2	8	0.09	0.41
Jun-09			2.4	3.2	7.2	0.23	0.54
Jul-09	20.3	112.9	1.5	3.2	14.4	0.13	0.5
Aug-09	24.2	113.1	1.5	3.2	12.6	0.26	0.64
Sep-09			2.5	3.2	14.4	0.22	0.7
Oct-09	18.6	113.3	2.5	3.2	12.3	0.35	0.7
Nov-09			2.3	3.2	11.3	0.3	0.67
Dec-09			1.6	2.4	1.9	0.3	0.67
Jan-10			1.6	3.2	10.2	0.34	0.73
Feb-10			1.3	3.2	8	0.3	0.73
Mar-10			2	3.2	9.3	0.27	1.03
Apr-10			0.9	3.2	9.5	0.21	0.5
May-10	23.6	114.9	1.1	3.2	10.9	0.28	0.74
Jun-10			1	3.2	14.1	0.28	0.6
Jul-10	24.2	113.3	0.9	3.2	14.4	0.2	0.58
Aug-10	21.5	114	1.4	3.2	14.4	0.29	0.69
Sep-10			1.8	3.2	7.2	0.3	0.7
Oct-10	20.6	112.5	1.6	3.2	14.4	0.3	0.66
Nov-10			2.6	3.2	11.6	0.33	2.4
Dec-10			2.5	3.2	8.2	0.27	0.71

Jan-11			1.4	3.2	8.7	0.3	0.73
Feb-11			1.1	3.2	7.4	0.3	0.73
Mar-11			0.9	3.2	9.2	0.23	0.68
Apr-11			0.8	3.2	7.6	0.14	1.3
May-11			2	3.2	9.5	0.19	0.61
Jun-11			2.7	3.6	13.7	0.31	0.69
Jul-11	17.5	111.2	2.2	3.2	14.4	0.28	1.15
Aug-11			2.7	3.3	14.3	0.23	0.65
Sep-11	18	109.7	2.5	3.2	14.4	0.24	0.66
Oct-11			2.4	3.2	13.9	0.3	0.93
Nov-11	14.7	107.6	2.3	3.2	8.7	0.35	0.75
Dec-11			2.6	3.2	8.1	0.27	0.97
Jan-12			1.2	3.2	7.4	0.3	0.74
Feb-12	14.3	107.5	2	3.2	7.3	0.24	0.52
Mar-12			1.7	3.2	7.3	0.2	0.66
Apr-12			1.6	3.2	8.5	0.3	0.66
May-12	7.1	108	1.7	3.2	9.5	0.29	0.92
Jun-12	17.5	106.8	2.6	3.2	12.1	0.13	0.32
Jul-12			1.5	3.2	13.9	0.23	0.91
Aug-12	14.3	109	2	3.2	13.5	0.25	0.57
Sep-12			2.2	3.2	12.9	0.29	0.84
Oct-12			2.6	3.2	10.9	0.31	0.7
Nov-12	15	108.9	2.3	3.2	9	0.31	0.75
Dec-12			1.9	3.2	7.4	0.3	0.63
Jan-13			0.8	3.2	7.3	0.23	0.71
Feb-13			1.4	3.2	7.3	0.28	0.72
Mar-13			2.3	3.2	7.2	0.26	0.76
Apr-13			0.5	2.6	5.9	0.13	0.64
May-13			0.2	2.6	7.3	0.14	0.72
Jun-13	19.7	110.2	2.1	3.2	13.8	0.17	0.41
Jul-13			2	3.2	14.4	0.11	0.23
Aug-13	20.6	108.7	2.1	3.2	13.5	0.18	0.69
Sep-13			2.2	3.2	12.7	0.2	0.83
Oct-13	16.4	108.4	2.8	3.2	12.9	0.24	0.87
Nov-13	16.4	107.9	3.2	3.2	9.6	0.24	0.71
Dec-13			3	3.2	7.6	0.24	0.69
Jan-14			1.5	3.2	7.7	0.26	0.75
Feb-14			2.2	3.2	7.2	0.17	0.67
Mar-14	17.8	106	1.6	3.2	7.2	0.2	0.7
Apr-14			2.5	3.2	7.3	0.26	0.7
May-14			2.6	3.2	7.7	0.24	0.56
Jun-14	16.3	108.1	2.4	3.2	11.4	0.21	0.48
Jul-14			2.1	3.2	12.9	0.22	0.58
Aug-14	20.8	106.8	2.6	3.2	13.8	0.14	0.43
Sep-14			2.9	3.2	12.5	0.24	0.47
Oct-14	14.7	107.2	2.4	3.2			
Nov-14			1.6	3.2	8.6	0.26	0.55
Dec-14	16.3	110	1.9	3.2	8.7	0.26	0.6

Jan-15			1.1	3.2	7.9	0.24	0.57
Feb-15			2.6	3.2	6.9	0.11	0.48
Mar-15			1	3.2	7.2	0.28	0.52
Apr-15			0.4	3.2	7.2	0.13	0.54
May-15			0.8	1.6	8.8	0.1	0.92
Jun-15	19.2	107	1.8	3.2	10.8	0.17	0.53
Jul-15			2	3.2	14	0.23	0.43
Aug-15	17.4	107.1	2.1	3.2	14	0.2	0.55
Sep-15			2.3	3.2	14.4	0.25	0.55
Oct-15	15.5	108.6	2.9	3.2	12.2	0.27	0.74
Nov-15			2.3	3.2	10.7	0.26	0.6
Dec-15	16.9	109.6	2.6	3.2	10.4	0.25	0.71
Jan-16			2.2	3.2	7.7	0.29	0.71
Feb-16			2.1	3.2	7.4	0.24	0.55
Mar-16	14.1	106.3	2.2	3.2	7.3	0.28	0.81

Outfalls 002, 003, and 010 Summary							
	Outfall 002		**Outfall 003**		**Outfall 010**		
1991 Permit Limits	255	120	4.1	4.1	19.4	0.5	1.0
Minimum	7.1	106	0.2	1.6	1.9	0.09	0.23
Maximum	26.2	114.9	3.2	3.6	14.5	0.35	2.4
Average	17.6	109.7	1.86	3.1	10.1	0.25	0.70
# of violations	0	0	0	0	0	0	5
# of samples	33	33	99	99	99	99	99

Attachment A: Discharge Monitoring Data

Pilgrim Nuclear Power Station - Outfall 011

Monitoring Period End Date	Flow		Total Suspended Solids	
	Monthly Avg	Daily Max	Monthly Avg	Daily Max
	MGD	MGD	mg/l	mg/l
Jan-08				
Feb-08				
Mar-08				
Apr-08				
May-08	0.0053	0.0053	0.5	0.5
Jun-08	0.0063	0.0122	0.5	0.5
Jul-09	0.0002	0.0002	0.5	0.5
Aug-08				
Sep-08				
Oct-08				
Nov-08				
Dec-08				
Jan-09	0.0104	0.0104	20	20
Feb-09				
Mar-09				
Apr-09	0.0054	0.0054	7	7
May-09	0.0002	0.0002	11.3	11.3
Jun-09				
Jul-09				
Aug-09				
Sep-09				
Oct-09	0.0049	0.0075	0.5	0.5
Nov-09				
Dec-09				
Jan-10				
Feb-10	0.001	0.001	21.5	21.5
Mar-10				
Apr-10				
May-10	0.0024	0.0024	0.3	0.3
Jun-10				
Jul-10				
Aug-10				
Sep-10				
Oct-10				
Nov-10				
Dec-10	0.008	0.008	13.8	13.8

Jan-11	0.0078	0.0078	1.2	1.2
Feb-11	0.01	0.01	22.5	22.5
Mar-11	0.0096	0.01	7.45	21.5
Apr-11	0.0085	0.0097	4.3	11.2
May-11	0.0091	0.0099	10.8	14.2
Jun-11	0.0099	0.0099	5.4	5.4
Jul-11				
Aug-11	0.0027	0.0027	0.5	0.5
Sep-11	0.0043	0.0051	0.5	0.5
Oct-11				
Nov-11				
Dec-11	0.0088	0.009	6.8	15.5
Jan-12	0.0095	0.01	2.2	3.6
Feb-12	0.0044	0.0047	16.6	16.6
Mar-12				
Apr-12				
May-12				
Jun-12				
Jul-12	0.0045	0.005	0.5	0.5
Aug-12	0.0075	0.0075	0.5	0.5
Sep-12				
Oct-12				
Nov-12				
Dec-12				
Jan-13	0.0008	0.0008	11.2	11.2
Feb-13				
Mar-13	0.0096	0.0104	12.3	23.2
Apr-13				
May-13				
Jun-13				
Jul-13				
Aug-13				
Sep-13				
Oct-13	0.0084	0.0084	14.8	14.8
Nov-13				
Dec-13				
Jan-14				
Feb-14				
Mar-14				
Apr-14				
May-14	0.0035	0.006	19.9	20.8
Jun-14				
Jul-14				
Aug-14	0.0024	0.0024	0.4	0.4
Sep-14	0.0076	0.0076	0.4	0.4
Oct-14				
Nov-14				
Dec-14				

Jan-15				
Feb-15				
Mar-15				
Apr-15	0.01	0.01	26.4	26.4
May-15				
Jun-15				
Jul-15	0.0053	0.0085	1.2	1.2
Aug-15				
Sep-15				
Oct-15				
Nov-15				
Dec-15	0.01	0.01	6.6	6.6
Jan-16				
Feb-16				
Mar-16				

Outfall 011 Summary				
1991 Permit Limits	0.015	0.06	30	100
Minimum	0.0002	0.0002	0.3	0.3
Maximum	0.01014	0.0122	26.4	26.4
Average	0.0062	0.0068	7.8	9.2
# of violations	0	0	0	0
# of samples	32	32	32	32

Attachment B

Outline of § 316(a) Decision Criteria

As described earlier [or in the Fact Sheet, etc.], discharges of heat must satisfy both technology-based standards and any more stringent water quality-based requirements that may apply. Under Section 316(a), however, a less stringent thermal limit may be authorized where a permittee demonstrates to the satisfaction of the Administrator that the otherwise applicable thermal limit is more stringent than necessary to assure the protection and propagation of the waterbody's balanced, indigenous population of shellfish, fish and wildlife. 33 U.S.C. § 1326(a). EPA regulations define the term "balanced, indigenous population"—and its synonym, "balanced, indigenous community"—in the following way:

> . . . 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 to section 316(a).

40 CFR § 125.71(c).

In May 1977, EPA released draft CWA 316(a) guidance entitled, *Interagency 316(a) Technical Guidance Manual And Guide For Thermal Effects Sections Of Nuclear Facilities Environmental Impact Statements* (hereinafter "316(a) Technical Guidance Manual" or "Manual") to be used for, among other things, 316(a) determinations in NPDES permit renewals at nuclear facilities. The 316(a) Technical Guidance Manual uses the term "balanced indigenous community" and suggests that an assessment of thermal impacts be done on a community-by-community (i.e., phytoplankton, zooplankton, habitat formers, finfish) basis. In analyzing the effects of the discharge of heat from the Pilgrim Nuclear Power Station (PNPS) to the balanced, indigenous population ("BIP") of marine organisms in Cape Cod Bay, EPA followed the recommended framework of the Manual, because it provides a useful and considered analytical structure developed for this purpose. The 316(a) Technical Guidance Manual suggests that a variance may be appropriate where the applicant shows either that the site is an area of low potential impact for each community type, based on specific criteria, or that certain "decision criteria" or endpoints indicative of thermal degradation for each community type have not occurred as a result of the thermal effects of current operations. Communities showing little or no impact from current operations were deemed by EPA to have low potential for thermal effects from future operation assuming other stressors stay constant. . EPA considered these endpoints in its thermal assessment. These decision criteria are detailed below.

PNPS's § 316(a) Variance: The § 316(a) variance in the current PNPS discharge permit allows the station to have a maximum daily discharge temperature of 102^o F with a delta (change in temperature from intake to discharge) of 32^o F. These discharge limits must be met in the discharge canal prior to release into Cape Cod Bay.

As part of the permit renewal process, the permittee must reapply for the § 316(a) variance. A permittee can make a case for a variance retrospectively, by showing that monitoring data collected during plant operation show no evidence of appreciable harm to the BIP attributable to the thermal discharge. 40 CFR § 125.73(c). Permittees may also present a prospective analysis. This approach generally requires extensive modeling of the thermal plume and is usually undertaken when a facility is requesting a change to its operation and its thermal limits. Regardless of the method chosen, the demonstration must show that the requested variance, "considering the cumulative impact of [the permittee's] thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of a [BIP]." *Id.* § 125.73(a). PNPS has opted for a retrospective analysis, with some data collection to confirm prior modelling efforts.

Phytoplankton

Phytoplankton are unicellular microscopic plants that are one of the most important sources of primary production for coastal and marine food webs. They are important food items for zooplankton, which include larval fish, filter feeding invertebrates and some species of fish. In addition, nuisance blooms of phytoplankton can cause aesthetic and ecological problems.

***i.* Low Potential Impact Areas for Phytoplankton (Open Ocean and Most Riverine Ecosystems)**

Areas of low potential impact for phytoplankton are defined in the 1977 EPA 316(a) Technical Guidance Manual as open ocean areas or systems in which phytoplankton is not the food chain base. Ecosystems in which the food web is based on detrital material; (e.g. embayments bordered by mangrove swamps, salt marshes, freshwater swamps and most rivers and streams) are in this category.

An area will not be considered one of low potential impact if preliminary literature review and/or abbreviated "pilot" field studies reveal that:

1. Phytoplankton contribute a substantial amount of the primary synthetic activity supporting the community;

2. A shift towards nuisance species may be encouraged by the thermal discharge; or

3. Operation of the discharge may alter the community from a detrital to a phytoplankton-based system.

If a receiving water is determined to be an area of potential impact for phytoplankton, the 1977 EPA 316(a) Technical Guidance Manual directs that the following decision criteria are to be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted unless the following decision criteria are met:

1. A shift towards nuisance species of phytoplankton is not likely;

2. There is little likelihood that the discharge will alter the indigenous community from a detrital to a phytoplankton based system; or

3. Appreciable harm to the balanced indigenous population is not likely to occur as a result of phytoplankton community changes caused by the heated discharge.

Zooplankton

Zooplankton are microscopic animals that live in the water column. Zooplankton are comprised of two different categories of organisms, holoplankton and meroplankton. Holoplankton spend their entire life cycles as planktonic creatures. Meroplankton, such as fish and crustacean eggs and larvae, only spend a portion of their life cycle as plankton. The zooplankton community is a primary food source for larval fish, shellfish and some species of adult fish.

i. Low Potential Impact Areas for Zooplankton

Areas of low potential impact for zooplankton are defined in the 1977 EPA 316(a) Technical Guidance Manual as those characterized by naturally low concentrations of commercially important species, rare and endangered species, and/or those forms that are important components of the food web or where the thermal discharge will affect a relatively small proportion of the receiving water.

Most estuarine areas will not be considered areas of low potential impact for zooplankton. However, where a logarithmic gradient of zooplankton abundance exists, those areas at the lowest level of abundance may be recognized as low potential impact areas at the discretion of the Regional Administrator.

If the receiving water is deemed a potential impact area for zooplankton, the 1977 EPA 316(a) Technical Guidance Manual recommends that the following decision criteria be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted unless the following decision criteria are met:

1. Changes in the zooplankton and meroplankton community in the primary study area that may be caused by the heated discharge will not result in appreciable harm to the balanced indigenous fish and shellfish population;

2. The heated discharge is not likely to alter the standing crop or relative abundance, with respect to natural population fluctuations in the far field study area, from those values typical of the receiving water body segment prior to plant operation; or

3. The thermal plume does not constitute a lethal barrier to the free movement (drift) of zooplankton and meroplankton.

Habitat Formers

Habitat formers are species whose presence provide cover, foraging, spawning or nursery habitat for other species. In the marine environment, these would typically include coral reefs, seagrass meadows, kelp beds and macroalgal stands. These environments tend to be limited resources and many other species utilize these habitats for spawning, nursery areas, foraging and refuge from predation.

i. Low Potential Impact Areas for Habitat Formers

In some situations, the aquatic environment at a site will be devoid of habitat formers. This condition may be caused by low levels of nutrients, inadequate light penetration, sedimentation, scouring stream velocities, substrate character, or toxic materials. Under such conditions the site may be considered a low potential impact area. However, if there is some possibility the limiting factors (especially man-caused limiting factors) may be relieved and habitat formers may be established within the area, the applicant will be required to demonstrate that the heated discharge would not restrict re-establishment. Those sites where there is a possibility that a thermal discharge will impact a threatened or endangered species through adverse impacts on habitat formers will not be considered low potential impact areas.

If the receiving water is deemed a potential impact area for habitat formers, the 1977 EPA 316(a) Technical Guidance Manual recommends that the following decision criteria be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted unless the following decision criteria are met.

1. The heated discharge will not result in any deterioration of the habitat formers community or no appreciable harm to the balanced indigenous population will result from such deteriorations; or

2. The heated discharge will not have an adverse impact on threatened or endangered species as a result of impact upon habitat formers.

Shellfish and Macroinvertebrates

Macroinvertebrate fauna, including shellfish, are important components of aquatic food webs and are directly important to man as a source of food and as bait for sport and commercial fishermen. Their burrowing and feeding activities promote oxygenation of sediments and recycling of important nutrients from the sediments.

i. Low Potential Impact Areas for Shellfish/Macroinvertebrates

A low potential impact area for shellfish/macroinvertebrates fauna is defined by the 1977 EPA 316(a) Technical Guidance Manual as an area which, within the primary and far field study areas, can meet the following requirements:

1. Shellfish/macroinvertebrate species of existing or potential commercial value do not occur at the site. This requirement can be met if the applicant can show that the occurrence of such species is marginal;

2. Shellfish/macroinvertebrates do not serve as important components of the aquatic community at the site;

3. Threatened or endangered species of shellfish/macroinvertebrates do not occur at the site;

4. The standing crop of shellfish/macroinvertebrates at the time of maximum abundance is less than one gram ash-free dry weight per square meter; and

5. The site does not serve as a spawning or nursery area for the species in 1, 2, or 3 above.

If the receiving water is deemed a potential impact area for shellfish and macroinvertebrates, then the 1977 EPA 316(a) Technical Guidance Manual recommends that the following decision criteria be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted unless the following decision criteria are met:

1. Reductions in the standing crop of shellfish and macroinvertebrates may be cause for denial of a 316(a) waiver unless the applicant can show that such reductions caused no appreciable harm to balanced indigenous populations within the waterbody segment;

2. Reductions in the components of diversity may be cause for the denial of a 316(a) waiver unless the applicant can show that the critical functions of the macroinvertebrate fauna are being maintained in the water body segment as they existed prior to the introduction of heat; or

3. Areas which serve as spawning and nursery sites for important shellfish and/or macroinvertebrate fauna are considered as zero allowable impact areas and will be excluded from consideration for the discharge of waste heat. Plants sited in locations which would impact these critical functions will not be eligible for a 316(a) waiver. Most estuarine sites will fall into this category.

Fish

Fish are important components of marine ecosystems and are important sources of food for people.

i. Low Potential Impact Area for Fish

According to the 1977 EPA 316(a) Technical Guidance Manual, a discharge may be determined to be in a low potential impact area for fishes within the primary and far field study areas if the following conditions are satisfied:

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

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

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

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

If the receiving water is deemed an area of potential impact for fish, then the 1977 316(a) Technical Guidance Manual recommends that the following decision criteria be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted if the following decision criteria are not met. The discharge should not result in appreciable harm to fish communities from:

1. Direct or indirect mortality from cold shocks;
2. Direct or indirect mortality from excess heat;
3. Reduced reproductive success or growth as a result of plant discharges;
4. Exclusion from unacceptably large areas; or
5. Blockage of migration.

Other Vertebrate Wildlife

These include marine mammals, sea turtles and birds that may rely on estuarine and coastal waters for foraging, reproduction and other life functions.

i. Low potential Impact Areas for Other Vertebrate Wildlife

According to the 1977 316(a) Technical Guidance Document, most sites in the United States will be considered ones of low potential impact for other vertebrate wildlife simply because thermal plumes should not generally impact large or unique populations of wildlife. The main exceptions will be sites in cold areas (such as North Central United States) which would be predicted to attract geese and ducks and encourage them to stay through the winter. These would not be considered low potential impact areas unless they could demonstrate that the wildlife would be protected through a wildlife management plan or other methods from the potential sources of harm mentioned in the next section.

Other exceptions to sites classified as low potential impact would be those few sites where the discharge might affect important (or threatened and endangered) wildlife such as manatees or sea turtles.

For most other sites, brief site inspections and literature reviews would supply enough information to enable the applicant to write a brief rationale about why the site should be considered one of low potential impact for other vertebrates.

If the receiving water is deemed an area of potential impact for vertebrate wildlife, then the 1977 EPA 316(a) Technical Guidance Manual directs that the following decision criteria should be used.

ii. Decision Criteria

Depending on the severity of the effect, denial of a 316(a) variance may be warranted if the following decision criteria are not met. The discharge should not cause appreciable harm to other vertebrate wildlife communities from:

1. Excess heat or cold shock;
2. Increased disease and parasitism;
3. Reduced growth or reproductive success;
4. Exclusion from unique or large habitat areas;
5. Or Interference with migratory pathways.

§ 316(a) Community Impact Analysis

The Massachusetts Department of Environmental Protection (DEP) compiled an excellent summary of thermal monitoring done by PNPS, hydrodynamic modeling of the thermal plume and a review of thermal thresholds for a wide suite of resident species. A few of the key findings of that review are included here:

1. The thermal plume has contact with the bottom for a limited distance outside the discharge canal. It is predominantly a surface feature.
2. The thermal plume is highly mobile, it changes position with the tide and likely the wind.
3. Ambient temperatures in Cape Cod Bay have increased by about 2^{o} C since 1976. This warming trend has resulted in numerous marine species expanding their ranges into Cape Cod Bay.

The Massachusetts DEP review is included as Attachment C to the Fact Sheet. EPA also reviewed satellite imagery of the thermal plume from PNPS generated by Dr. John Mustard of Brown University. Dr. Mustard's analysis showed the thermal plume from PNPS is on average 3.53 km^2 in size and is on average 0.75^{o} C warmer than the surrounding bay waters. EPA utilized the Massachusetts DEP review document, an additional literature review by our contractor Tetratech, NOAA'S Endangered Species Act Consultation with the Nuclear Regulatory Commission (NRC) and our 316(a) guidance document to conduct a Community Impact analysis to determine whether the alternative effluent limitation desired by the discharger, considering the cumulative impact of its thermal discharge together with all other significant impacts on the species affected, will assure the protection and propagation of the BIP.

Phytoplankton Community: EPA does not consider western Cape Cod Bay a low potential impact area for phytoplankton, because phytoplankton do constitute a significant portion of the primary production in these waters. Extensive seagrass meadows and salt marsh do occur in Plymouth and Duxbury Bays, but the deeper water and open ocean nature of western Cape Cod Bay ensure that phytoplankton are still significant components of the total primary production. There has been no indication that the PNPS thermal discharge has caused or contributed to the proliferation of any nuisance species or has caused the system to shift from a detrital based system to a phytoplankton dominated one. Recent monitoring of Cape Cod Bay by the Provincetown Center for Coastal Studies does not show elevated levels of chlorophyll a (a proxy for phytoplankton abundance) and shows no clear trend in chlorophyll a concentrations through time (Costa and Hughes, 2012). This monitoring does not suggest that thermal impacts are occurring to the phytoplankton community and/or that changes to the phytoplankton community are causing impacts to the larger Balanced Indigenous Population (BIP) in western Cape Cod Bay.

Zooplankton Community: EPA does not consider western Cape Cod Bay a low potential impact area for zooplankton, due to the presence of large numbers of commercially important fish and shellfish species and the presence of endangered whale species that feed on copepods and other components of the zooplankton community. There have not been detected any changes in the zooplankton community that could be attributed to the thermal plume. Thus, impacts to the balanced indigenous fish and shellfish species are unlikely. The thermal plume is highly dynamic and relatively small compared to the size of Cape Cod Bay (Figure 1), thus no far field changes have been observed. During the Nuclear Regulatory Commission (NRC) relicensing process, NOAA assessed the potential impact of the thermal plume on copepods and endangered whales. NOAA concluded that there was no evidence of the operation of PNPS causing a negative trend in copepod or right whale abundance in western Cape Cod Bay.

Habitat Formers: EPA does not consider western Cape Cod Bay a low potential impact area for habitat formers, due to the presence of stands of kelp, extensive seagrass meadows and salt marsh. The thermal discharge has a small, but measureable impact on habitat formers in the receiving waters. There is an area of approximately 1 acre in size where the normal algal growth of *Chondrus crispus* has been completely eliminated or severely stunted. Additionally, several warm water species *Bryopsis plumosa*, *Codium fragile*, *Gracilaria folifera* and *Soliera tenera* have been found in close proximity to the discharge canal, but not at reference locations. All of these changes are in a small area (1 acre) immediately adjacent to the discharge canal. Due to the limited areal extent of the change, the balanced indigenous population of fish and shellfish are unlikely to be effected. Based on the limited areal impact to them and the more limited seasonal use of these habitats by sea turtles or other endangered species EPA concludes that there is no impact to sea turtles or other endangered species that might forage/use these habitats.

Shellfish/macroinvertebrate community: EPA does not consider western Cape Cod Bay a low potential impact area for shellfish and macroinvertebrates, due to the presence of a rich macroinvertebrate community and multiple commercially important shellfish species. The vast majority of shellfish/macroinvertebrates in this system exist as benthic infauna or are epibenthic. Either way, they spend the vast majority of their lives in, on or near the seafloor. PNPS's thermal plume has minimal contact with the seafloor and is predominantly a surface feature, thus it has an extremely limited opportunity to impact shellfish or macroinvertebrates. Massachusetts Division of Marine Fisheries (MDMF) collected close to 74,000 lobsters over a 5-year period from near the discharge and from reference areas. They found no difference in abundance, timing of molting, onset of maturity or growth rates between the test locations near the discharge and the reference areas. There is no data to suggest that the thermal plume is causing a reduction in shellfish or macroinvertebrates.

Fish community: EPA does not consider western Cape Cod Bay a low potential impact area for fish, because the area is a rich spawning habitat for multiple fish species. The thermal plume tends to be a surface plume and highly mobile, moving with wind and tide. The discharge is in an open ocean environment where it is diluted and dissipated relatively quickly. There is a small area where maximum temperatures in the summer could approach threshold values that could trigger acute mortality in some species. Due to the relatively small size of this area, if a fish did not avoid it, exposure time would be limited and as a result so would mortality. The mobility of the plume and the open ocean nature of this coast prevents the plume from being a block to normal migration. The thermal plume is relatively small compared to the receiving water, so there has been no evidence of thermal exclusion of large areas of western Cape Cod Bay by any resident fish species. There has been no evidence of mortality due to cold shock or from excess heat. There has been no evidence of impaired/reduced reproduction in fish resulting from exposure to the thermal plume.

Other vertebrate wildlife: EPA does not consider western Cape Cod Bay a low potential impact area for other vertebrate wildlife, due to the seasonal presence of several endangered marine mammals and sea turtles. As stated earlier, NOAA conducted an Endangered Species Act Consultation with the NRC during the PNPS relicensing process. The potential impact of the PNPS thermal discharge on whales and sea turtles was assessed. At the conclusion of its analysis, NOAA found that the thermal discharge from PNPS was not having an impact on any endangered species present in western Cape Cod Bay. EPA has received no reports from the permittee, DEP, or any third parties that the thermal plume serves as an attractant for migrating birds, such as ducks or geese. Migration of these species are not delayed by the presence of the thermal plume, nor has there been any evidence of birds foraging with greater/lesser frequency in the thermal plume than in the surrounding bay waters.

Conclusion: The thermal plume from PNPS is relatively small compared to the receiving water and it dissipates rapidly. It is predominantly a surface plume that moves with the tides and the wind. Minor impacts to the macroalgal community have been documented that can be attributed to the thermal plume, but this area is only roughly an acre in size. Thus, from a retrospective analysis, the past 40 years of operation of PNPS—during which the thermal component of the discharge has remained the same—has been protective of the balanced indigenous population of fish, shellfish and wildlife, in the context of § 316(a). Based on this information, EPA concludes that no appreciable harm has resulted from the current variance-based thermal limits in the PNPS discharge permit and that the continuation of the variance-based limits will assure the protection and propagation of a balanced, indigenous community of shellfish, fish and wildlife.

Figure 1: Satellite image from Mustard et al. (Brown University Report) of the thermal plume from PNPS

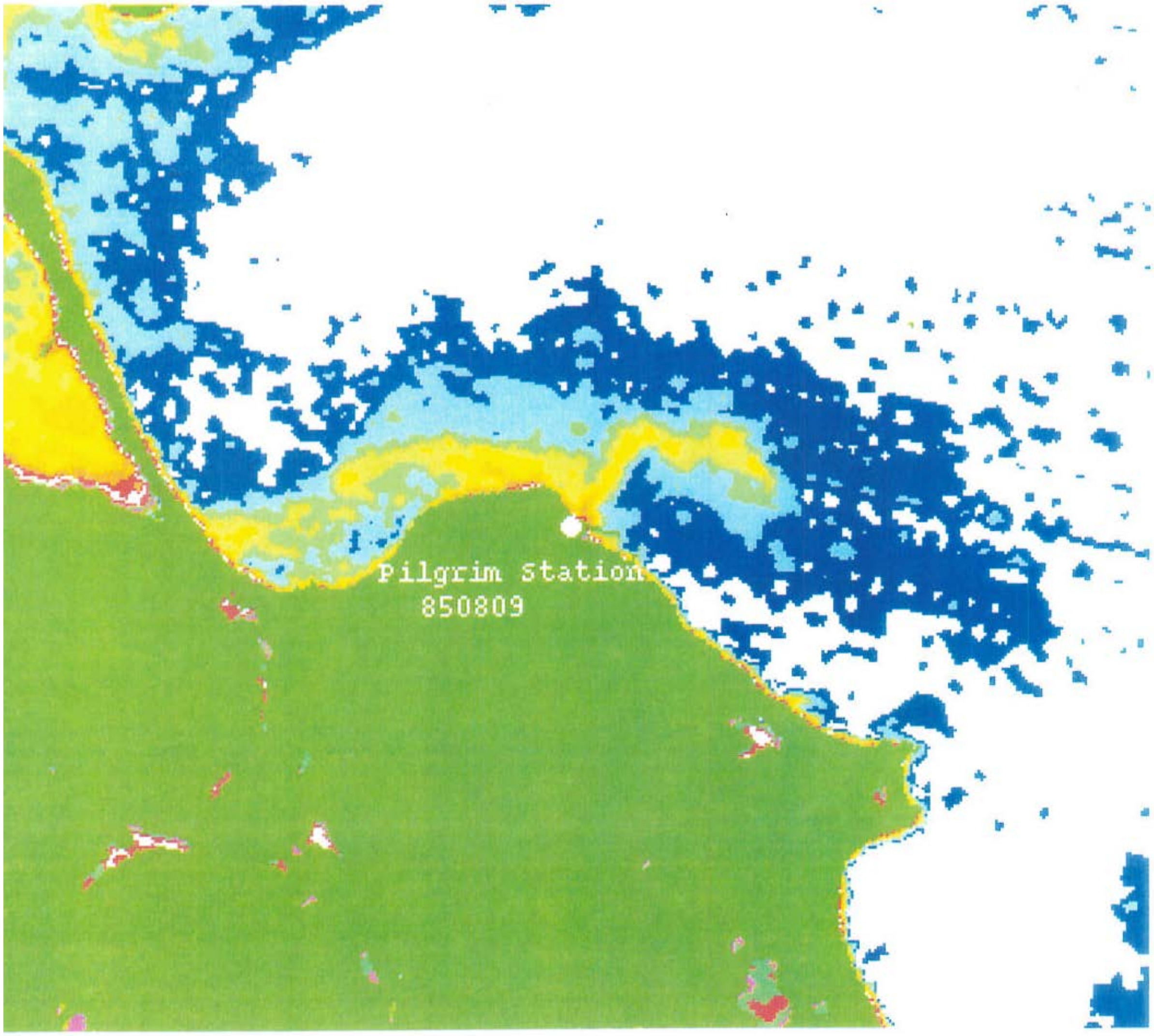


Figure 14: Example plume of Pilgrim station. Image acquired on 8/9/85.
Temperature range: 294°K (red) – 291°K (green).

Attachment C

Massachusetts Department of Environmental Protection's Assessment of Impacts to Marine Organisms from the Pilgrim Nuclear Thermal Discharge and Thermal Backwash

Physical Water Temperature Characterization:

Overview: PNPS pulls cool ocean water into its condensers where a transfer of heat from the condensers to ocean water occurs. Heated water leaving the condensers is released into the PNPS discharge canal (discharge 001) and into the ocean adjacent to Pilgrim. The allowable rate of ocean water inflow to the condensers is 447 mgd as an average monthly rate with a maximum daily rate of 510 mgd. The allowable temperature rise in the water moving across the condensers is 32°F (17.8°C) and the maximum permitted temperature at discharge 001 is 102°F (38.9°C). In addition to the thermal discharge just described, the facility also uses a "backwash" of heated water to control bio-fouling. Thus, heat is discharged into the intake channel on occasion, as well through the typical route through the discharge canal.

The company's thermal discharge 001 and its effects on ocean temperatures were modeled by Pagenkopf and others from MIT (Pagenkopf, *et al*., 1974; 1976). Field characterizations of the plume were also conducted by MIT in the early 1970's in part to validate the model. Additional field studies to characterize ocean-bottom plume dimensions were conducted by EG&G (1995).

MIT's field studies took place in three phases: July 2-3, August 30 and November 13, 1973. The August 30 survey was coordinated with an airborne thermal infra-red survey through Aero-Marine Surveys. Ground-truth for the infra-red information was provided by Marine Research, Inc. (recently purchased by Normandeau), along with vertical temperature profiles of the water column. MIT constructed bathythermographs from these and other data collected by MIT personnel. Depictions of surface water, plume isotherms (delta temperatures beyond ambient, caused by the plume and depicted as areas of similar water-temperature), isotherms at different depths, and isotherms through vertical "slices" of the water column (i.e., through the center of the plume) were generated. Modeling of the plume was conducted that considered effects of tide, plume temperature and velocity, bottom contours, air temperature, water temperature, wind speed and direction and other factors. Because the variability in the vertical and horizontal plume dimension was great, modeling was needed to tease out how the variables described interacted to alter the shape, lateral extent and depth of the plume under different environmental conditions.

Tidal phase (e.g., high tide, low tide, periods in-between, etc.) was found to have a great influence on plume dimensions. Because the plume is warmer than ambient ocean temperatures it is less dense and, therefore, buoyant. As a result the plume is expected to have a greater or lesser contact with the bottom depending on the slope of the ocean bottom and the height of the water column into which the plume is released. These general expectations were confirmed in the field studies and data from these studies were depicted graphically in the MIT and EG&G reports.

The plume has the greatest contact with the bottom for the longest distance from its point of release from the discharge canal during low tide and during the tidal period slightly before and afterwards. As tidal height increases, plume contact with the bottom decreases and at high tide the plume is primarily confined to the surface (see dimensions below). Plume detachment from the bottom is partly due to its buoyancy, a drop in the bottom contour offshore from PNPS, and is also due to the rising tide and a relatively-high tidal amplitude (about 10 ft.) in this area of the coast.

The largest areas of temperature change at the surface of the water column due to the PNPS plume during the MIT studies occurred shortly after peak high tide and did not decrease until well after the mid-tide following high tide. In most of the isotherm delineations, the plume had little or no effect on background temperatures past about 4,000 ft. from the end of the discharge canal (although this could change with wind direction and several other factors; see below). A decrease in surface isotherm area was seen during the late part of low tide and the early part of the following rising tide.

Surface plume dimensions: The physical dimensions of the surface plume observed during each of the three field studies differed substantially. High tide surface plume dimensions in July and November for the 1°C isotherm were 138 and 56 acres, respectively, supporting the idea that during cooler, ambient conditions the plume dimensions decrease. Although the facility was only operating at 50% capacity during the November survey, the volume of the plume as well as the areal dimensions of each of the different isotherms were reduced well-beyond levels expected due to the difference in the plant's operational capacity factors alone. For example, the volume of the $\geq$3°C isotherm during the November survey was 56 acre-ft., while the volume for the same isotherm for the August survey was 864 acre-ft. MIT suggested that heat-exchange during November when air was much less humid, and when winds were higher, was greatly increased compared to the August survey.

The depth of the surface plume varied substantially with tidal phase and distance from the point of release. During all tidal phases the depth of the plume was greatest near the point of release from the discharge canal and lessened with distance from the canal. Far-field surface plume depth during high tide in all of the field studies ranged from about 3-8 ft. During low tide and tidal periods around low tide, plume depth was much greater, but the horizontal travel of the surface plume was greatly reduced. In all cases, the depth of the plume is greatest near the discharge as are the delta temperature changes. As the plume moves away from the point of discharge, it flattens and spreads out across the surface. During low tide, plume isotherms in touch with the bottom extended somewhat beyond 500 ft. (MIT's field-generated plume depictions did not include depths past about 500 ft.). However, during high tide plume interaction with the bottom extended to less than 50 ft. from the end of the discharge canal. Later studies of benthic flora and fauna (see **Benthic Flora** and **Benthic Fauna** sections below) support the idea that negative impacts from the plume to the benthos adjacent to the facility are very limited.

ENSR (2000) compared the model-predicted surface plume area with measured plume dimensions from the field surveys. Based on the model predictions, a surface plume of 1°C or less could encompass as much as 3,000 acres to a depth of about 5 ft. For reference, the surface area of Cape Cod Bay is about 365,000 acres (Stone and Webster, 1975). NOAA (May 17, letter to the NRC) used the MIT model results and the maximum distance between the 3 and 4°C isopleths to predict that the linear distance from the discharge point to the 1°C isotherm could be as great as 7,000 ft. (about 1.4 miles). For reference, NOAA also added that the distance from the Pilgrim shoreline to the tip of Cape Cod was about 18.8 miles and the distance to the most southern extent of Cape Cod Bay was about 18 miles. Additionally, the distance from the Pilgrim shoreline to the inner "elbow" of the cape (at Orleans) is about 31 miles (as measured through Google Earth).

Wind velocity, wind direction, air temperature and humidity level also had substantive effects on plume characteristics. MIT characterized the effects of wind velocity and direction on the plume through a description of changes in the area of the 5°C isotherm. Typically, the area of this isotherm was negatively related to wind speed, i.e., the area of the 5°C isotherm increased as wind velocities decreased and vice-versa. However, a northeast wind created larger areas of this isotherm. MIT's explanation of this phenomenon was that when the wind was from the northeast, a heated air mass was held against the shoreline, whereas a south-westerly wind carried the air mass out to sea tending to create lower areas of this isotherm. Although larger surface areas of delta temperatures were seen at high tide than at low, when the wind conditions mentioned above were in effect they over-ruled the simple tide effects. In addition, ocean currents within the bay move primarily in a counter-clockwise direction with a north to south movement along the Plymouth shoreline. However, most of MIT's surface-plume depictions show the plume bending to the north. This phenomenon was explained as an effect of winds driving the plume to the north at the times that the field studies were conducted.

Highly humid conditions with low air velocity created a "greenhouse" effect. This limited evaporative cooling and allowed the size of the plume to increase over time during certain of the summer studies. Dry conditions and high delta temperatures between air and water tended to have the opposite effect. Under very low wind conditions, the plume typically extends at a right angle to the shoreline although tidal effects may also bend the plume.

Plume dimensions at the bottom: EG&G (1995) conducted more extensive studies than MIT in the area directly adjacent to the facility on the bottom of the sea floor where they measured isotherm areas at the bottom (i.e., where the plume made contact with the ocean floor) at different times of the tidal cycle. Fifty-nine internally-recording temperature sensors were anchored in an offshore array and temperatures were recorded in approximately half-hour intervals during August, 1994. Data for five tidal cycles were collected from the full array before the facility unexpectedly shut down for a long period. The monitoring stations closest to the station were located 50 meters in distance from the mouth of the discharge canal. Stations farthest from the facility were 260 meters from the mouth of the canal. Station placement was based on findings from the earlier MIT studies discussed above.

EG&G found that the maximum area covered at low tide by the lowest detectable temperature increment (+1°C) was about 51,000 sq. ft., or about **1.2 acres**. The maximum linear extent of the 1°C isotherm in contact with the bottom was about 560 ft. (~170 m) from the end of the discharge canal and occurred at low tide. This finding concurs with the MIT work done in the 1970s (see above). The maximum width of the 1°C isotherm in the EG&G study was about 130 ft. (40 m) and occurred about 260 ft. (~80m) offshore. Temperatures above the 1°C level affected smaller areas. Isotherms ≥9°C affected about 0.12 acres at low tide.

Based on data from these studies EG&G researchers found (as did MIT from the studies outlined above) that as the tide moved from low to high the plume separated from the bottom beginning at the points farthest from the discharge. The most distant points of the bottom that were in touch with the plume (about 110-170 meters from the discharge) began to lose a temperature-signal from the plume as the tide rose after low tide. The terminal end (point of greatest distance from the discharge canal) of the plume's contact with the bottom moved towards the point of discharge during the rising tide. By mid-tide the plume was often in contact at about the 50-80 meter point, but typically not beyond this point. As the tide height increased beyond the mean-tide level the plume's contact with the bottom continued to decrease. Although no thermistors were located closer than 50 meters from the discharge canal, EG&G speculated that that at high tide the discharge plume separated from the bottom very near the end of the discharge canal (supporting MIT's findings).

In addition to characterizing the footprint of the plume dimensions on the ocean floor as summarized above, EG&G also hypothesized that if a number of environmental conditions[1] were to change, the bottom areas affected by the plume could exceed those described above from 4-7 times.

EG&G's field data support those of MIT from the mid-1970s which were discussed above, and demonstrate that the thermal plume affects only a relatively-small area of the ocean floor adjacent to PNPS.

Summary of Physical Water Temperature Characterizations: The PNPS 001 thermal discharge is released to Cape Cod Bay. The near-field shape of the plume and its degree of contact with the bottom are constantly changing throughout the tidal cycle. At stages near low-tide, the plume has its greatest effect on the bottom, but due to the slope of the bottom adjacent to the facility, the large tidal range (about 10'), and other variables, the most extensive measured plume effects (heat and velocity) to the bottom have been limited to about an acre or less although, in theory, plume effects to the bottom could be up to seven time that value. Due to its buoyancy, the bulk of the plume rises to the surface and its horizontal spread increases with distance from the point of release. The far-field shape and physical location of the plume vary greatly and are influenced by a number of factors. Far-field delta temperatures of 1°C from background are typically found in only the top 3-8 feet of the water column. Heat in the plume is extracted both by surrounding water and by the atmosphere. The rate of release of plume heat to the atmosphere is greatly affected by wind velocity, the difference between ambient air temperature and water temperature, humidity, tidal stage (which affects the horizontal and vertical shape of the plume) and other factors.

[1] The EG&G survey occurred during an "average" tidal stage, i.e., neither neap nor spring. If the study had been conducted during spring tides, during which the greatest tidal amplitudes are seen, the linear extent to which the plume touched bottom would have been greater than seen in the EG&G survey. In addition, if there were strong northwesterly winds and cooler temperatures, these conditions encourage down-welling which tends to push the plume deeper and somewhat farther offshore.

Because the shape of the plume is constantly changing throughout the day, from day to day and throughout the seasons, there is little consistency to the location of the impact of the far-field plume on water temperatures. The effect of the plume on near-field temperatures is much more consistent although it changes dramatically throughout the tidal cycle. In tidal periods around and including low tide, the plume can interact directly with the bottom to a distance of about 700 ft. (but changes with the degree of tidal fluctuation which varies over the course of each month and seasonally). As the tide progresses from low to high and the height of the water column increases, the plume lifts from the bottom but spreads to a much greater extent in the far-field.

Long-Term Warming Trends in Cape Cod Bay

The company has records of intake temperatures at the plant since at least 1976. Intake water temperatures are measured by two Resistance Temperature Detectors (RTDs), each in front of the 2 main circulating water pumps in the CWIS (screen-house) at elevations well-below mean low water. Because there is about a 10 ft. tidal range at this site, and the RTDs are stationary, the water depth at which these temperature elements collect information varies with tidal stage. Measurements taken by these two elements are averaged together by the facility and compiled every 10 minutes. This arrangement of thermistors is thought[2] to have been in place since about the time the plant was first built, although record keeping has evolved from hand records (hourly) to computer-assisted.

Based on a review of the 1976-2012 monthly average temperature records from the company, the Massachusetts Department of Environmental Protection (MassDEP) concludes that there has been a rather substantial thermal rise in intake temperatures over that period. Because heat from the discharge can be affecting intake temperatures, the intake temperatures recorded at the facility may not accurately depict ambient ocean temperatures. However, the facility's rate of heat release into the bay has not undergone a gradual increase since the time when the facility went on-line (although there have been extended "outages" and occasional reductions in plant capacity) and it is logical to assume that the impact of the discharge on intake temperatures has been fairly constant over the period of record. Given the above, MassDEP assumes that any long-term thermal rise over this period is due to a more widespread phenomenon than the PNPS release of heat to Cape Cod Bay. PNPS average monthly reported values for intake temperature are presented in Table 1. Note that some of the monthly values are missing from the record (20 missing values from a total of 444 possible values in the 37-year dataset).[3] In order to develop yearly averages, each month of any particular year must have a value. To estimate the missing values, the agency performed a regression of each month over all years in the dataset and used the statistically-generated regression values for the months with missing values.

[2] Information pertaining to the placement and measurement frequency of temperatures measurements is based on an e-mail (April 25, 2013) and a phone conversation (May 6, 2013) between Gerald Szal, MassDEP and Joseph Egan, PNPS.

[3] the reader should note that there are several outlying datapoints in 1993 and 1994 that appear suspicious to MassDEP but the agency has not been able to access original records to check these data.

There was a significant ($p<0.00002$) rise in the mean average intake temperature at PNPS over the 1976-2012 period (see Fig. 1) of about 0.058°C (0.1047°F) per year. This rise is about 45% higher than the yearly rise (0.04°C) noted by Nixon (2004) for the 1970-2002 period based on daily temperature measurements collected off a dock at Woods Hole, MA.

MassDEP also developed seasonal regressions for "winter" (December, January and February), "spring" (March, April and May), "summer" (June, July and August) and "fall" (September, October and November) to provide additional comparisons to the work conducted by Nixon who evaluated "winter" and "summer" using the same months indicated above, and also to provide input for the two remaining seasons. Note that certain monthly values in the PNPS dataset over 1993 and 1994 are exceptionally low compared to other years and the agency is concerned that the method of measuring temperatures over those months may have changed (e.g., only one of the two thermistors may have been registering temperatures, or the record keeping during this period changed due to a personnel change). Based on these regressions seasonal rises over the period of record and the p-value for the regressions were as follows: 1) winter: 2.13°C (3.83°F; $p<0.003$); 2) spring: 2.07°C (3.72°F; $p<0.002$); 3) summer: 1.9°C (3.42°F; $p<0.01$); and fall: 2.28°C (4.11°F; $p<0.003$).

Given these figures, the seasonal rise (on a yearly basis) ranged from a low of about 0.053°C to a high of about 0.063°C. Both the winter and summer seasonal rises are greater than those found by Nixon, *et al*. (2004) for the same seasons. All four seasonal rises reported above for the PNPS intake are statistically significant ($p<0.01$) which means that it is highly unlikely that there is no rise in temperature and it is highly unlikely that the rises seen are simply due to chance.

Based on the regressions discussed above, there has been a statistically-significant warming trend in both the intake and in surface waters in Cape Cod Bay over the 37-year period of record.

In its May 17, 2012 letter to the NRC, NOAA (2012) states that ocean temperatures in the northeast have been increasing and notes that if new information regarding climate change became available, re-initiation of their consultation with the NRC might be necessary:

> "*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. If new information on the effects of climate change becomes available then reinitiation of this consultation may be necessary*." (See pg. 28 of the NOAA letter to NRC)

As we noted above, the yearly rate of increase over the 37-year PNPS intake temperatures was 0.058°C which is well above the 0.03-0.04°C used by NOAA in their analysis. Given this, NOAA will have to decide if the PNPS intake data and the yearly temperature rise based on those data constitute "new information on the effects of climate change" sufficient to re-initiate consultation with the NRC regarding the PNPS license.

Biological Assessments of Thermal Plume Impacts

Impacts of the PNPS thermal discharge (Discharge No. 001) on marine organisms can occur from an array of different attributes/effects of the discharge, including but not limited to: heat; the rapid loss of the heated discharge, potentially resulting in "cold shock"; chemical (e.g., chlorine) additions to the discharge; alterations of the physical/chemical state of constituents naturally found in water (e.g., super-saturation of nitrogen); the high-velocity of the plume; and interactive effects among two or more of these and/or other variables. Back-flushing of heated water through the facility creates short-term heated plumes in the intake embayment as well, and organisms in this area are subjected to many of the same variables listed above, but to a much lesser degree.

The first scientists involved in evaluating the plume impacts at PNPS (see summaries in Boston Edison, 1978) used a "before/after, control/impact" ("BACI") research design. PNPS began operating in late 1972 and prior to this two years of pre-operational data were collected from "control" sites during this "before" period. After operations began, data were collected at the same sites, some of which had now become "impact" sites. Due to the great variability from season to season in physical, biological and chemical constituents of marine environments, these studies cannot properly be considered to have had a "controlled" component, as one might have in a laboratory study, because researchers were unable to control anything but the placement of the sample locations. Thus, the term "control site" is a misnomer. More correctly, these studies compared data from reference sites far-removed from "likely" plume effects, to data collected from test sites, i.e., those more likely to have been affected by the plume. The latter sites were located in areas that were in the direct path of the plume and/or directly adjacent to the discharge.

After these initial thermal plume studies were completed, biological, chemical and physical monitoring continued but with certain modifications. Most of the later monitoring studies were also designed to compare characteristics of "test" areas (i.e., areas directly in the path of the plume) to "reference" areas (areas distant from the plume). When fish kills occurred or when fish appeared stressed, special studies (both laboratory and/or forensic autopsies) were conducted to determine the potential cause(s) of mortality/stress. Impacts of the thermal plume based on these evaluations are characterized below.

The two primary contractors from initial studies through about year 2000 were the Massachusetts Division of Marine Fisheries (DMF) which was contracted by PNPS to conduct much of the lobster, fisheries and diver-assisted thermal-effects mapping, and Marine Research Incorporated (MRI, recently purchased by Normandeau Assoc.) which was contracted to conduct impingement, entrainment and certain other PNPS impact evaluations from initial studies through present.

Plankton Studies (Summarized from Toner, 1984): Beginning in the early 1970s, MRI was contracted by PNPS to evaluate entrainment effects on phytoplankton, zooplankton, fish eggs and larvae and lobster larvae. MRI conducted an abundance and distribution analysis of Cape Cod Bay ichthyoplankton during 1974-1977. The study was discontinued having demonstrated minimal impacts. It should be noted that ichthyoplankton studies continue today at PNPS that are specifically designed to evaluate entrainment effects of the PNPS operations. Although the Toner (1984) study primarily addressed entrainment effects, it is included here as many of the samples collected were considerably off-shore and have the potential to inform concerns about indirect effects to right whales that may be thermally-influenced.

Copepods: Toner (1984) reported on collections of monthly mid-depth samples at the PNPS intake and discharge stations and at offshore stations (the farthest off Rocky Point was about a mile from shore; one in Plymouth Bay was about 1.5 miles from shore) where samples were collected at various depths. Zooplankton densities in these samples exhibited seasonal cycles that varied over several orders of magnitude throughout the year, reaching highest densities in August, and minimum densities in January through February. Copepods dominated the samples, especially *Acartia clausi* and *A. tonsa*. Species of *Calanus* were found at both inshore and offshore stations in moderate densities. *Calanus finmarchicus*, one of the species targeted by right whales (see below), was present at in-shore stations as early as April 22 and was collected through August with densities typically in the 100s per m^3, sometimes exceeding 1,000 per m^3. *Pseudocalanus minutus* also occurred in moderate densities and was consistently present throughout the year (about 1,000 individuals/m^3). Certain species of *Pseudocalanus* are also fed upon by right whales.

Due to enormous variability in the makeup of copepod samples, Toner was unable to detect differences among the three off-shore stations and was thus unable to detect impacts from PNPS. These three stations were aligned perpendicular from shore in the direct line of sight of the effluent discharge channel. However, the author reported that higher densities of three species (*Oithona similis, Acartia clausi and Pseudocalanus minutus*) and nauplii were found in deeper[4] sections of the water column at all stations than were found at shallower depths. These findings suggest that the depth-related distribution of these copepods could be due to copepod avoidance of the thermal plume. However, the author suggested that depth-related abundance differences in these species might be due to diurnal migrations as had been found with *Acartia tonsa* in another study. Toner's studies were all conducted during the daytime so he was unable to test this hypothesis.

Bivalve larvae: Toner also studied the spatial distribution of bivalve larvae which are pelagic and are released into the water column in this area from late May through early April. Over the course of the year, bivalve densities ranged from zero to 100,000 per cubic meter. A non-parametric statistic (Mann-Whitney U-test) was used to determine if various groups of these larvae were more abundant at stations near the power plant than at stations farther off-shore at specific points in time. In 22 of 48 tests, a significant difference was seen and indicated that larvae were less abundant near the facility than farther offshore. Toner was not able to discern,

[4] Depth: Toner did not provide specifics on depth for this statement, although samples were collected at 0,3,6 meters at the station nearest shore and at 0,3,6,9 and 12-meter depths at the station farthest from shore.

however, whether the differences seen were due to entrainment or thermal effects, displacement of coastal water by the discharge, localized currents, none of the aforementioned or due to a combination of these and/or other effects. Toner did not conduct a comparison between outage years and operational years. This information could have shed some light as to whether or not the differences between on-shore and off-shore stations were related to PNPS operations but additional work would have to be done to determine whether differences were due to the plume, intake effects, or other variables.

Comparisons with Mt. Hope Bay: Densities of phyto- and zooplankton in Cape Cod Bay were compared by Toner to those in Mt. Hope Bay where MRI had done work for the Brayton Point power plant. Toner reported that the average phytoplankton density in Cape Cod Bay was only about 20% of that found in Mt. Hope Bay. Zooplankton densities were, as expected, also lower in Cape Cod Bay and averaged about 23,000 per m^3 compared to 94,500 per m^3 in Mt. Hope Bay, yielding a ratio (0.24) nearly the same as that of the two phytoplankton densities. The only conclusion drawn with regard to the differences between the two areas was that the Mt. Hope Bay system was much more productive than Cape Cod Bay due to higher nutrient levels in the former system.

Zooplankton and the North Atlantic right whale:

A number[5] of north-Atlantic right whales (*Eubalaena glacialis*) move into Cape Cod Bay each year, and some stay throughout the year. This species population is on the federal Endangered Species list and subsists primarily by feeding on high-density populations of certain zooplankton including species of *Calanu*s and *Pseudocalanus*. Right whales in Cape Cod Bay have typically remained in the western portion of the bay. However, on April 29, 2013, the following advisory appeared on the Massachusetts Division of Marine Fisheries Website:

HIGH RISK AREA FOR RIGHT WHALES IN WESTERN CAPE COD BAY

> A large and stable aggregation of endangered North Atlantic right whales has been documented in western Cape Cod Bay, many of them outside the boundary of the Critical Habitat. The Division of Marine Fisheries is issuing a High Risk Advisory in this area due to the number of whales, their behavior, and their proximity to vessel traffic. Approximately 60 - 80 whales were seen surface and sub-surface feeding in a wide swath near the shipping lanes, from Green Harbor down to Sandwich. Dense concentrations of zooplankton at the surface and just below the surface are attracting the whales to this area. Whales feeding in this manner are incredibly difficult to see and at great risk for vessel strike. Vessel strike is a major cause of human-induced mortality for right whales. For the safety of both mariners and whales, **vessel operators in this**

[5] NOAA (2012) stated that the estimated number of right whales in Cape Cod Bay in 2005 was at least 365 individuals.

area are strongly urged to proceed with caution, reduce speed (less than 10 knots), and post lookouts to avoid colliding with this highly endangered whale.

(Taken from:
http://www.mass.gov/dfwele/dmf/marinefisheriesnotices/2013/right_whale_advisory_043013.htm)

Based on the map provided on the DMF website on April 30, 2013, the PNPS discharge is in the approximate center of the High Risk Area, and thus, in the center of the area frequented by right whales at the time the DMF advisory above was developed. Their presence in the area is apparently due to high-densities of zooplankton. According to the May 17, 2012 letter from NOAA to the NRC (NOAA, 2012) regarding the re-licensing of PNPS, it is highly unusual for right whales to occupy this area of Cape Cod Bay, as, prior to the sightings referenced above, there had been only six sightings records (5 definite, one probable) of 12 right whales within 2 miles of the PNPS discharge since 1997.

In addition, DMF[6] reports that a mother right whale and a calf were observed very close to shore off PNPS. It is possible that the mother and calf were partially warmed by the PNPS thermal plume. According to DMF right whales usually bear their young off the coasts of Florida and Georgia. This begs the question whether or not the presence of the thermal plume played a role in modifying the more typical migratory and birthing patterns of this particular right whale.

One of the issues investigated by NOAA in their 2012 letter to the NRC was whether or not the discharge of heat from PNPS might be having a negative effect on the right whale's food supply within Cape Cod Bay. NOAA concluded the following relative to this issue (but in the entrainment-related impact section of their letter):

> "*While there may be significant annual variability in copepod abundance (sic) and associated right whale foraging in the Bay, which is thought to be due at least party (sic) to weather and oceanic conditions (e.g., differences in 2010 as compared to other years are thought to be due to the changes in the Western Maine Coastal Current (Stamieszkin et at (sic).. 2010), the available information does not suggest that there has been a long-term negative trend in copepod abundance or distribution or right whale abundance or distribution since the Pilgrim facility became operational that may be attributable to operations of the facility*." (See pg. 12 of the NOAA letter to NRC)

NOAA analyzed the potential effect that the facility's discharge might have on oceanographic features that interact to aggregate copepods. Right whales feed on dense aggregations of certain copepods and any factor that would serve to destabilize these aggregations could be detrimental to right whales. NOAA's comments on this subject include the following:

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[6]June 3, 2013 e-mail from Erin Burke, MA DMF to Gerald Szal. Ms. Burke's e-mail (in part) reads: "In January 2013 a right whale mother and calf spent a couple weeks in the shallow waters off Plymouth, including areas off Gurnet Light and the PNPS. Based on physical characteristics, the calf was believed to be around two weeks old and born in the Northeast, although we don't know exactly where. This is highly unusual, as calves are typically born off Florida and Georgia. Many scientists were concerned about the effect of the cold water temperatures on the calf's ability to thrive."

> "*Several factors are thought to concentrate copepods in Cape Cod Bay. These include currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes (Wishner et al.. 1988, Mayo and Marx 1990, Murison and Gaskin 1989, Baumgartner et al.. 2003a, Jiang, et a12007, Pace and Merrick 2008). The major oceanographic features include the Maine Coastal Current (MCC), Georges Bank anticyclonic frontal circulation system, the basin-scale cyclonic gyres (Jordan, Georges and Wilkinson), the deep inflow through the NEC, the shallow outflow via the Great South Channel and the shelf-slope front (SSP) (Gangopadhyay et al.. 2003, Pace and Merrick 2008). It is also thought that some variability in the availability of copepods is linked to water temperature changes associated with the North Atlantic Oscillation (Greene at al. 2004). It is thought that these features combine to result in conditions that affect the distribution of copepods throughout the Gulf of Maine, including Cape Cod Bay. We have considered whether the thermal plume from Pilgrim could affect any of these conditions in a way that would affect copepods and therefore, foraging right whales. However, because these conditions and patterns are regional to global scale, and temperature increases from Pilgrim are not detectable at distances more than 1.4 miles from the outfall, it is extremely unlikely that any of these conditions would be affected by the thermal plume. Therefore, it is extremely unlikely that the factors that serve to aggregate copepods in Cape Cod Bay would be affected by continuing operations of Pilgrim.*" (From pgs. 24 and 25 of the NOAA letter to NRC)

NOAA's analysis includes the following relative specifically to the heated discharge and direct effects to zooplankton utilized by right whales:

> "*Copepods are mobile and can move through the water column. During the time of year when right whales are foraging in Cape Cod Bay (January -May), ambient water temperatures are typically 0-10°C. Copepod distribution is not likely to be affected at temperatures below 21°C (see citations referenced above). At ambient water temperatures of 11.5°C and below, the area which would experience an increase in water temperature more than 11°C above ambient is limited to less than 0.5 acres (see table 5.1-1 in ENSR 2000); the area at the bottom which would experience temperatures this high is less than 0.13 acres. Given the small size of the area where the distribution of copepods would be affected (0.5 acres; less than 0.0002% of the surface area of Cape Cod Bay) and that copepods are likely to avoid the area rather than be injured or killed, any effect to foraging right whales is extremely unlikely.*" (from pg. 24 of the NOAA letter to NRC)

> **<u>MassDEP conclusions regarding Zooplankton:</u>** Given the information discussed above, MassDEP concludes that there is no evidence that the facility's heated discharge into Cape Cod Bay has had a significant deleterious effect on zooplankton populations within the bay or on the behavior of right whales within the bay but retains the right to change that conclusion based on further input from NOAA. This statement, and other conclusions made in the thermal effects section of the Fact Sheet, do not take into account the effect of heat on organisms passing *through* the plant. Effects due to the entrainment of organisms into and through the plant, and heating to those organisms that takes place during their transit through the facility, are dealt with in the 316(b) section of the Fact Sheet.

<u>Benthic flora:</u> A number of benthic evaluations of flora adjacent to the Pilgrim discharge were conducted from 1969 through 1999 to characterize effects of the Pilgrim thermal discharge on organisms inhabiting the seafloor adjacent to PNPS. These included studies of both commercial and non-commercial flora.

<u>Irish moss:</u> The effect of the facility's discharge on the commercial harvest of Irish moss (*Chondrus crispus*) was evaluated by DMF (Lawton, *et al*., 1992) in the first years of impact studies at PNPS. At the time (the early 1970s) Irish moss was being collected by workers in small boats using rakes. DMF estimated that the local harvest of Irish moss during the period of study was between $10,000 – $25,000.00 per year (based on 1983 wet-weight prices). Landing data were collected from 1971-1977 which included two years of pre-operational information and five years of operational data. The approximate wet weight of Irish moss collections from eight different harvesting "zones", stretching from Warren Cove to the northwest of PNPS to Manomet Point to the southeast, was tallied over these years and compared.

The DMF scientists conducting this work concluded that natural fluctuations in Irish moss abundance had a major effect on moss harvest and that these fluctuations were so high that they exceeded any alterations that could possibly be attributed to PNPS operations. Although no statistically-significant differences were seen in the area that received the thermal discharge from Pilgrim, compared to other areas during pre- and post operations, DMF personnel estimated that about 10% of the test area (one of the harvest zones) had been negatively affected by the PNPS discharge (see also: Pilgrim Nuclear, 1978; and Lawton, et al., 1984)

<u>Algae in intertidal and subtidal Zones:</u> Algal evaluations (reported by Grocki, 1984) of the intertidal and subtidal zones adjacent to PNPS were conducted at four sites from Rocky Point through Manomet Point, from 1974 through 1981 including a test site (i.e., near the effluent discharge; this site had two stations) and 3 reference sites (with 1-2 stations apiece). These studies characterized patterns of species richness, dominance, community structure and biomass and examined whether or not any differences between sites might be attributable to PNPS operations.

More species were captured at test stations than at reference stations; in addition, four "warmwater" taxa not normally seen north of Cape Cod were regularly found at the effluent station but not at reference stations. These are: *Bryopsis plumosa, Codium fragile, Gracilaria folifera and Soliera tenera*. Grocki states that the distribution of these species north of Cape Cod is restricted to the "warmer waters of shallow bays and estuaries and occurs only during the summer months". All four warmwater taxa were collected from a small area of a few meters from the discharge plume at the end of the discharge jetty. Grocki attributed their settlement in this area to the thermal discharge. They were not found in other areas and did not appear to decrease the number of indigenous species found at the discharge station in comparison to other stations. A fifth species, *Enteromorpha aragonensis*, was also found at the effluent station but not at reference stations, and the significance of its exclusive presence at this station was not determined. In addition, sub-tidal habitats at the effluent site exhibited significantly lower biomass of *Chondrus crispus* than the reference stations. This was attributed both to scouring effects of the discharge as well as a somewhat different habitat type than the other sites. No attempts were made to map the extent of the area where differences in algal metrics were detected.

Near-shore macrofaunal benthic evaluations were conducted from 1969-1998 using several different approaches. Although differences were seen between the stations in the direct path of the effluent compared to reference stations, the only studies that were useful in delimiting the areal extent of the thermal plume effects on the benthos were those that employed divers that directly measured the distance on either side of the central line of the plume that was devoid of *Chondrus crispus* or where the growth of this macroalga was visually "stunted" compared to *C. crispus* growth farther distant. The dive surveys took place from 1980-1998 and the diver observational information along with temperature and plant operation data were statistically analyzed (see: ENSR, 2000, *in* Entergy, Semiannual report #55, Jan.-Dec. 1999). Results of the analysis revealed that the denuded zone increased greatly in the warmer months compared to the winter and that the size of the denuded zone was positively correlated with the monthly mean power output from the plant.The total area of stunted and denuded zone was relatively small and ranged from much less than an acre to slightly greater than one acre. The greatest area observed to be affected (stunted zone) through these surveys was about 4,500 m^2 (**about 1.1 acres**).

> **<u>MassDEP conclusions regarding Benthic Flora</u>**: Based on the information available to date, effects of the PNPS thermal plume on benthic flora appear to be *de minimis.*

<u>Benthic Fauna:</u>

<u>Commercial Lobster Fishery (</u>Summarized from Lawton, *et al*., 1984b**):** In the 1970s, DMF compared data pertaining to the growth and movement of lobsters in areas adjacent to Pilgrim to data for the same variables from reference areas (i.e., areas far removed from the thermal plume). A lobster tag-and-retrieval program was conducted from 1970-1975 during which 50-100 lobsters, 64-81 mm carapace length were measured, tagged and released on each of the three ledges near PNPS (from northwest to southeast: Rocky Point, White Horse Beach and Manomet Point, respectively) three times each year. Additional individuals were tagged and released on an off-shore ledge (Coles Hole) located north of the facility. Tag-return data (from about 49% of the tagged lobsters released) indicated that movement was localized and primarily toward adjacent ledges. Dispersal of the lobsters at the test site (Rocky Point) and at the reference site (Manomet Point) was similar during both pre- and post-operational years. In addition, there was no significant ($p>0.05$) difference in lobster growth between these two areas in pre- vs. post-operational years.

DMF also studied the commercial catch of lobsters in lobster pots from 1970-1976 in areas adjacent to PNPS and from reference areas to evaluate potential effects of the PNPS discharge on harvest rates. A sampling grid was constructed of 0.8km^2 cells and catch records were kept separately for each cell. Three cells (two entire and one partial cell along the shoreline) were considered to be "surveillance" cells (henceforth called test cells) as they were closest to the discharge and were known to be affected by the plume at the bottom. Cells outside that area were considered to be "control" cells (henceforth called reference cells). Study design was such that reference and test cells used in the comparison were from similar depths and substrate types. During the study period, DMF sampled 22,519 lobster pots and acquired information on 73,398 lobsters. Four possible thermal effects were evaluated: alteration of growth rate; change in size at lobster maturity; onset of molt; and change in catch rate. This last metric was assumed to reflect abundance changes.

No detectable differences were seen between test and reference stations in the overall size composition of lobsters caught in pots. There was a slight increase in the numbers of small, mature ("berried", i.e., egg-bearing) females found in the test areas during operational periods compared to non-operational periods. No differences were seen in the time of onset of molting in the test areas vs. the reference areas, and the catch rate of legal lobsters was not statistically different ($p>0.05$) in test and reference quadrants. In summary, DMF found no statistically-significant impacts from the PNPS discharge on the commercial harvest of lobsters. A long-term annual decline in catch rate was noted throughout the study area (both near and distant from Pilgrim) and DMF personnel suggested that this might be due either to fishing pressure and/or to natural temperature trends.

Benthic Fish Assessments via Otter Trawl (summarized from Pilgrim Nuclear, 1978; and Lawton, et al., 1984b): Personnel from DMF conducted a benthic fish sampling program over the years 1970-76 using an Otter Trawl. The period evaluated included three years of pre-operation and four of post-operation. Three areas of Cape Cod Bay were studied: two reference stations (stations 1 and 3) and one test station (station 2), nearest the outfall. Sampling was conducted bi-weekly at each station over the study period. Each tow of the trawl was 20 minutes in duration and tows were approximately 0.75 nautical miles in length. A total of 843 tows were made and 43,502 fish were captured. Fish were keyed to species (when possible), and their lengths recorded. Forty-one different taxa were collected. Six taxa were dominant and comprised 91.4% of the total catch. These were: 1) winter flounder, *Pseudopleuronectes americanus* (46.7% of the catch); 2) ocean pout, *Macrozoarces americanus* (12.4%); 3) yellowtail flounder, *Limanda ferruginis* (12.2%); 4) longhorn sculpin, *Myoxocephalus octodecemspinosus* (8.6%); 5) windowpane, *Scophthalmus aquosus* (5.8%); and 6) skate, genus *Raja*, which was not keyed to species (5.7%). According to DMF, this assemblage is typical of other northern-temperate fish communities. Trawl data were assessed in terms of catch per unit effort (CPUE) of sampling.

Over the 1970-75 period, Annual Mean Catch per Tow (i.e., CPUE) at all three stations dropped precipitously. From 1970-1973, the CPUE at the test station (station 2) was intermediate between the two reference stations (1 and 3). In 1974 it fell below both of the other two stations, then rose to nearly the same as the higher of the other two stations in 1975. At the end of 1975 it was slightly below that at the other two stations.

Based on these data, DMF concluded that there was no detectable difference between the CPUE in overall catch at the test station compared to the two reference stations due to a change from pre- to post-operations. Additionally, DMF saw no statistically-significant differences between test and reference stations in the study period after operations began.

A second component of the DMF analysis was an inter-station comparison of densities of each of the most abundant fish. CPUE for winter flounder and yellowtail flounder at the test station was, for the most part, between that from the two reference stations. However, for Ocean Pout, the CPUE at the test station was consistently higher (i.e., "better") than that at the other two sites throughout the study period. For skates, the CPUE at the test station was consistently higher than that at one of the reference stations (Station 3) but was both higher and lower than that at station 1, depending on the year in question. Skate CPUE decreased at both stations 2 (the test station) and 3 in 1972 but later rebounded at both stations. Because the effect took place at both the test station and one reference station, negative changes in CPUE were not judged to have been due to the discharge. Longhorn sculpin and windowpane fared similarly: annual mean catch for each at the test station was typically intermediate between that at the two reference stations and did not appear to change in any different manner after Pilgrim operations began.

DMF researchers (Pilgrim Nuclear, 1978) reporting on the trawl results conclude that the PNPS thermal discharge had no apparent deleterious effects on the overall abundance of benthic fish over the period of study (1970-1975) or on the densities of the five most commonly-found taxa. These same researchers publishing at a later date (Lawton *et al.* ,1984) added that after the dramatic declines seen in groundfish stocks over 1970-1974, CPUE for certain species (e.g., winter flounder, yellowtail flounder, windowpane and skate) increased substantially in 1975, and/or 1976 even though the facility was operating over these years. The Otter Trawl studies were continued through 1981, although in the last year the frequency of sampling was reduced. No findings of impact at the test station, compared to the reference studies, were noted during the 1970-1981 period when the 3-station Otter Trawl program was in effect.

Near-Shore Benthic Assessments via Shrimp Trawl. In 1981, DMF instituted the use of a Shrimp Trawl to sample near-shore stations in the vicinity of the Pilgrim discharge. This trawl was smaller than the Otter Trawl and was pulled by smaller boats allowing more maneuverability around lobster buoys that were in high concentrations near to Rocky Point where the Pilgrim discharge is located. This program consistently sampled a “Surveillance” (i.e., “test”) station in front of the discharge and two reference stations. The latter were located in Warren Cove and northwest of Priscilla Beach. All stations were trawled monthly from January-March and biweekly from April-December during the daylight hours (See: Pilgrim Nuclear, 1990). Station selection was based on bottom types, depth contours, available substrate for trawling and known patterns of the thermal plume. The program continued into the 1990s with duplicate tows at each station; the tow duration increased from 10-minutes to 15-minutes over the course of the program. Catch per unit effort was used as a measure of relative abundance and because year-to-year trends were evaluated as a ratio of CPUE between reference and test stations, the difference in tow duration should not affect the long-term analysis. Catch figures for replicate tows were averaged for each station (by species) to produce mean catch estimates.

One of the methods used to evaluate station impacts in this program was to analyze catch information by species. In the annual report for 1984, DMF reviewed the mean catch per unit effort by year over the 1981-1984 period. Catch rates (i.e., per unit effort) of winter flounder were lower in Surveillance (i.e., “test”) station 3 than at Reference Station 1, but catch rates of yellowtail flounder and skate spp. were higher at the Surveillance station than at the reference station. If the abundance of these species was influenced by the thermal discharge, one would expect that the catch rates would have changed if the company stopped discharging. 1984 was an “outage” year for the facility and the discharge was much reduced that year. Relative abundances of the three groups mentioned above did not undergo any noticeable changes in 1984 compared to other years, i.e., winter flounder catch rates in the surveillance station remained low compared to the catch rates at the reference station, and the relative abundances of yellowtail flounder and skate spp., also remained similar between Reference Station 1 and Surveillance Station 3. As a result, DMF surmised that the PNPS thermal discharge did not have any measurable effects on the relative abundance of the most abundant species, and that slight differences in habitat structure were responsible for the consistent differences seen between sites in the catch rates of different benthic species.

DMF added a second surveillance station to the near-shore trawling program in 1984. This new station was located in the intake embayment. There is no continuous thermal discharge at this site (unlike at Station 3) but only occasional thermal backwashes that could potentially impact the fish community. DMF found that length frequencies for little skate, and winter flounder were different between the intake station and reference station 1. For both species, there was a disproportionate abundance of smaller fish at the intake station relative to the size distribution at the reference station. DMF concluded that this was probably a difference of habitat but also that this put certain individuals of these two species at greater risk to intake effects because smaller fish are more susceptible to being drawn into the intake than are larger fish.

Several additional “outage” years occurred in 1984, 1986, 1987 and 1988 where the capacity factor was either near zero (1984, 1987 and 1988) or less than 20% (1986). Data from these years were compared to years when the operational capacity of the facility was 80% or greater (see Semi-Annual Report #33, January – December, 1988 and Semi-Annual Report #35, January-December, 1989). During the low/off operational years, current moving through the canal was variable, but heat was negligible during the outage period. Annual mean trawl catch per unit effort (CPUE) was used to measure changes in relative abundance in the three most abundant benthic species, winter flounder, little skate and windowpane.

Changes in the relative abundance between the primary Surveillance (Station 3) and Reference (Station 1) stations (i.e., whether one of these stations showed a higher abundance than the other) did occur for winter flounder in 1986 and 1987 but not in 1984 and 1988 (1989 was a “low-operational” year – about 30% capacity - and cannot be evaluated in terms of the low/no capacity format mentioned above). No changes in relative abundance were seen over the 1981-89 period for little skate. Changes in the relative abundances of windowpane between these two stations only occurred in two of the nine years of the study.

Based on this information, DMF concluded that the relative abundances between reference and test stations did not follow a pattern expected if the discharge was having a direct effect on these fish species.

DMF also compared the size distributions of winter flounder in the two sites in different seasons and found that in both summer and fall, the relative proportion of small winter flounder was much greater in the intake than in the reference station. DMF concluded that this contributed to the risk of winter flounder and coupled that with impingement information that showed high impingement rates of small (5-12mm total length) flounder.

Rather than continue reporting on specific gear types, DMF changed the format of impact reporting after 1989 to reporting impacts on specific indicator species. Additional information on the benthic trawls can be found in the section of this Fact Sheet entitled <u>Thermal Effects to Target Species.</u>

> **<u>MassDEP conclusions regarding lobsters and benthic fish:</u>** Based on the information available the agency considers impacts of the PNPS thermal plume on lobsters, and on benthic fish studied through the Otter Trawl and Shrimp Trawl programs, to be *de minimis*.

<u>Pelagic and In-shore Fish Assessments:</u>

Haul-Seine Program (summarized from Kelly, *et al*., 1992)**:** Haul-seine surveys of near-shore fish were conducted by DMF from 1981-1991 to evaluate, in part, the potential effects of thermal backwashes on the population of fish residing in the intake canal at PNPS but also to evaluate potential intake effects. Six stations (five reference and one test station) were located along the western shoreline of Cape Cod Bay and into Kingston Bay, from White Horse Beach in the south-east, to Gray's Beach, within Kingston Bay to the north-west. The single test station was located within the PNPS intake embayment. DMF personnel used a 45.7 m x 1.8 m mesh net with 0.20 in openings. The net, when deployed, enclosed about $225m^2$ of bottom. Over the 11-year period, 185,000 fish were captured representing 46 different species. Two sets were made at each site on a sampling day. The program evaluated three different metrics among sites: a) relative abundance of Atlantic silverside (*Menidia menidia*) which was typically the most abundant species at all sites; b) relative abundance of winter flounder, a commercially important species; and c) species diversity.

No statistically-significant trends in either the relative abundance of silversides or winter flounder were seen at the test site compared to the reference sites. Over all years of study combined, species diversity was highest at the test station and lowest at the sites that were more open-coastal in nature. In summary, based on an 11-year study of trends at these stations, no negative effects of heated backwash on the near-shore fish community were seen.

Gill Net: Over the 1971-1976 period, DMF deployed a 600' by 10' six-panel (each panel with a different hole size) gill net along the 10' depth (at MLW) contour, just adjacent to the direct line of the thermal discharge from Pilgrim. This net was set over-night and fish were collected the day following the initial set. This work was conducted to determine if there were noticeable trends in species composition and/or abundance in pre-operational datasets vs. those from post-operation. The study yielded 17,072 fish, comprising 25 species in 99 gill net sets. Four species comprised >80% of the total catch: Pollock, *Pollachius virens* (39.0%); Atlantic herring, *Clupea harengus harengus* (17.8%); cunner, *Taugogolabrus adspersus* (13.0%) and alewife, *Alosa pseudoharengus*.

DMF concluded from the Gill Net studies in the early-to-mid-70s that PNPS had little or no influence on pelagic species near the ledges that were adjacent to the PNPS discharge. Although there was an apparent local decline in the abundance of cod (one of the less abundant fishes) it was not determined whether the decline was due to sampling bias, or a real decline. No trends were apparent from a review of the data that would implicate the facility in negative impacts to either overall catch, or catch of individual species.

Gill Net studies continued at PNPS through the early 1990s. These studies were focused on long-term trend analyses in which particular species were monitored for changes in abundance that might be associated with changes in PNPS capacity factor. Although large differences were seen in pelagic species caught in the gill net deployed in the direct path of the thermal discharge, no statistically significant differences in species abundances were found to be related to plant capacity factor over the course of these studies.

> **MassDEP conclusions regarding the Haul-seine and Gill Net programs**: The agency considers thermal plume effects on the marine fish evaluated through these two programs to be *de minimis*.

Sport Fishing (Summarized from Boston Edison, 1978): The sport-fishing evaluation is included here to characterize the composition of fish species caught by anglers in comparison to what is expected for the region. The shorefront area of PNPS was designed and constructed in part to provide marine sport fishing access to Rocky point. A parking area was installed adjacent to the plant to allow fishermen to park and walk to the two jetties that formed the discharge canal and to the intake breakwater. DMF conducted a “creel census” over a 3-year period, from July-Nov., 1973 and April-November, 1975 and 1975. The census was conducted during four randomly selected half-day segments each week over these periods. DMF estimated angler effort and success from their time at PNPS as follows: a) number of anglers visiting PNPS during the 3-yr. study period: 21,120; b) number of hours spent fishing: 41,405; c) number of fish caught: 9,332; d) overall catch rate: 0.22 fish/angler hour; e) number of species caught: 16; species accounting for most (>80%) of the catch: cunner (37.1%), bluefish (31.8%), pollock: (13%). Angling effort peaked in June-August.

DMF reported that sport-fish catch composition was typical of a temperate open coast region, and there was no catch of southern (warm-water) fauna in the harvest that was reported. Sport fishing was allowed at PNPS from April, 1973 to shortly after September 11, 2001, when security became a concern. The facility grounds are now closed to public fishing.

Thermal Effects to Target Species:

Biomonitoring at PNPS underwent a significant change in the late 1980 and early 1990s as the focus of the monitoring program shifted towards an evaluation of potential effects to target species and away from comparisons of impact based on gear types. The gill-net program and near-shore shrimp trawl monitoring programs were dropped during this period.

DMF selected eight aquatic species as indicator species in the Pilgrim area. These were divided into 6 categories, and are listed below:

Benthics:	Winter flounder, American lobster
Predatory Pelagics/sportfish:	Bluefish and Striped bass
Pelagic Schooling fish/Commercially harvested:	Atlantic menhaden
Most abundant shoreline fish:	Atlantic silverside
Resident, abundant, groundfish:	Cunner
Groundfish/sportfish:	Tautog

DMF used this list to develop information relating to impact studies and/or observational information from personnel working to evaluate potential impacts from the facility. Summaries of the thermal-related impact work for each species is provided below. Where data were available, these were used to approximate the size of a thermal "exclusion" zone for each species.

Benthics:

American Lobster (*Homarus americanus*): No relationship between annual catch ratios in surveillance and reference areas was seen in extensive evaluations of lobster-pot catch compared to degree of station operation. In addition, no statistically-significant differences were seen in lobster catch from stations near the discharge to reference stations much farther distant from the discharge.

EG&G's (1995) bottom plume mapping (see: **Physical Water Temperature Characterization: Plume Dimensions at the Bottom**) demonstrated that the maximum contact of the plume with the bottom occurred during the low-tide period. On an average tide (i.e., neither neap nor spring) only about 1.2 acres of bottom (at 1°C or more) was affected by the thermal plume at low tide. The area affected by the plume where delta temperatures beyond ambient are less than 1°C will be larger than the 1.2-acre figure. However, isopleth areas for plume-induced temperature changes <1°C were not provided. As the tide moved past about mean tide level, the plume lifted and was in contact with the bottom only to about 50-80 meters from the end of the discharge canal. As the tide progresses further in its cycle, the plume lifted even more. The maximum linear contact of the plum (during low tide) occurred out to about 150-170 meters. Beyond that point, water temperatures were indistinguishable from background.

Based on the above, and based on the lobster work conducted by DMF (see: **Benthic Fauna: Commercial Lobster Fishery)** , MassDEP has no data to support the contention that PNPS impacts to lobster are any greater than those of the plume's dimensions at the bottom, and MassDEP considers these to be *de mimimis* considering the fact that the PNPS facility discharges to the open ocean. These data support conclusions reached by MassDEP above (See: **Benthic Fauna**).

Winter flounder (*Pseudopleuronectes americanus*): This fish is considered a target species for PNPS primarily due to the negative effects of the intake on flounder eggs and larvae due to entrainment. In the juvenile and adult stages, these fish are bottom-dwellers and because only a small (<1 acre to <2 acres) area of the bottom is affected by the thermal plume, flounder in the adult and juvenile stages are not thought to be negatively affected by the plant's discharge outside this area.

MassDEP used the following information to estimate the size of a thermal zone of impact for winter flounder larvae. In the larval stage, winter flounder are pelagic. In developing a winter-time upper tolerance value for the Brayton Point permit relative to winter flounder larvae, the Region I EPA (EPA, 2002) referenced Dr. Grace Klein-MacPhee who recommended 8°C as best for larval survival and growth and a figure up to 12°C where survival and growth was reduced. Dr. MacPhee also recommended that temperatures above 10°C from March to mid-April should not be exceeded but beyond mid-April, the metamorphosing larvae could tolerate higher temperatures. EPA chose **8°C** as the **target** value, **10°C** as **suboptimal** and **12°C** as not suitable (i.e., as an acutely-toxic value) for the March-mid April period and MassDEP used the same approach for this review.

MassDEP compared the figures above to the mean monthly intake temperatures in March and April and the delta temperature isotherm areas in the ENSR 316 document (Table 5.1-1, ENSR 2000) using MIT's mid-November measured surface plume isotherm areas as a surrogate for the March-April time frame. No isotherm projections were developed for the March-April time period by MIT. Of the three time periods studied by MIT (July, August and November) the November information is expected to be closest to water temperatures (but not other factors) that persist in the March-April time frame.

Ambient surface water temperature at the time of the MIT November, 1973 survey was 8.5°C (47.3°F). By comparison, the regression line through all the average monthly March temperatures from the PNPS intake over 1976-2012 yields a statistically-generated figure of about 40°F (~4.4°C) for post-2012 and a similarly-generated figure of about 44.5°F (~7°C) for post-2012 April temperatures. Because the statistically-generated temperature figures are lower than that from November, 1973, MIT's isotherm areas developed during November, 1973 should provide a slight over-estimate of the isotherm areas for March-April if other factors (wind, humidity, ambient air temperature, etc.) are not considered.

Using the approach outlined above, MassDEP expects that in March there would be less than 0.1 acres that would be "not suitable" for winter flounder; and less than 0.9 acres that would be sub-optimal. For April, these estimates are: less than 0.9 acres as "not suitable"; and less than 14 acres that would be considered "sub optimal". Because larvae are unable to maintain a position in current, the agency expects that any drifting winter flounder larvae would be quickly pushed out of the "not suitable" and "sub optimal" areas due to the high velocity of the plume's current. As a result, MassDEP does not do not expect winter flounder larvae moving past the facility to suffer from heat-effects of the PNPS thermal discharge into Cape Cod Bay.

Effects of larval travel through the facility, delta temperature change during this period of travel (and afterwards), ultimate temperature effects and other effects of larval travel through the facility are evaluated in the **Entrainment** section of this report.

<u>MassDEP conclusions regarding winter flounder:</u> Based on the information reviewed, the agency concludes that effects to winter flounder from the PNPS discharge of heated water into Cape Cod Bay have been *de minimis*.

<u>Predatory/Pelagics/Sport Fish:</u>

<u>Bluefish (*Pomatomus saltatrix)* and Striped bass (*Morone saxatilis*)</u>: Both species are important game fish and both are attracted to the PNPS 001 discharge at certain times of the year. DMF personnel noted that the attraction of bluefish and striped bass to the plume is at least partly due to the velocity of the discharge:

> "*Both gamefish are voracious predators that are attracted to moving water, e.g., currents and tidal rips, where the velocity of the running water incapacitates smaller fish and invertebrates making them easy prey (Wooner and Lyman 1983). Ristori (1989) adds that most marine game species feed when there is a current running but cease this activity in slack water. Pilgrim Station's once through, open-cycle cooling system produces a continuously flowing, pump generated thermal current that can attract game fish to the outfall area.*" (Taken from Lawton, *et al*., 1992a)

Lawton *et al*. (1992a) noted that when the facility was operating and discharging a noticeable current, Striped bass numbers near the facility that were observed by divers, through the sportfish catch and in Gill nets, were typically higher than when the facility had an outage. In addition these authors posit that the attraction of bass and bluefish to the plume in the spring and late fall is due to the fact that plume temperatures at that time are near to those preferred by these two species. However, in August and early September both species appear to be repelled by high temperatures and Lawton *et al.* (1992a) asserted that the plume creates an exclusion zone in the near-field outfall area during these months.

The attraction of these two species to the plume had both positive and negative effects. When sport-fishing was allowed at PNPS (prior to 9/11/2001), the attraction of both species to either the thermal plume or the higher-velocity water increased the contact of bluefish with fishermen (positive to anglers, negative to fish). In addition, the nearness of bluefish fish to the plume also increased the likelihood that if the plant ceased operations for a time these fish could be subjected to cold shock (negative to fish and anglers). However, there is no record of fish kills for either species at PNPS and DMF observed that these fish simply left the area[7].

By comparison to the situation at PNPS, striped bass residing in the discharge canal at the Brayton Point electrogenerating station in Somerset MA were known to forego their usual southward migration. Prior to the installation of cooling towers at that facility, and a drastic diminution in the amount of cooling water discharged, many striped bass remained in the canal all year long. The discharge canal at Brayton is about 0.5 miles long, over three times the length of the PNPS canal (~0.14 miles long); fish residing in the Brayton Point canal were completely separated from other Mt. Hope Bay waters and were, apparently, not cognizant of changing ambient temperatures. By contrast, striped bass at PNPS were caught by fishermen outside the

[7] Personal communication from Vincent Malkoski, MADMF to Gerald Szal, MassDEP, May 29, 2013.

canal itself, and have not been known to over-winter in the plume[8]. DMF reported that the PNPS canal was too exposed and conditions in the discharge canal got "too rough" in the winter to support overwintering fish[9]. The departure of striped bass and bluefish from areas adjacent to the thermal plume at PNPS typically occurred sometime during the November-December time frame each year[10].

Estimated area of thermal avoidance: MassDEP used a figure of 25°C (Coutant and Benson, 1990) as an upper avoidance temperature for striped bass. We also used the highest, monthly-mean summertime temperature (65.9°F [~19.4°C] seen in August of 2000) from the PNPS reports over the 2000-2012 July-September period to approximate the worst-case high ambient temperature near PNPS. To estimate the greatest area that would be avoided by striped bass due to the thermal plume (under worst-case ambient conditions as described above), we used the MIT estimates of isopleths acreage based on delta temperatures above ambient (as outlined in ENSR, 2000, Table 5.1-1). Based on this information, a delta T of 5.6°C would be needed to cause avoidance to striped bass if ambient water temperatures reach the highest monthly mean temperature (19.4°C) seen over the 2000-2012 period. This equates to between 2.6 acres (at a delta T of 6°C) and 12 acres (at a delta temperature of 5°C). If ocean warming continues to increase, this acreage will also increase.

The following paragraph is based on Pottern, *et al*.'s (1989) review of the literature. Adult bluefish prefer temperatures in the 18-20°C range. In laboratory experiments adult bluefish increased swimming rates at temperatures both above this range and below this range. Based on an acclimation temperature in the preferred range (18-20C), loss of equilibrium was seen at 35°C (95°F) in fish subjected to a slow rise in temperature beyond the acclimation range. In addition, swim speed greatly increased as temperatures increased from 20-30°C and at 30°C, was about 3 times the rate seen at 18-20°C and the fish showed little interest in food.

The 30°C temperature would only occur in areas very near the discharge, and a temperature of 35°C would occur only within the direct plume in the very near field during the height of summertime temperatures. More importantly, based on DMF's observations, bluefish avoided the thermal plume in the mid-summer. In addition, the DMF dive team studying the benthic plume did not report thermal stress to this species.

> **MassDEP conclusions regarding bluefish and striped bass**: Given all of the above, MassDEP concludes that the PNPS thermal discharge at PNPS does not appear to pose a threat to populations of striped bass or bluefish and effects to date appear to have been *de minimis*.

Pelagic Schooling fish/Commercially harvested:

Atlantic menhaden (*Brevoortia tyrannus*): Two fish kills have occurred at PNPS which were thought to be due to heat-stress. Both included menhaden and/or other clupeids (the family of

[8] Personal communication from Vincent Malkoski, MADMF to Gerald Szal, MassDEP, May 29, 2013.
[9] Personal communication from Vincent Malkoski, MADMF to Gerald Szal, MassDEP, May 29, 2013
[10] Personal communication from Vincent Malkoski, MADMF to Gerald Szal, MassDEP, April, 2013

fishes that includes Atlantic menhaden). The first occurred on August 2, 1975 in which about 3,000 menhaden died. A second event occurred over August 21-25, 1978 in which an estimated 2,300 clupeids (the family of fish that includes menhaden), including menhaden, succumbed to what was thought to be heat stress, "perhaps aggravated by chlorine" (Lawton, et al., 1992b). The suggestion that chlorine may have been involved was not accompanied by any effluent data relative to chlorine. It is certainly possible that that chlorine-aggravated heat stress was responsible for these deaths because both heat and chlorine are the two factors most likely to have caused stress in fish frequenting the discharge after Gas-Bubble Disease has been ruled out. Fish suffering from Gas Bubble Disease typically have bubbles on their outer surfaces and this manifestation was not found on the fish that were examined. It is also likely that if there was any time that the facility might have had problems associated with chlorine toxicity it would have been during the early years of operations.

If heat-stress alone was the cause of the menhaden fish-kill events in the 1970s, it is puzzling to MassDEP that schools of menhaden have not continued to succumb to similar circumstances. This may be explained by the apparent inconsistency in patterns of menhaden movements from year to year. DMF reports that, in some years, the species can almost completely by-pass MA waters as they head farther north[11].

Two other discharge-related fish-kill events took place in April of 1973 and 1975. These two events were judged to be due to Gas Bubble Disease and are discussed in the section by that title. A net was kept in the canal for many years to keep fish, especially menhaden, out of the canal but primarily because of concerns relating to Gas Bubble Disease.

To conclude that the menhaden at PNPS were stressed by heat alone conflicts with certain literature information. Natural Resources, Canada (2013) conducted a thermal review of Atlantic menhaden and reports that adults avoid temperatures in excess of 26°C (78.8°F), and prefer temperatures in the 15-21°C range. In addition, the agency states that menhaden have been known to suffer mass mortalities from cold shock, i.e., due to sudden exposure to falling temperatures as might occur at a power plant if the heated discharge were to suddenly cease. No outages were reported in the characterizations of the two Atlantic menhaden kills at PNPS, thus cold-shock was probably not the cause of these two fish kills.

Given that there have been no reported heat-related kills of menhaden at the facility since the mid-1970s, it seems inappropriate to the agency to mandate that technologies or operational changes be instituted at PNPS to control against heat-stress to menhaden. However, daily monitoring for potential stress to this species does not take place on a regular basis at the facility, and since 9/11/2001, there are no fishermen to report if there is evidence of stressed fish in or alongside the discharge canal. Consultants are occasionally on-site, but not on a daily basis, and thermally-related events may have taken place since 9/11/2001 but gone un-noticed.

> **<u>MassDEP conclusions regarding menhaden:</u>** Given the above, MassDEP asserts that there have been impacts to populations of menhaden that frequent the western side of Cape Cod Bay. Due to the fact that these events are not frequent, and that there is no

[11] Personal communication from Vincent Malkoski, MADMF to Gerald Szal, MassDEP, May 29, 2013.

evidence that such events have occurred in the recent past, the agency does not feel that technological changes need to be made to mitigate an on-going problem. However, the agency maintains that it is prudent to institute a set of protocols for daily, visual monitoring of the canal and areas adjacent to the canal, to look for signs of stressed fish, as well as a mitigation plan that would lessen the potential for thermal-related kills to menhaden populations (or other fish populations) or the potential for long-duration events of stress that could be damaging to populations of menhaden or other fish.

Most abundant shoreline fish:

Atlantic silverside *(Menidia menidia)*: this species has consistently been the most abundant fish in the area near the PNPS. Silversides were targeted as an important fish in the PNPS assessment by DMF both for this reason and the fact that this species is an important “forage” fish (i.e., one that his preyed upon by other fish).

DMF estimated that, based on their thermal tolerance, there was about an exclusion area of about 4.5×10^4 m^2 (~11.1 acres) during mid-to-late summer. After more than 15 years of monitoring, DMF personnel also surmised, however, that the negative impacts of the thermal plume, at the population level, are probably negligible to their population for three reasons: a) the relatively small size of the exclusion zone; b) the ability of silversides to avoid stressful temperatures; and c) the fact that Atlantic silverside population numbers are so high that an exclusion area of the size mentioned above would not have an important negative effect on the population in the vicinity of the facility.

MassDEP conclusion regarding Atlantic silversides: Based on the information above, the agency concludes that the effects of the PNPS thermal discharge on Atlantic silversides are *de minimis*.

Resident, abundant, groundfish:

Cunner (*Tautogolabrus adspersus*): Also known as a sea perch[12], the cunner is a relatively small fish, often captured by anglers, that inhabits rocky shorelines and reefs to a depth of about 11 m but is also found in off-shore banks and ledges sometimes as deep as 21 m (Clayton, et al., 1978). Bigelow and Schroeder (1953) provide a preferred temperature range of 0-22°C (32-71°F) for this species. Haugaard &Irving (1943) developed upper lethal temperatures of 82.4-84.2F (28-29°C) for juveniles acclimated to 64.4-71.8°F (18-22.1°C). Cunner were observed by DMF divers in the early summer feeding on mussels that accumulated at the end of the discharge canal. When ambient water and plume temperatures were at their highest in the mid-late summer, and mussels were dying (apparently from the high plume temperatures), divers observed that cunner avoided the plume (see Appendix 1).

[12] Bigelow and Schroeder, 1953.

To approximate the area of unusable habitat for cunner due to the PNPS plume, the agency first estimated an avoidance temperature based on toxicity information. We used Coutant's (Natl. Acad. 1972) estimate for a "safe" (one with no associated death) acute temperature as 2°C less than the upper lethal temperature[13]. Using this approach and the information in the previous paragraph, we arrive at a "safe acute" level of 26°F for juveniles acclimated to 18°C (64.4°F). Coutant demonstrated that acute and chronic toxicity as well as avoidance are all tied to acclimation temperature.Knowing that avoidance temperatures are typically less than temperatures that cause acute toxicity, the agency estimated an avoidance temperature (**25°C**) for this species by subtracting 1°C from the "safe acute" level for the 18°C acclimation value. The 18°C acclimation value is close to the post-2012 statistically-derived mean August temperature (17°C; 62.6 °F) and the similarly-derived September mean temperature (16.8°C; 62.3°F) developed from the PNPS intake dataset.

Based on the information above, we can estimate unusable area due to the plume in two ways: a) using MIT's field data; and, b) using MIT's model results. About 0.9 acres would have temperatures above the estimated 25°C avoidance temperature for cunner based on the August 1973 MIT field-derived delta temperature isopleths (summarized in ENSR, 2000, Table 5.1-1). Using MIT's model results, the predicted surface plume areas during High Tide (see Table 5.1-2 from ENSR, 2000) that would have exceeded the estimated avoidance temperature for cunner would be about 4 acres.

The facility's impacts on the recruitment of cunner juveniles to the bottom was studied by Nitschke (1998). This researcher evaluated factors that influence cunner recruitment in Cape Cod Bay at several sites, one of which was near and in the direct path of the PNPS discharge. Recruitment with regard to cunner refers to the process of pelagic larvae (<12mm) leaving this stage of the life cycle and settling to the bottom. Within 24 hours of this event, cunner darken in color and the small (10-45mm, age=0), pigmented fish now residing on the bottom are called "recruits". Nitschke set up a number of line-transects at each of four sites of similar habitats over one reproductive season in the vicinity of PNPS and he counted recruits along a 1-meter swatch along these lines from July 24, 1995, before recruits were present, until November 7, 1995, just prior to "hibernation"[14] of recruits.

Of all the sites studied, the site nearest the PNPS discharge had the highest recruit abundance over the "settlement period"; however, post-settlement numbers toward the end of the period of study were not significantly different among the different sites. Nitschke postulated that plume-related currents may have been at least partly responsible for the high rates of settling at the discharge site, but also suggested that density-dependent mechanisms (e.g., competition and other intra-specific interactions; predation), and not the plume itself, were responsible for the apparent drop in densities at the discharge site during the post-settlement period. The researcher, and later, DMF personnel (Lawton, et al., 2000), concluded that settlement of recruits and post-settlement densities did not appear to be negatively affected by the PNPS discharge.

[13] Charles Coutant (Natl. Acad., 1972) suggested that one can approximate a temperature where no acute effects are seen for a particular thermal acute toxicity test if one subtracts 2°C from the TL50 value [the temperature lethal to 50% of the exposed organisms].

[14] Cunner enter a state of torpor during the coldest months during which they remain, usually hidden, on the bottom. This stage is sometimes referred to as "hibernation".

MassDEP conclusions regarding cunner: Based on the information above, the agency expects that there is a small area of thermal exclusion for cunner in the summertime due to the PNPS discharge. In addition, it appears that cunner avoid the plume when temperatures are above the levels that might be acutely toxic. Given the information presented, the agency concludes that deleterious effects to cunner from the PNPS thermal plume have been *de minimis*.

Groundfish/sportfish:

Tautog (*Tautoga onitis*). (Summarized from Lawton, *et al*., 1990b and 1992a). Tautog is an important game fish. Although DMF reported that tautog are routinely seen by divers in the discharge canal area they also reported that there was no relationship between tautog catch in gill nets that were set near the discharge and the degree of plant operation; additionally, no tautog kills have been reported. Thus, the heated discharge itself does not appear to be attracting tautog. Instead, it appears that mussels, which "set" in the discharge channel and at the end of the canal every year, are responsible for tautog presence at the end of the canal, as tautog feed on mussels.

MassDEP conclusions related to tautog: As a result of the DMF diver's reports, and the lack of tautog kills related to the discharge, MassDEP concludes that PNPS thermal plume effects to this species are *de minimis*.

Rainbow Smelt (*Osmerus mordax*): For this Fact Sheet MassDEP added rainbow smelt (*Osmerus mordax*), to the list of "target" species originally generated by DMF because of this species'diminishing numbers along the coast of Massachusetts, and the fact that one of the last remaining spawning runs in Cape Cod Bay is the Jones River, which is very close to PNPS. Impingement of this species at PNPS is problematic and is discussed in the impingement section of this document.

ENSR (2000) estimated that with an ambient water temperature of 19.6°C (67.3F) in the upper water column rainbow smelt would be excluded from the area encompassed by a 2°C (3.6°F) delta temperature above ambient. In their report, ENSR stated that this temperature was seen, as a monthly average, only once (during 1975) in the ten-years prior to the report publication. The exclusion area was estimated at about 1,000 acres of the top $1/8^{th}$ of the water column. Because rainbow smelt could utilize deeper waters as habitat, they were not expected to be negatively affected. Using the second highest monthly-mean ambient temperature (18.2°C [64.7°F]) seen during that ten-year period, ENSR estimated that rainbow smelt would have been excluded from an area of about 400 acres at the top $1/8^{th}$ of the water column.

Bigelow and Schroeder (1953) report that this fish is "an inshore fish confined to so narrow a zone along the coast that none has ever been reported more than a mile or so out from the land, or more than two or three fathoms in depth". As such, there is question that the thermal discharge may interfere with its free movement up and down the coast. ENSR (2000) used a temperature of 71°F (~21.7°C) as the "low end of the thermal tolerance threshold" to estimate the area encompassed by the plume that would be too warm for this species to inhabit during the summer months.

ENSR's 71°F figure was not supported with a reference, but appears to be based on toxicity rather than avoidance information. Clayton, *et al*. (1978) conducted a literature review of marine fishes in coastal Massachusetts. They report that de Sylva (1969) provided upper lethal temperature limits for smelt at 21.5 to 28.5 (70.7°F to 83.3°F) for fish acclimated to 10-15°C (50-59°F). Judging from these reports, we expect that the ENSR estimate is actually an estimate of 50% survival upon exposure to 71°F, based on an acclimation temperature of 10°C, rather than an avoidance temperature. It is reasonable to assume that the avoidance temperature is below temperatures known to cause a toxic response. Coutant (Natl. Acad., 1972) recommended a "safety factor" of 2°C below the TL50 to estimate a no-acute-effect temperature (see footnote 9 above). MassDEP estimates (as we did for cunner; see above) that the avoidance temperatures for acclimation temperatures of 10 and 15°C would be about 3°C (5.4°F) below the upper lethal temperatures mentioned above. This yields avoidance temperatures of 18.5°C and 25.5°C [65.3°F and 77.9°F] respectively for smelt acclimated to 10 and 15°C (50 and 59°F). Note that the 71°F avoidance figure used by ENSR falls at about the middle of the 65.3 to 77.9°F range that we estimate would induce avoidance, and we assume that the temperature inducing avoidance depends on the acclimation temperature.

To approximate a summertime acclimation temperature for rainbow smelt, we consulted the PNPS intake temperatures over the months of July-September, 2000-2012, figuring that these would provide estimates of near-shore temperatures similar to those that would be inhabited by rainbow smelt. Monthly average summertime intake temperatures at PNPS have been in the range of 14.2-18.8°C (57.6-65.9°F) with a median of about 16.5°C (61.7°F) over the period 2000 to 2012. These temperatures either exceed those evaluated by de Silva, or are in the very upper range of the de Silva acclimation temperatures. Based on this information, temperatures causing avoidance in rainbow smelt might range into the high 70s and low 80s (Fahrenheit). Thus, the ENSR (2000) estimates of habitat lost to this species due to avoidance appear to be higher than would be expected based on summertime, ambient acclimation temperatures in the western side of Cape Cod Bay.

Even considering the above, however, the plume is buoyant, and rainbouw smelt should be able to move underneath the plume at tidal elevations above mid-tide. DMF personnel projected that the PNPS thermal plume should not negatively impair the Jones River population because

> "juvenile and adult smelt are mobile and should avoid the thermal plume if the temperature or current are unfavorable" (Lawton, et al., 1990).

Aside from one incident where impinged smelt were sluiced into the discharge canal in December of 1978, and were subjected to heat shock as well as physical damage from the impingement event, no thermal-shock or plume-related stress has been reported for this species at PNPS. Because the plume's effect is primarily at the surface except for areas very near the shoreline, MassDEP expects that plume would not unduly affect this species' movement past the facility.

<u>MassDEP's conclusions regarding rainbow smelt:</u> Based on the information reviewed by MassDEP, the agency concludes that deleterious effects to rainbow smelt from the PNPS thermal plume have been *de minimis*.

<u>River Herring (Bluebacks: *Alosa aestivalis*; and Alewives: *Alosa pseudoharengus*):</u>
MassDEP added bluebacks and alewives to the list of fish species needing attention in the PNPS thermal review for several reasons: **a)** both are important "forage" species for other fish; **b)** both are species that have incurred dramatic declines in population levels along the Atlantic coast; **c)** both are commercially harvested as adults although there is currently a "ban" on the take of adult river herring in MA due to their greatly-diminished numbers; **d)** both species frequent the PNPS area.

Blueback and alewife adult specimens are relatively small (maximum lengths of each are about 13 and 14 inches, respectively[15]) and the two species are easily confused. In the spring, they migrate into and up streams along the east coast to breed. Blueback herring breed in flowing water and are sometimes attracted to effluent discharges. The agency has a video that was taken by consultants to the Kendall Power Plant (Cambridge MA) in which river herring can be seen displaying breeding behavior *within* the thermal discharge pipe from the power plant. Although bluebacks and alewives are difficult to tell apart, bluebacks breed in flowing water which alewives breed in lentic environments. As a result, MassDEP believes that the river herring in the Kendall video were bluebacks rather than alewives.

It is common knowledge that the urge to breed can cause many organisms to "take risks", both physiologically and behaviorally. This behavior can place organisms in unhealthy environments that can lead to diminished health of the individuals. In the specific case where river herring were found breeding in a thermal discharge pipe, the behavior may also result in the demise of eggs released in those areas, and may also result in the diminishment of the number of population-specific spawning events that occur in more healthful environments.

Based on work conducted by EPA and state agencies for the Kendall facility[16] alewives and bluebacks respond differently to warm water depending upon the season during which they encounter that water. In the spring, adult migration into streams is initiated when fish have found their way to the mouths of rivers/streams and the stream temperatures reach certain levels. Inward migrations are halted when stream temperatures rise above certain levels and spawning typically stops when the stream water exceeds certain limits.

High-temperature water can be toxic to river herring but toxicity varies, within certain limits, with the species, life stage, acclimation temperature of the exposed individual, and the frequency, duration and delta temperature (difference between acclimation temperature and exposure temperature) of the exposure[17]. Low-temperature water can also be toxic to herring when there is an abrupt decrease in temperature as might occur if either species had been

[15] See: http://www.nefsc.noaa.gov/sos/spsyn/af/herring/

[16] See the Mirant Kendall Determination Document:
http://www.epa.gov/region1/npdes/mirantkendall/assets/pdfs/draftpermit/Kendall_Determin-Doc_06_08_04.pdf
[17] See, for example, Otto, et al., 1976

attracted to the discharge and the facility were to drastically cut back on the discharge of heat (e.g., when a plant outage occurs). As a result of these relationships both the temperature maxima and minima to which a certain fish species (and life stage) can be exposed without harm varies throughout the year because ambient temperatures (i.e., the acclimation temperatures) also vary throughout the year.

Based on the research conducted for the Kendall NPDES permit MassDEP expects that alewives would be repelled by the discharge at most times of the year. There is a possibility that adults could be attracted by warmer temperatures in the spring, but this agency expects that as alewives moved closer to the discharge, due to the very high delta temperature (32°F) between ambient sea water and the discharge, these adults would be repelled rather than attracted to the plume. It is also possible that adult alewives could become confused by the thermal plume which could delay migration past the facility, but there is no evidence to support this possibility.

Due to our knowledge of blueback behavior in the Lower Charles at the Kendall facility, there is the potential for bluebacks to be attracted to the plume in the spring due to the high velocity of the plume. If this were the case there is the potential for thermal-stress to occur. However the events in the Charles occurred in fresh water, which is the environment within which bluebacks spawn. Because the PNPS discharge is comprised of salt water only (rather than fresh water) this may preclude *any* attraction of adult bluebacks to the discharge. If there were attraction to the plume, the individuals attracted could become stressed from the high delta temperature compared to ambient or their further migration could be delayed. However, there is no evidence to support that blueback attraction to the thermal plume has occurred at PNPS.

Unless evidence is presented to the contrary, based on the information presented above, it appears most likely that both adult alewives and bluebacks would avoid the plume rather than be attracted by it. EG&G (2000) came to this same conclusion for alewives, but did not evaluate the issue for bluebacks. In addition, EG&G developed estimates for the area of thermal exclusion to adult alewives during the summer when ambient temperatures are highest. After spawning in fresh water, alewives return to the sea and could encounter the PNPS discharge during those times of the year when ambient and discharge temperatures are at their highest.

Meldrin & Gift (1971) list preferred temperatures of adult alewives to be in the 68-71°F range (~20-21°C), and state that the avoidance temperature is 76°F (24.4°C). We assume that this is the avoidance temperature at the warmest time of the year (avoidance temperatures during migration, or at other times, would vary with acclimation temperature). If we use 24.4°C as the avoidance temperature, and the very highest monthly-average intake temperature (65.9°F [18.8°C] – see Table 1 below) seen at PNPS over the 1976-2012 period, we can estimate the surface area of Cape Cod adjacent to PNPS that would be inhospitable to alewives using the MIT model results (see Table 5.12 in ENSR, 2000). MIT's results provide the area enclosed by various delta T isotherms during high tide. Based on these figures, the area that would exceed a 5.6°C thermal rise above 18.8°C (i.e., (24.4 – 18.8) = 5.6) is about 40 acres of the surface to a depth of about 7-8 feet below the surface. Bluebacks tolerate slightly higher temperatures than alewives; therefore, the area expected to be avoided by bluebacks would be somewhat less.

EG&G suggested that alewives would simply move beneath the thermal plume. MassDEP accepts the EG&G conclusion and also expects that this would be the case for bluebacks as well.

> **MassDEP Conclusions re: thermal impacts to Bluebacks and Alewives:** Unless MassDEP receives evidence to the contrary, the agency concludes from the above that while some habitat exclusion probably occurs to both bluebacks and alewives due to the PNPS discharge of heat, the negative impacts to populations of these two species that move past the PNPS facility are *de minimis*.

Gas Bubble Disease (GBD):

The following summary is based on Clay *et al*. (1976) and Lawton *et al*. (1986). There have been several documented GBD-related events at PNPS. Two substantial kills of Atlantic menhaden (*Brevoortia tyrannus*) attributed to GBD occurred in the PNPS discharge canal since the facility began operations. The larger of the two occurred over April 9-19, 1973 (See: Table 4, Impingement Section, PNPS Report #57, Jan-Dec. 2000) when an estimated 43,000 adult menhaden succumbed to GBD in the PNPS discharge canal and thermal plume. Over April 2-15 (See PNPS Report #57, as above), 1975 about 5,000 adult menhaden also died from GBD in the same areas. A third incidence of GBD occurred in late fall-early winter in 1975, this time with striped mullet (*Mugil cephalus*). In the latter event, fish exhibited external abnormalities indicative of GBD but no mortality was observed. Smaller events in which fish have exhibited external GBD symptoms, but no mortality was observed, have been reported by DMF involving Atlantic silverside (*Menidia menidia*), menhaden and river herring (*Alosa sp*.). The largest of these occurred in 1985 where an estimated 600 silversides and about 300 clupeids (in this case, menhaden and river herring) were observed with GBD symptoms. Although no mortality was noticed in the 1985 event, DMF reports that many of these fish were “severely stressed”.

Events where mortalities were observed (those in April of 1973 and 1975) were coincident with the following: a) seasonally-increasing ambient seawater temperatures (i.e., spring/early summer); b) >80% PNPS operating capacity; c) super-saturation of nitrogen and other gases in the discharge; and d) attraction of large schools of fish to the thermal discharge. GBD occurs when water with highly super-saturated levels of gases (especially nitrogen) come in contact with certain fish. The gas enters the bloodstream through the gills, is too concentrated to be safely absorbed and/or released and causes emboli that can destroy tissues. The condition manifests externally as bubbles on the outer tissues of affected fish but also occurs internally. The most extreme of all reported events have occurred in the springtime.

Cold water can hold a higher concentration of dissolved gases than warm water. Thus, a water sample that is 100% saturated with nitrogen at, for example, 10°C, will have a higher nitrogen concentration than a 15°C water sample that is also 100% saturated. When completely-saturated cool water enters the PNPS it is quickly warmed and the heated effluent can, for a short time, have a super-saturated concentration (beyond 100% saturation) of nitrogen. This situation exists because it takes time for dissolved gases to leave the water and for the gases in the water to equilibrate with atmospheric pressure. Thus, the highest levels of (super-) saturation are nearest the point where the heated discharge leaves the facility. In addition, PNPS contractors found that the level of nitrogen-saturation changed with depth, even in the effluent channel, and the highest levels were found closest to the surface. This may be, at least in part, why it is possible for the upper level of the water column to exhibit saturation levels that are considered too high for fish, but for fish to still remain either in the discharge canal or in the direct line of the discharge close to the canal and not succumb to GBD.

Super-saturation of nitrogen gas in the effluent is, by itself, not problematic. It only becomes a problem when super-saturation events are coupled with the presence of fish schools. Fish are attracted to the effluent for different reasons, depending on species and season. During the 1980s and 1990s the facility contracted a pilot to conduct “over-flights” once per week in order to determine if large schools of fish were in the area. The presence of large schools of fish was reported to PNPS in order to warn the facility and its contractors to be on alert for GBD and/or impingement events.

Menhaden, the species involved in the two mortality events, annually migrate from as far as Florida up the east coast to the Gulf of Maine. DMF reports that the preferred temperature for menhaden adults is higher than that found in ambient Cape Cod Bay waters in the spring when they may pass PNPS. Based on literature information, DMF hypothesized that the springtime migrants were attracted to the plume because of its higher temperature (unlike other clupeid species, e.g., blueback hering [*Alosa aestivalis*], that spawn in fast-moving waters and are naturally attracted to effluent discharges because the water *velocity* in these discharges is higher than ambient). When the facility operates, nitrogen-saturation levels in the discharge often exceed the recommended tolerance value (115%) for menhaden. DMF suggested that during the summer and fall attraction of menhaden to the discharge does not occur because the discharge temperatures exceed the preferred temperatures (20°C) of menhaden during that part of the year.

PNPS conducted several evaluations of alternatives to prevent GBD events from occurring at the facility (see: Marcello, et al., 1975, Doret, et al., 1976; and Krabach and Marcello, 1978). In 1973 a fish barrier net was installed in the discharge canal at about 61 m from the downstream end of the canal. The location of the net was partially dictated by engineering considerations that included protection from storm damage. This first net did not function as well as intended as it tended to lift up from the bottom and allow schools of fish to move past the net to points farther up the discharge canal. In 1976, a better support system which included concrete side and bottom sills for anchoring the net was installed about 2/3 of the distance toward the terminal end of the canal. This net was made of a stretchable material and had openings about 2” wide.

Staff from DMF (Lawton, et al., 1986), contracted by PNPS to evaluate potential impacts from the facility, summarized GBD concerns at Pilgrim and the company’s attempts to prevent future events through the installation of the barrier net described above. The effectiveness of the net varied in part with the tide. Gas-saturation levels were found to greatly decline at periods around low tide because during this part of the tidal cycle turbulent mixing of the effluent occurs in the canal due to increased contact with the bottom of the canal. By contrast, during high tide, ambient sea water moves part way into the canal and the discharge plume moves over this water at the far reaches of the canal, decreasing contact of the plume with the bottom of the canal, and also decreasing the degree to which turbulent mixing occurs. During periods around low tide, the area of high levels (>115%, a figure found to be a critical level for adult menhaden; see Clay, et al., 1976) of super-saturated nitrogen greatly decreases and is primarily contained within the first

2/3 of the discharge canal. As the tide rises, plume contact with the bottom decreases and areas exceeding the 115% saturation level are found well-beyond the end of the discharge canal. As a result, the net's effectiveness in preventing GBD varies with the tide. DMF also noted that although the net reduces movement of large fish into the canal, smaller fish, such as silversides, can move through the mesh and enter the upper canal such as occurred in the GBD event in 1985 (see above).

Marcello, *et al.* (1975) evaluated a number of different technologies to decrease or eliminate GBD events. They concluded that the most cost-effective method to prevent GBD was to install an air-diffuser system into the canal. Bubbling air into the canal at high rates would require structural modifications to the canal and would also increase the cost of operating the facility.

In the recent past, PNPS has only rarely monitored for nitrogen-saturation levels in the effluent. Their consultant (Normandeau) provided the permitting agencies with monitoring records from 2003-2012. Monitoring over these years has taken place in both the discharge canal and in the intake between 3 and 7 times per year over this time period. Since 2008, monitoring has occurred 3x per year.

Monitoring for stressed fish in the discharge canal may not be taking place on a daily basis at PNPS and it is not currently required in the NPDES permit. Through the 1990s DMF divers were periodically present in the discharge canal, or in the near-field path of the discharge, and had very few reports of stressed fish during this period. This does not mean that events of stress did not occur in-between dive events at PNPS.

Since there has been only one known GBD event at PNPS since the 1970s MassDEP does not feel that installation of an air diffuser into the canal is imperative at this point in time. However, since dive events and other monitoring were not conducted on a daily basis at the facility, GBD or other stress-producing events could have occurred in-between dives. In addition, since diving was halted in about 2000, and very little monitoring (by the facility) for stressed fish has occurred at the facility since that time, we have little opportunity for observing events if they should occur. The lack of sportfishing at PNPS since 9/11/2001 further decreases the potential for knowledge of plume-induced stress events.

> **Recommendation regarding GBD monitoring**: Given the information above, MassDEP asserts that it is prudent to mandate daily, visual monitoring of the canal and areas adjacent to the canal to screen for events where fish may be stressed due to GBD or other causes.

Thermal Backwash: A number of times per year, as needed, heated water (up to 120°F) may be flushed through the condenser unit to control bio-fouling. This is allowed through the NPDES permit. Based on conservations with plant personnel, the facility typically conducts five (5) thermal backwashes per year under normal operations and four (4) during years where there is a re-fueling outage[18]. Although the 1991 permit limited such thermal backwashes to a flow limit of 255 MGD, the draft permit limits backwashes to 28 million gallons per day, to reflect the

[18] Telephone conversation between Gerald Szal, MassDEP and Joe Egan, PNPS, Feb. 27, 2013.

actual flow through the intake bay for each backwash event. The draft permit also limits thermal discharges to three (3) hours per day and one (1) per week, per intake bay.

Normandeau (1977) characterized the physical extent of the thermal plume during backwash operations under different tidal regimes. During the studies, the heated backwash resulted in a fairly thin surface plume, averaging 3 to 5 feet in depth with shoreline areas along the intake only being affected for the top 1 foot or so. Water depths in this area ranged from 18-24 feet below mean low tide level. When the backwashing stopped, the plume was seen to disappear within 2-4 hours. Most of the plume was dissipated within the first several hundred feet of the intake with delta temperatures of 10 to 15°F in excess of ambient, although some of the plume extended into the outer breakwaters into Cape Cod bay during one of the two surveys.

Potential impacts to marine communities from backwashing operations were evaluated through the Haul Seine Program (see above). No substantial impacts to species populations were discerned through these studies.

MassDEP conclusions regarding Thermal Backwash: Based on the information available, the agency concludes that backwash events are not a cause for appreciable harm to fish populations in the environs of the PNPS intake.

End of Thermal-Effects Evaluations at PNPS: Due to the lack of any findings of significant impacts other than those from the 1970s, DMF stopped the thermal-effects monitoring in 1999. After that time the biological monitoring program focused on evaluating effects of entrainment and impingement on marine fish populations. Based on a review of the available literature and on information from both PNPS personnel and its long-time consultant[19] (Mike Scherer from Normandeau) the company and its consultants have no knowledge of thermally-related fish kills occurring at PNPS since the 1970s.

[19] July 18, 2013 e-mail from Joe Egan at PNPS (with consultation from Mike Scherer) to Gerald Szal, MassDEP.

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Table 1: Mean monthly intake temperatures (degrees Fahrenheit) from PNPS plant records and PNPS annual or semi-annual reports are found in un-colored cells. Values in colored cells were derived from regressions of monthly values over the 1972-2012 time period. See text for a full description of these data and how they were derived.

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
2012	40.8	40.2	43.4	47.2	52.4	60.4	63.5	62.5	60.6	56.9	52.2	46.6
2011	36.5	35.8	39.8	43.2	52.6	58.6	62.5	61.7	60.9	58.8	51.7	47.3
2010	37.2	36.1	42.4	46.8	52.7	56.9	63.0	60.4	62.8	57.3	50.8	42.4
2009	36.0	36.2	39.5	43.8	49.3	58.2	62.4	63.0	63.3	55.8	52.5	43.1
2008	39.3	38.1	39.8	45.0	50.3	56.8	58.2	65.7	63.4	57.1	49.4	43.5
2007	41.6	34.6	38.7	41.9	51.5	59.8	59.8	62.1	61.3	57.4	49.9	41.2
2006	40.5	38.8	38.5	46.0	51.8	57.5	57.6	63.8	62.8	56.0	51.9	46.6
2005	38.4	36.6	37.2	43.0	49.0	55.7	61.7	61.3	58.9	53.0	50.6	41.9
2004	34.6	34.3	38.1	43.6	50.0	56.5	61.2	60.9	60.9	58.5	50.2	44.1
2003	36.7	34.3	37.2	41.1	50.8	56.4	57.6	61.1	63.4	55.8	50.7	42.9
2002	40.1	39.8	42.0	47.0	50.9	57.0	64.1	64.6	63.6	57.3	50.4	42.1
2001	37.1	37.6	39.8	44.3	52.1	57.6	59.5	60.7	59.4	55.3	50.0	46.6
2000	37.6	36.2	41.1	44.9	51.1	57.3	60.8	65.9	61.8	57.1	50.0	41.1
1999	39.1	39.0	38.5	45.7	50.8	59.2	59.4	61.9	61.5	55.7	49.6	44.3
1998	40.5	39.6	40.1	45.2	51.4	52.6	57.5	57.7	60.0	54.4	49.9	45.3
1997	38.8	37.4	39.2	44.1	47.8	58.7	60.6	62.3	61.7	55.7	50.8	41.0
1996	37.1	35.8	37.4	41.8	48.6	56.0	56.1	60.8	62.9	57.5	49.6	45.2
1995	41.1	36.6	39.5	41.7	48.8	56.4	58.1	67.3	62.4	57.9	50.6	40.3
1994	28.2	29.2	30.9	37.9	44.3	45.2	56.8	59.3	60.4	63.3	55.8	44.9
1993	37.3	32.2	35.2	41.2	48.3	52.7	56.8	53.7	50.5	43.9	39.9	34.5
1992	36.3	34.3	36.5	43.4	51.6	54.2	55.9	60.4	57.4	53.8	50.8	43.1
1991	37.6	36.7	39.7	44.5	53.8	60.1	61.7	58.5	58.6	52.0	47.9	41.7
1990	38.4	38.1	37.9	46.6	50.9	53.6	61.2	64.7	63.3	55.1	47.9	42.9
1989	38.4	43.0	38.4	41.4	48.7	57.4	61.6	59.8	58.6	53.9	45.6	35.6
1988	36.8	36.0	36.2	41.3	48.8	50.2	52.8	58.8	56.9	52.3	47.2	38.9
1987	38.4	38.7	40.7	42.9	49.5	56.7	63.0	61.0	58.2	52.7	47.5	41.3
1986	36.0	35.0	37.2	45.0	48.8	56.1	61.5	63.3	58.3	58.6	52.2	44.0
1985	35.6	33.4	37.8	41.9	50.6	56.3	59.0	63.4	63.7	57.8	52.0	42.4
1984	33.6	36.1	37.6	42.6	49.2	53.9	67.0	64.6	60.9	55.9	45.7	42.3
1983	38.9	37.1	40.3	43.1	47.3	57.5	59.4	61.5	61.1	55.4	49.6	41.4
1982	35.5	34.4	37.5	43.6	49.7	55.1	56.0	60.2	59.0	55.6	50.4	44.6
1981	32.0	32.7	39.0	37.6	46.0	52.7	61.0	63.7	63.7	54.1	47.9	40.4
1980	35.3	34.1	37.4	41.8	48.2	49.5	52.8	58.0	55.9	54.6	46.3	39.3
1979	36.8	30.4	35.5	39.9	49.6	54.4	55.6	56.7	53.8	51.9	48.8	40.9
1978	34.5	32.9	35.0	40.7	47.2	50.0	56.0	60.5	58.6	52.8	49.2	40.4
1977	31.9	30.9	36.4	42.9	50.8	54.2	57.0	60.4	58.1	53.7	47.3	39.8
1976	34.8	33.7	42.6	49.0	52.6	52.1	58.5	61.6	58.9	54.2	45.4	38.2

Appendix 1.

Personal Communication (phone-call) to Gerald Szal, MassDEP from Vin Malkoski, MA Division of Marine Fisheries, April 23, 2013; reviewed by Vincent Malkoski on May 29, 2013.

Vincent Malkoski, biologist at MADMF, worked on the PNPS impact assessment team for about 18 years (approximately 1982-2000). During that time he was involved in monthly dives, typically April through October, to document effects of the discharge on the bottom of the bay and to catch (i.e., spear) fish for radiological testing. Divers were required to swim into the discharge canal at regular intervals to take fish for radiological testing and also dove in the area adjacent to the discharge to measure the areas of the bottom where Irish moss was denuded or stunted due to effects from the discharge. Fish caught for radiological testing were taken both from the discharge canal as well as from spots farther away from the discharge canal.

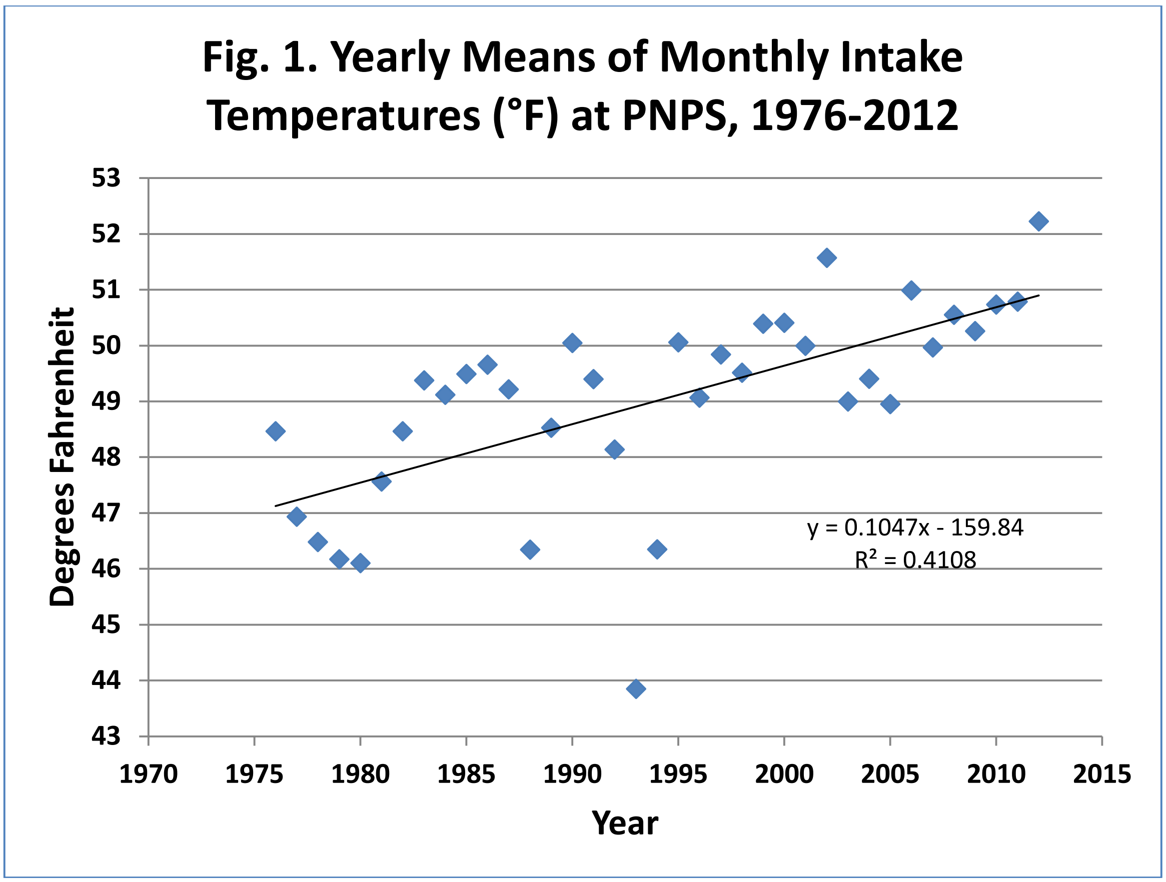
Mr. Malkoski stated that the most commonly-seen fish during dives in the area directly adjacent to PNPS were striped bass, bluefish, winter flounder, cunner and tautog. Although the bass and bluefish were attracted to the discharge there appeared to be no mortality to these fish due to their attraction to the plume. Dead fish were seen on occasion, but only during times when fishing was allowed at the facility, and divers assumed that these fish were “discards”, i.e., fish that were caught and thrown back by the fishermen.

The discharge would “hold” (be attractive to) bass into the fall into November and even December in some years, but this varied from year to year. Bluefish left the discharge area much earlier than bass. During the periods of the year that bluefish and bass were present, they did not simply remain in the plume, but moved in and out of the current (and heat) in attempts to catch prey. Mr. Malkoski also saw bluefish and striped bass inside the canal at various times but their presence varied by time of year. By mid-summer when temperatures were highest, the bass and bluefish would be seen no more than about 10 or so yards into the canal (**see: Physical Temperature Characterization);** during much of the tidal cycle, the thermal plume mixes with ocean water inside the canal and the hottest water in the canal is at the surface during these times). In mid-summer, most of the bass and bluefish would be gone from the plume.

Blue mussels (*Mytilus edulis*) grew in large numbers at the end of the discharge canal through the spring but would die and fall off from their benthic attachments (byssal threads) in “sheets” during the heat of the summer when discharge temperatures reached their highest levels (mussels are one of the primary “fouling” organisms with which the facility has concerns as they can clog cooling pipes; because mussels are sensitive to high temperatures, they are controlled by “back flushing” with heated water).

Tautog and cunner were seen in abundance near the shore adjacent to PNPS. Both eat mussels and may have been attracted to the large numbers of mussels that were found in the path of the discharge. Tautog were often seen around large rocks near the mouth of the discharge canal but their abundance decreased as one proceeded farther up into the canal. The divers used to shoot (spearfish) tautog in the canal as they also were taken for radiological analysis. During the mid-late summer when ambient and plume temperatures were at their highest (and mussels were dying, apparently from the high plume temperatures) cunner avoided the plume.

Lobsters were also seen both adjacent to the path of the discharge as well as in the direct path of the discharge near the mouth of the canal but not usually inside the canal. Depending on time of year, divers would also see lumpfish, sea ravens and sculpins within the influence of the plume but these were not the dominant fishes observed.



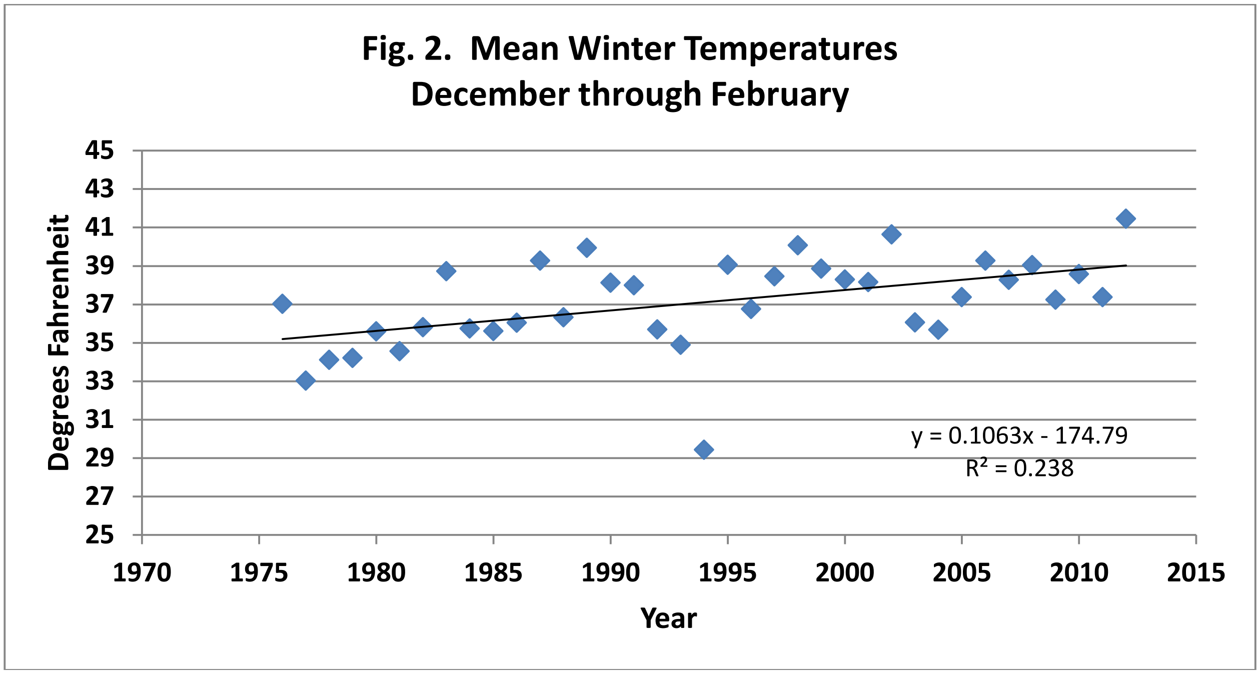


Fig. 2. Mean Winter Temperatures
December through February
Degrees Fahrenheit
45
43
41
39
37
35
33
31
29
27
25
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 0.1063x - 174.79
R² = 0.238

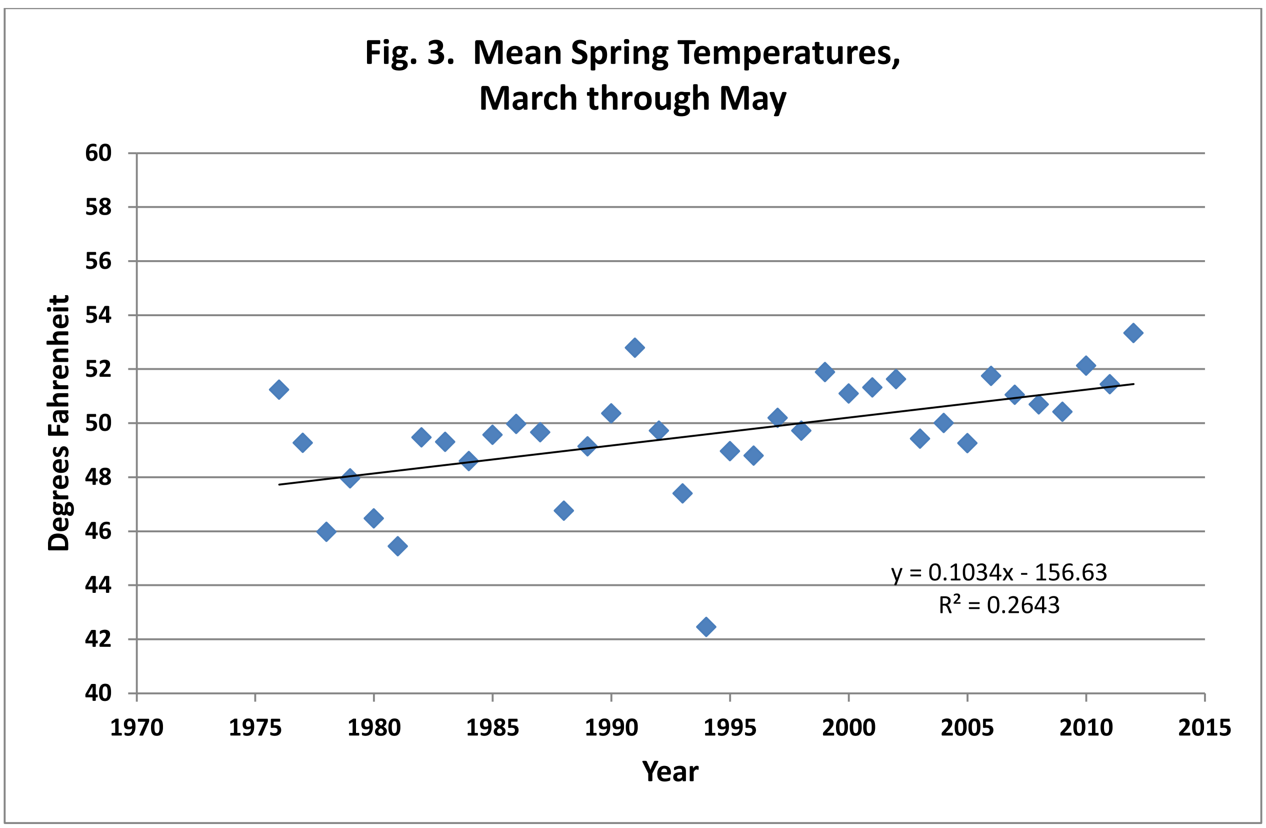


Fig. 3. Mean Spring Temperatures,
March through May
Degrees Fahrenheit
60
58
56
54
52
50
48
46
44
42
40
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 0.1034x - 156.63
R² = 0.2643

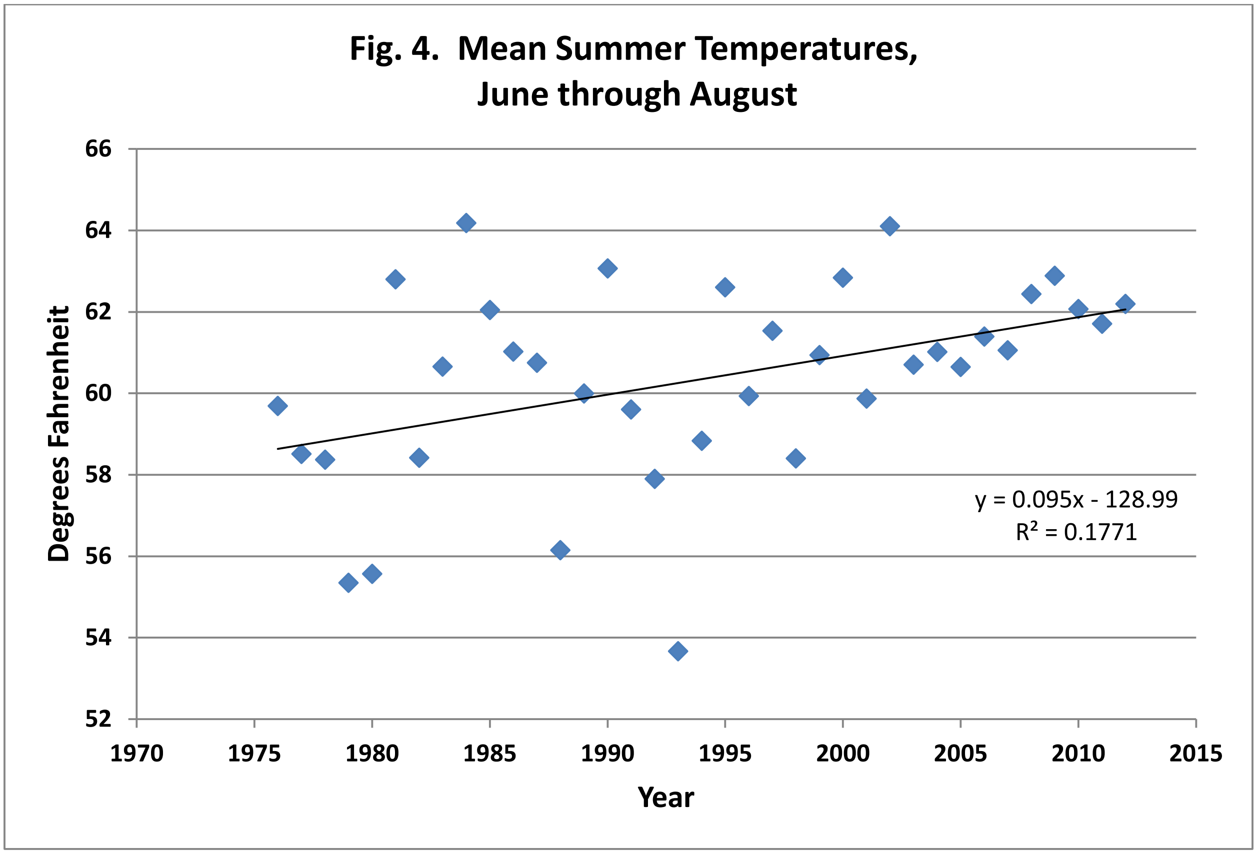


Fig. 4. Mean Summer Temperatures,
June through August
Degrees Fahrenheit
66
64
62
60
58
56
54
52
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 0.095x - 128.99
R² = 0.1771

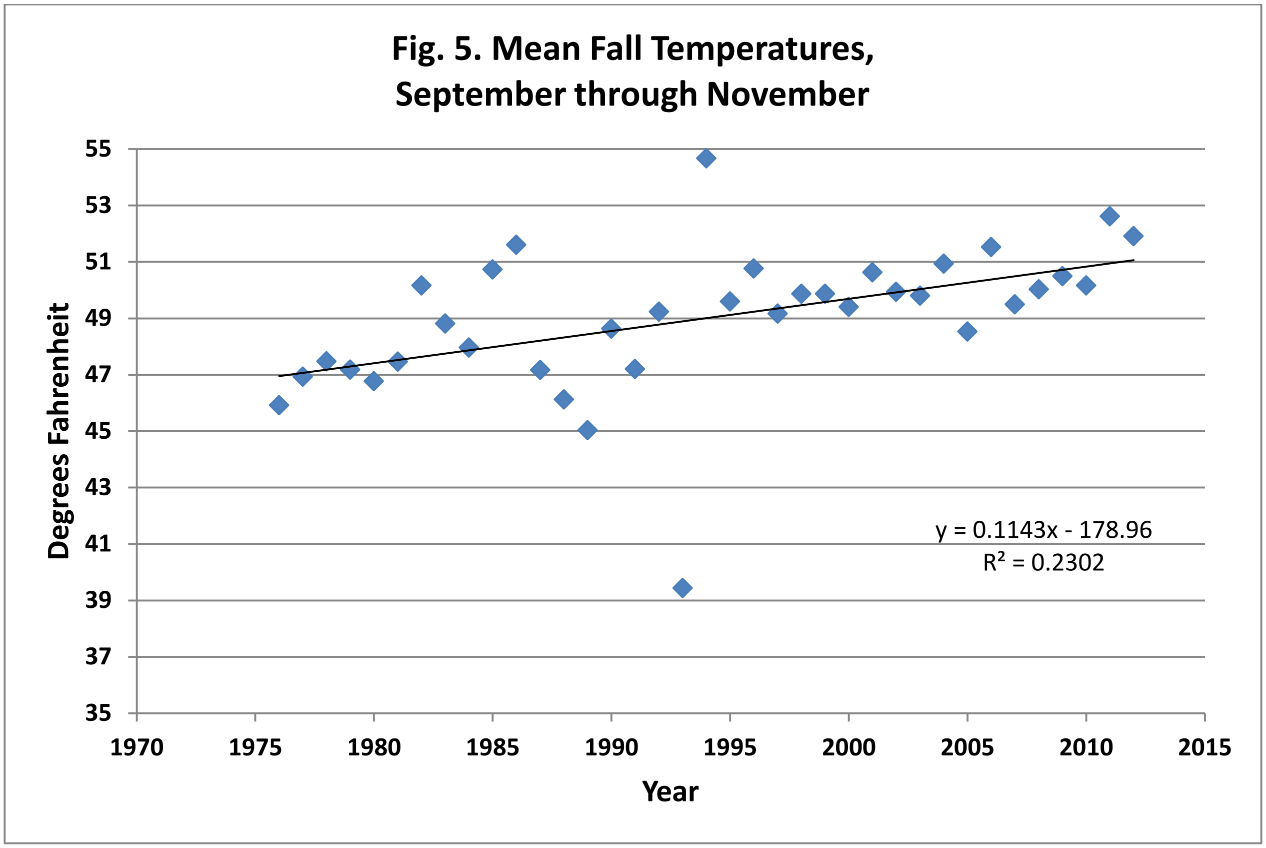


Fig. 5. Mean Fall Temperatures,
September through November
Degrees Fahrenheit
55
53
51
49
47
45
43
41
39
37
35
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year
y = 0.1143x - 178.96
R² = 0.2302

Attachment D
Assessment of Cooling Water Intake Structure Technologies and Determination of Best Available Technology Under CWA § 316(b)

Table of Contents

1.0 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). 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). 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 as water is 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.

CWA § 316(b) applies to facilities with point source discharges authorized by a NPDES permit that also withdraw water from waters of the United States through a CWIS for cooling purposes. CWA § 316(b) applies to this permit due to the operation of a CWIS withdrawing water from Cape Cod Bay and used for cooling at the Pilgrim Nuclear Power Station (PNPS).

1.1. History of Rulemaking under CWA § 316(b)

EPA first promulgated regulations to implement § 316(b) in 1976. *See* 41 Fed. Reg. 17,387 (Apr. 26, 1976). The U.S. Court of Appeals for the Fourth Circuit remanded these regulations to EPA, *see Appalachian Power Co. v. Train*, 566 F.2d 451, 457 (4th Cir. 1977), which withdrew them, leaving in place a provision that directed permitting authorities to determine the BTA for each facility on a case-by-case basis. In the absence of applicable regulations, EPA has historically made § 316(b) determinations on a case-by-case basis based on best professional judgment ("BPJ"), for both new and existing facilities with regulated CWISs.

In 1995, EPA was sued for failing to promulgate regulations applying the BTA standard under § 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. 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). Phase III was to address all remaining existing facilities with CWISs, such as manufacturing facilities and smaller power plants.

In December 2001, EPA promulgated new, final § 316(b) regulations that provide specific technology-based requirements for *new* facilities of any kind with a CWIS with an intake flow greater than two (2) million gallons per day ("MGD") (the "Phase I Rule"). *See generally* 66 Fed. Reg. 65,255 (Dec. 18, 2001). 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 like PNPS.

In July 2004, EPA published final regulations applying § 316(b) to large, *existing* power plants withdrawing at least 50 MGD or more and generating and transmitting electric power as their primary activity (the "Phase II Rule"). *See* 69 Fed. Reg. 41,576 (July 9, 2004). Subsequent to litigation that resulted in the remand to EPA of many of the rule's provisions, *see Riverkeeper, Inc. v. U.S. EPA*, 475 F.3d 83 (2d Cir. 2007), *rev'd in part*, *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 227 (2009), the Agency suspended the Phase II rule in July 2007, with the exception of 40 C.F.R. § 125.90(b), which remained in effect. *See* 72 Fed. Reg. 37,107 (July 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."

On June 16, 2006, EPA published the Phase III Rule under § 316(b) of the CWA, which established categorical requirements for new offshore oil and gas extraction facilities that have a design intake flow threshold of greater than 2 MGD, but dictated that the BTA would be determined on a case-by-case, BPJ basis for existing facilities with a design intake flow less than 50 MGD. *See* 71 Fed. Reg. 35,006 (June 16, 2006). As with the Phase I and II Rules, the Phase III Rule was challenged in federal court. EPA defended the Phase III Rule's provisions regarding new offshore oil and gas facilities, but, following the Supreme Court's 2009 decision in *Entergy*, the Agency sought a voluntary remand of the Phase III Rule to the extent that it addressed existing facilities. EPA explained that it planned to reconsider the Phase III Rule decision with regard to existing facilities in conjunction with its reconsideration of the Phase II Rule. In other words, EPA planned to consider requirements for all existing facilities together. The Fifth Circuit granted EPA's motion, while at the same time affirming the Phase III Rule's provisions pertaining to new offshore oil and gas extraction facilities. *See ConocoPhillips Co. v. EPA*, 612 F.3d 822, 842 (5th Cir. 2010).

After the suspension of the Phase II and III Rules (as it applies to existing facilities), and under the then-effective terms of 40 C.F.R. § 125.90(b), EPA continued to make BTA determinations on a case-by-case, 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 § 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).[1] 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. *See* 40 C.F.R. § 125.3(c)(2)(i)–(ii). Thus, EPA considered these factors in making its case-by-case, 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.

1.2. New CWA § 316(b) Regulations for Existing Facilities

On April 20, 2011, EPA published a proposed rule that would establish requirements under § 316(b) of the CWA for existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than 2 MGD of water from waters of the United States and use at least 25 percent of the water withdrawn exclusively for cooling purposes. *See generally* 76 Fed. Reg. 22,174 (Apr. 20, 2011). The proposed rule included several options for addressing adverse environmental impacts from impingement and entrainment. EPA published two Notices of Data Availability (NODA) on June 11, 2012 and June 12, 2012 that further clarified EPA's approach to promulgating a Final Rule establishing CWIS requirements for existing facilities under § 316(b) of the CWA.

On August 15, 2014, EPA published the Final Rule establishing requirements for existing facilities under § 316(b) of the CWA. *See* 79 Fed. Reg. 48,300 (Aug. 15, 2014) ("Final 316(b) Rule for Existing Facilities" or "Final Rule").[2] The Final Rule's requirements reflect the BTA for minimizing adverse environmental impact, applicable to the location, design, construction, and capacity of cooling water intake structures for existing power generating facilities and existing manufacturing and industrial facilities. The Final Rule responds to the remands of the Phase II Rule and aspects of the Phase III Rule that applied to existing facilities by consolidating the universe of potentially regulated

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[1] *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.").

[2] EPA notes that following its promulgation, multiple petitions challenging the Final 316(b) for Existing Facilities have been filed in federal court.

facilities in a single proceeding. The Final Rule applies to all existing power generating facilities and existing manufacturing and industrial facilities that have the design capacity to withdraw more than 2 MGD of cooling water from waters of the United States and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes. The Final Rule, which became effective on October 14, 2014, applies to this permit because PNPS is an existing power generating facility that withdraws more than 2 MGD from waters of the United States and uses at least 25 percent of that withdrawal exclusively for cooling purposes.

2.0 METHODOLOGY FOR IMPLEMENTING THE NEW CWA § 316(B) REGULATIONS

Under the Final Rule, existing facilities are subject to "best technology available" (BTA) standards for impingement mortality and entrainment that are expected to minimize the adverse environmental impacts of CWISs. The Final Rule became effective October 14, 2014 and the requirements of the rule are implemented in NPDES permits as they are issued. In part, the Final Rule requires an existing facility to submit information and studies pertaining to its cooling water intake structure(s) and the resulting impingement and entrainment. The Final Rule provides a timeline for submitting this information with the NPDES permit application. However, in some cases, a facility's NPDES permit will expire before the permittee is able to collect the necessary information required in 40 C.F.R. § 122.21(r). Such is the case at PNPS, where the facility's NPDES permit has expired and is administratively continued, and the facility submitted an application for permit renewal long before the Final Rule was published.

As explained above, in the decades prior to promulgation of the Final § 316(b) Rule for Existing Facilities, 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 Final Rule builds upon that prior site-specific, BPJ determination process. The Final Rule continues to call for the BTA to be determined on a facility-specific basis. Unlike the case-by-case nature of "pure BPJ permitting," however, the Final Rule lays out specific provisions for the site-specific analysis.

2.1. Final § 316(b) Rule's BTA Standard for Impingement Mortality

In the Final Rule, EPA's BTA impingement mortality standard is based on a modified traveling screens with a fish-friendly return as the best performing technology for impingement mortality reduction at existing facilities on a national basis. *See* 40 C.F.R. § 125.94(c)(5); 79 Fed. Reg. at 48,337 and 48,344. EPA's definition of this technology at 40 C.F.R. § 125.92(s) describes screens with collection buckets designed to minimize turbulence, a fish guard rail/barrier to prevent fish from escaping the collection bucket, "fish-friendly" smooth, woven, or synthetic mesh that protects fish from descaling and other abrasive injuries, continuous or near-continuous rotation, and a low pressure spray wash. In addition, the fish handling and return system must provide sufficient water flow to return organisms to the source waterbody in a manner that does not promote predation or re-impingement or require a large vertical drop. *See also* 79 Fed. Reg. at 48,374.

However, rather than specify a single technology or standard, the Final Rule requires a facility to choose from a number of alternatives for complying with the BTA standard for impingement mortality. Three of the compliance pathways are based on pre-approved technologies: a closed-cycle recirculating system (*See* 40 C.F.R. § 125.94(c)(1)), a CWIS with a design maximum through-screen intake velocity of 0.5 feet per second (fps) (*Id*. § 125.94(c)(2)), and an existing offshore velocity cap (*Id*. § 125.94(c)(4)). Three compliance pathways offer a streamlined approach to compliance which require the permittee to demonstrate that the technology (or combination of technologies) represents BTA performance under the conditions at the facility: a CWIS with an actual maximum through-screen intake velocity of 0.5 fps (*Id*. § 125.94(c)(3)), modified traveling screens (*Id*. § 125.94(c)(5)), and a system or combination of technologies whose demonstrated performance is the BTA for impingement reduction at the site (*Id*. § 125.94(c)(6)). The seventh alternative allows a facility to demonstrate compliance with the numeric impingement mortality performance standard through biological monitoring (*Id*. § 125.94(c)(7)). 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.*, 40 C.F.R. §§ 125.94(c)((9), (10), (11) and (12). Consequently, a permittee may choose to comply with the BTA standard for impingement mortality by employing a properly designed, built, and operated modified traveling screen as defined at § 125.92(s) or one of six alternative methods of compliance.

2.2. Final § 316(b) Rule's BTA Standard for Entrainment

Although modified traveling screens constitute BTA for impingement mortality, they do not minimize adverse environmental impacts associated with entrainment. Only three technologies – dry cooling, wet closed-cycle cooling, and a far offshore intake – performed well enough to serve as potential candidate best performing technologies for establishing BTA entrainment standards (See the *Technical Development Document for the Final Section 316(b) Existing Facilities Rule* (Final Rule TDD) at p 7-3[3]). In the Final Rule, EPA identified closed-cycle recirculating cooling systems as the best performing technology for entrainment (See the Final Rule TDD at p 7-6), but, despite numerous retrofits of existing units to closed-cycle cooling, rejected this technology as the basis for a uniform national entrainment standard because, among other things, it is not nationally available and in some instances has unacceptable non-water quality impacts. The Final Rule at 40 C.F.R. § 125.94(e) does require mechanical draft wet cooling as the BTA for impingement and entrainment at new units (as defined at § 125.92(u)).

For existing units, EPA did not identify any single technology or group of technology controls as available and feasible for establishing national performance standards for entrainment. Instead, the Final Rule expressly calls for the permitting agency to make a

[3] An electronic version of this document is available at
http://water.epa.gov/lawsregs/lawsguidance/cwa/316b/upload/Cooling-Water_Phase-4_TDD_2014.pdf

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). It puts in place a framework for establishing entrainment requirements on a site-specific basis, including the factors that must be considered in the determination of the appropriate entrainment controls, including the number or organisms entrained, emissions changes, land availability, and remaining useful plant life. 40 C.F.R. § 125.98(f)(2). The Final Rule also establishes factors that may be considered when establishing site-specific entrainment requirements, including: entrainment impacts of the waterbody, thermal discharge impacts, credit for flow reductions associated with unit retirements, impacts of controls on reliability of energy delivery, impacts on water consumption, and availability of alternative sources of water. *Id*. § 125.98(f)(3).

Finally, the United States Supreme Court held that EPA is authorized, though not statutorily required, to consider a comparative assessment of an option's costs and benefits in determining the BTA under CWA § 316(b). *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208, 222-26 (2009), *rev'g in part*, *Riverkeeper v. EPA*, 475 F.3d 83 (2d Cir. 2007). In that regard, and as noted above, the Final Rule directs the permitting authority, under certain circumstances, to base site-specific entrainment requirements on, among other factors, the "[q]uanitfied and qualitative social benefits and costs of available entrainment technologies when such information is of sufficient rigor to make a decision." 40 C.F.R. § 125.98(f)(2)(v); *see also id.* § 125.92(x), (y) (defining "social benefits" and "social costs"). [4] The rule also provides the permitting authority with the discretion to "reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." *Id.* § 125.98(f)(4); 79 Fed. Reg. at 48,351-52.

2.3. Additional Provisions of the Final 316(b) Rule

The Final Rule provides that the permitting authority may establish additional control measures and monitoring or reporting requirements in the permit in order to protect Federally-listed threatened and endangered species and designated critical habitat. 40 C.F.R. § 125.94(g). The permitting authority may include such conditions "that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to Federally-listed species and designated critical habitat, or avoid jeopardizing Federally-listed species or destroying or adversely modifying designated critical habitat (*e.g.*, prey base)." *Id.*

Finally, applicable to both impingement mortality and entrainment and PNPS, the rule

[4] As described in EPA's *Guidelines for Preparing Economic Analyses* (December 2101) (EPA 240-R-10-001), social costs "represent the total burden that a regulation will impose on the economy and are defined as the sum of all opportunity costs incurred as a result of a regulation where an opportunity cost is the value lost to society of any goods and services that will not be produced and consumed as a result of a regulation." (Chapter 8, p. 8-1). The Economic Analysis for the Final Section 316(b) Existing Facilities Rule (May 2014) (EPA-821-R-14-001) defines social costs of regulatory actions as "the opportunity cost to society of employing scarce resources to prevent the environmental damage otherwise occurring except for the design and operation of compliance technology." (Chapter 7 p. 7-1).

provides that, if the owner or operator of a nuclear facility demonstrates to the permitting authority, upon the permitting authority's consultation with the Nuclear Regulatory Commission ("NRC"), that "compliance with this subpart [i.e., Subpart J—Requirements Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Clean Water Act] would result in a conflict with a safety requirement established by" the NRC, the permitting authority must establish site-specific BTA requirements that would not result in a conflict with the safety requirement. *Id.* § 125.94(f); 79 Fed. Reg. at 48,322-23.

2.4. Final § 316(b) Rule's Provision for Ongoing Permit Proceedings

In the Final Rule, EPA also sought to address ongoing permitting proceedings like the reissuance of the PNPS NPDES permit. Specifically, EPA recognizes that, in some cases, a facility may already be in the middle of a permit proceeding at the time the new regulations were promulgated. Relevant to the PNPS 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 CFR 122.21(r). The Director's BTA determination may be based on some or all of the factors in paragraphs (f)(2) and (3) of this section and the BTA standards for impingement mortality at 125.95(c).[5] In making the decision on whether to require additional information from the applicant and what BTA requirements to include in the applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 CFR 122.21(r) is necessary.

The Final Rule makes clear that for an ongoing proceeding, when sufficient information has already been collected, the permitting authority may proceed to a site-specific BTA determination for entrainment and impingement mortality. It is evident that 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 Final Rule where sufficient information has been submitted upon which to base a site-specific BTA determination. *See also* 79 Fed. Reg. at 48,358 ("… 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)."). The Final Rule 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).

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[5] So in original. Correct reference is likely 125.94(c).

PNPS was first issued a NPDES permit in 1975 and has been collecting and submitting information to EPA and MassDEP about its CWIS for more than 30 years. Region 1 was working on the permit prior to promulgation of the Final § 316(b) Rule for Existing Facilities and had gathered substantial additional information from the permittee as required under its current, administratively-continued permit 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. This information includes, but is not limited to, the following:

- *Engineering Response to United States Environmental Protection Agency CWA § 308 Letter – Pilgrim Nuclear Power Station, Plymouth, Massachusetts* (Enercon June 2008);
- *Adverse Environmental Impact Assessment for Pilgrim Nuclear Power Station* (LWB and Normandeau June 2008);
- *Economic Assessment of Fish Protection Alternatives at Pilgrim Nuclear Power Station* (NERA June 2008) ;
- *Entrainment and Impingement Studies Performed at Pilgrim Nuclear Power Station, Plymouth, Massachusetts from 2002 to 2007* (Normandeau, June 2008);
- *Assessment of Finfish Survival at Pilgrim Nuclear Power Station Final Report 1980-1983* (Marine Research, Inc. 1984);
- *Winter Flounder Area-Swept Estimate Western Cape Cod Bay* (Normandeau 2013);
- *Engineering Response Supplement to United States Environmental Protection Agency CWA § 308 Letter – Pilgrim Nuclear Power Station, Plymouth, Massachusetts* (August 2014);
- *316 Demonstration Report – Pilgrim Nuclear Power Station* (ENSR March 2000);
- *Study of Winter Flounder Transport in Coastal Cape Cod Bay and Entrainment at Pilgrim Nuclear Power Station* (ENSR and Marine Research, Inc. November 2000); and
- Annual entrainment and impingement reports from 1991 to the present.

As explained below, the BTA determination for controlling impingement mortality and entrainment at PNPS has been developed on a site-specific basis, consistent with EPA's Final § 316(b) Rule for Existing Facilities and under the ongoing permit proceeding provision at 40 C.F.R. § 125.98(g). In addition, EPA has considered any conditions necessary to meet Massachusetts surface water quality standards at 314 CMR 4.00 as they apply to the effects of CWISs on the State's waters.

2.5. State Water Quality Standards

In addition to satisfying technology-based requirements, NPDES permit limits for CWISs must also satisfy any more stringent provisions of state water quality standards (WQS) or other state legal requirements that may apply, as well as any applicable conditions of a state certification under CWA § 401. *See* CWA §§ 301(b)(1)(C), 401(a)(1) &(d), 510; 40 C.F.R. §§ 122.4(d), 122.44(d), 125.84(e), 125.94(i). This means that permit conditions for CWISs must satisfy numeric and narrative water quality criteria and protect designated uses that may apply from the state's WQS.

The CWA authorizes states to apply their WQS to the effects of CWISs and to impose more stringent water pollution control standards than those dictated by federal technology standards.[6] The United States 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 that such conditions are needed to ensure compliance with state WQS or other applicable requirements of state law.[7]

With respect to cooling water withdrawals, both sections 301(b)(1)(C) and 401 authorize the Region to ensure that such withdrawals are consistent with state WQS, because the permit must assure that the overall "activity" associated with a discharge will not violate applicable WQS. *See PUD No. 1*, 511 U.S. at 711-12 (Section 401 certification); *Riverkeeper I,* 358 F.3d at 200-02; *In re Dominion Energy Brayton Point, LLC,* 12 E.A.D. 490, 619-41 (EAB 2006). Therefore, in EPA-issued NPDES permits, limits addressing CWISs must satisfy: (1) the BTA standard of CWA § 316(b); (2) applicable state water quality requirements; and (3) any applicable conditions of a state certification under CWA § 401. The standards that are most stringent ultimately determine the final permit limits.

The Massachusetts Department of Environmental Protection (MassDEP) has designated Cape Cod Bay in the vicinity of this discharge a Class SA waterbody. Class SA "waters are designated as an excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth, and other critical functions, and for primary and secondary contact recreation." 314 CMR 4.05(4)(a). Though the standard for Class

[6] The regulation governing the development of WQS notes that "[a]s recognized by section 510 of the Clean Water Act [33 U.S.C. § 1370], States may develop water quality standards more stringent than required by this regulation." 40 C.F.R. § 131.4(a). The Supreme Court has also recognized that the Clean Water Act allows states to adopt water quality requirements more stringent than federal requirements. *PUD No. 1 of Jefferson County v. Wash. Dep't of Ecology,* 511 U.S. 700, 705 (1994) (citing 33 U.S.C. §§ 1311(b)(1)(C), 1370; 40 C.F.R. § 131.4(ad)). *See also* 40 C.F.R. § 125.80(d); *Riverkeeper, Inc. v. U.S. Environmental Protection Agency,* 358 F.3d 174, 200-02 (2d Cir. 2004) ("*Riverkeeper I*").

[7] In *PUD No. 1,* the Supreme Court held that, in setting discharge conditions to achieve WQS, a state can and should take account of the effects of other aspects of the activity that may affect the discharge conditions that will be needed to attain WQS. 511 U.S. at 711-12. "The text [of CWA § 401(d)] 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.'" *Id.* at 711. For example, a state could impose certification conditions related to CWISs on a permit for a facility with a discharge, if those conditions were necessary to assure compliance with a requirement of state law, such as to protect a designated use under state WQS. *See id.* at 713 (holding that § 401 certification may impose conditions necessary to comply with designated uses).

SA waters does not include any specific numeric criteria that apply to cooling water intakes, it is nevertheless clear that MassDEP must impose the conditions it concludes are necessary to protect the designated uses of the bay, including that it provide excellent quality habitat for fish and other aquatic life and a recreational fishing resource. In addition, 314 CMR 4.05(1) of the Massachusetts WQS provides that each water classification "is identified by the most sensitive, and therefore governing, water uses to be achieved and protected." This means that where a classification lists several uses, permit requirements must be sufficient to protect the most sensitive use.

Massachusetts interprets its WQS as being applicable to cooling water withdrawals. EPA agrees with the Commonwealth's interpretation. First, the Massachusetts Clean Waters Act provides that "[n]o person shall engage in any other activity which may reasonably be expected to result, directly or indirectly, in discharge of pollutants into waters of the [state] without a currently valid permit" from the Department. M.G.L. ch. 21, § 43(2); 314 CMR 3.04. MassDEP's position has been that the cooling water withdrawal associated with a once-through cooling water operation is an integral component of the "activity" that directly results in a thermal discharge. Therefore, PNPS's cooling water withdrawal is an activity subject to regulation under the permit that MassDEP must issue to authorize the discharge of thermal pollution under the Commonwealth's Clean Waters Act. Second, the state's CWA provides that MassDEP water permits may specify "technical controls and other components of treatment works to be constructed or installed," that MassDEP "deems necessary to safeguard the quality of the receiving waters." M.G.L. ch. 21, § 43(7). "Treatment works" is broadly defined to include "any and all devices, processes and properties, real or personal, used in the collection, pumping, transmission . . . recycling . . . or reuse of waterborne pollutants." M.G.L. ch. 21, § 26A; 314 CMR 3.02. MassDEP has concluded that a CWIS constitutes an integral component of a facility's once-through cooling water "treatment works," and therefore, MassDEP has further authority to regulate such structures.

On December 29, 2006, Massachusetts amended its WQS to make explicit its interpretation of the implicit meaning of its pre-existing WQS, adding the following provision in several locations: "in the case of a [CWIS] regulated by EPA under [CWA § 316(b)], the Department has the authority under [CWA § 401], M.G.L. c. 21, §§ 26 through 53 and 314 CMR 3.00 to condition the CWIS to assure compliance of the withdrawal activity with 314 CMR 4.00, including, but not limited to, compliance with narrative and numerical criteria and protection of existing and designated uses." 314 CMR 4.05(3)(b)(2)(d), 4.05(3)(c)(2)(d), 4.05(4)(a)(2)(d), 4.05(4)(b)(2)(d), 4.05(4)(c)(2)(d). Entergy promptly challenged the regulation in state court, alleging that MassDEP had no such authority under the state Clean Waters Act. *Entergy Nuclear Generation Co. v. Dep't of Envtl. Prot.*, 944 N.E.2d 1027, 1032 (Mass. 2011). On January 11, 2007, Massachusetts submitted this revision (among others) to its WQS to EPA for review pursuant to Section 303(c) of the federal CWA. On July 29, 2007, EPA wrote a letter to MassDEP stating that "there is nothing in the CWA that prohibits MassDEP from adopting and enforcing WQS related to CWISs to ensure that water withdrawals are conducted in a manner that protect[s] designated and existing uses and compl[ies] with narrative and numeric criteria." Letter from Stephen S. Perkins, EPA, to

Arleen O'Donnell, MassDEP (July 29, 2007), at 3. In 2011, the Massachusetts Supreme Judicial Court upheld the revision to Massachusetts' WQS, concluding that the state Clean Waters Act "confers on [MassDEP] authority to protect the water resources of the Commonwealth, and that that authority is broad enough to encompass the regulation of CWISs." *Entergy*, 944 N.E.2d at 1030, 1036-42.

In summary, the Massachusetts WQSs apply to CWISs. Furthermore, the PNPS permit's requirements must be sufficient to ensure that the facility's CWISs neither cause nor contribute to violations of the WQS and must satisfy the terms of the state's water quality certification under CWA § 401. EPA anticipates that the MassDEP will provide this certification before the issuance of the final permit.

2.6. Conclusion

The permit requirements in PNPS'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 state water quality standards. As presented below, EPA has developed a site-specific BTA determination for PNPS's CWIS consistent with the Final 316(b) Rule for Existing Facilities. This determination is based on information sufficiently similar to the information required by the Final Rule at § 122.21(r) and which has been provided by the permittee in response to EPA's requests under § 308 of the CWA as well as supplemental biological information provided by the permittee. 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.

3.0 Biological Impacts of Cooling Water Intake Structures

The principal adverse environmental impacts typically associated with CWISs evaluated by EPA are the *entrainment* of fish eggs, larvae, and other small forms of aquatic life through the plant's cooling system, and the *impingement* of fish and other larger forms of aquatic life on the intake screens. *See, e.g.*, 79 Fed. Reg. at 48,318. In Section 316(b) Rulemaking, the effects of impingement and entrainment are referred to as adverse environmental impacts (AEI). *See* 79 Fed. Reg. at 48,303. Entrainment and impingement can kill large numbers of aquatic organisms, which can have immediate and direct effects on the population size and age distribution of the affected species. In some cases, losses of fish from impingement and entrainment may contribute to diminished populations of local species of commercial and/or recreational importance, biologically important local forage species, and local threatened or endangered species. In effect, CWISs can degrade the quality of aquatic habitat by adding to the ecosystem a significant anthropogenic source of mortality to resident organisms. The resulting losses of particular species could alter a wide range of aquatic ecosystem functions and services at the community level, including disrupting predator-prey relationships, ecological niches, and food webs. Mortality from long-term impingement and entrainment could lead to reductions in local community biodiversity, decrease ecosystem resistance and resilience (i.e., the ability to resist and recover from disturbance, both from anthropogenic impacts and natural variability), and contribute to overall degradation of the aquatic environment. In addition to considering these adverse impacts directly, their effects as cumulative impacts or stressors in conjunction with other existing stressors on the species are also considered. *See* 79 Fed. Reg. at 48,318-21 (Aug. 14, 2014).

Entrainment of organisms occurs when a facility withdraws water into a CWIS from an adjacent water body. Fish eggs and larvae are typically small enough to pass through intake screens and become entrained along with the cooling water within the facility. Organisms carried through the cooling system can be exposed to shear forces from mechanical pumps, physical stress or injury from contact with pipe surfaces, a rapid increase in water temperature as heat is transferred to the cooling water from the facility's condensers and high concentrations of chlorine or other biocides. After passing through the cooling system, organisms that survive are likely exposed to rapid decreases in water temperature as the heated cooling water mixes with the receiving waters. These physical, chemical, and thermal stressors, individually or in combination, can kill or injure the entrained organisms. *See* 79 Fed. Reg. at 48,318. The number of organisms entrained is dependent upon the volume and velocity of cooling water flow through the plant and the density of organisms in the source water body that are small enough to pass through the screens of the CWIS.[8] The extent of entrainment can be affected by the intake structure's location, the biological community in the water body, seasonal variation in ichthyoplankton densities, and by the characteristics of any intake screening system or other entrainment controls used by the facility.

Impingement of organisms occurs when organisms too large to pass through the screens at a CWIS but unable to swim away become trapped against the screens and other parts of the intake structure. Impinged organisms may be killed, injured, or weakened from exhaustion, starvation, asphyxiation (from being removed from the water or pressed against a screen preventing proper gill movement), descaling (loss of scales upon contact with screens), and other physical harms. *See* 66 Fed. Reg. at 65,263 (Dec. 18, 2001). Injured or weakened organisms that initially survive and are returned to the water may suffer delayed mortality. The quantity of organisms impinged is a function of the intake structure's location and depth, the velocity of water at the entrance to or in front of the intake screens (approach velocity) and through the screens (through-screen velocity), the seasonal abundance of various species of fish, and the size of fish relative to the size of the mesh in any intake barrier system (e.g., screens).

At PNPS, the productive aquatic community in Cape Cod Bay near the CWIS results in the presence of high egg and larval densities, numerous juvenile and adult fish and invertebrates, and anadromous fish migrating to spawning habitat, all of which have contributed to high rates of entrainment and impingement. The following section

[8] As described in the Phase I proposed rule (65 Fed. Reg. at 49,060) and the Phase II NODA (66 Fed. Reg. at 28,853), absent any other controls, withdrawal of a unit volume of water from a waterbody will result in the entrainment of an equivalent unit of aquatic life (e.g., eggs and larvae) from that volume of the water column. *See* 79 Fed. Reg. at 48,321 n.37.

discusses the potential for adverse environmental impacts to aquatic organisms as a result of the operation of PNPS's CWIS.

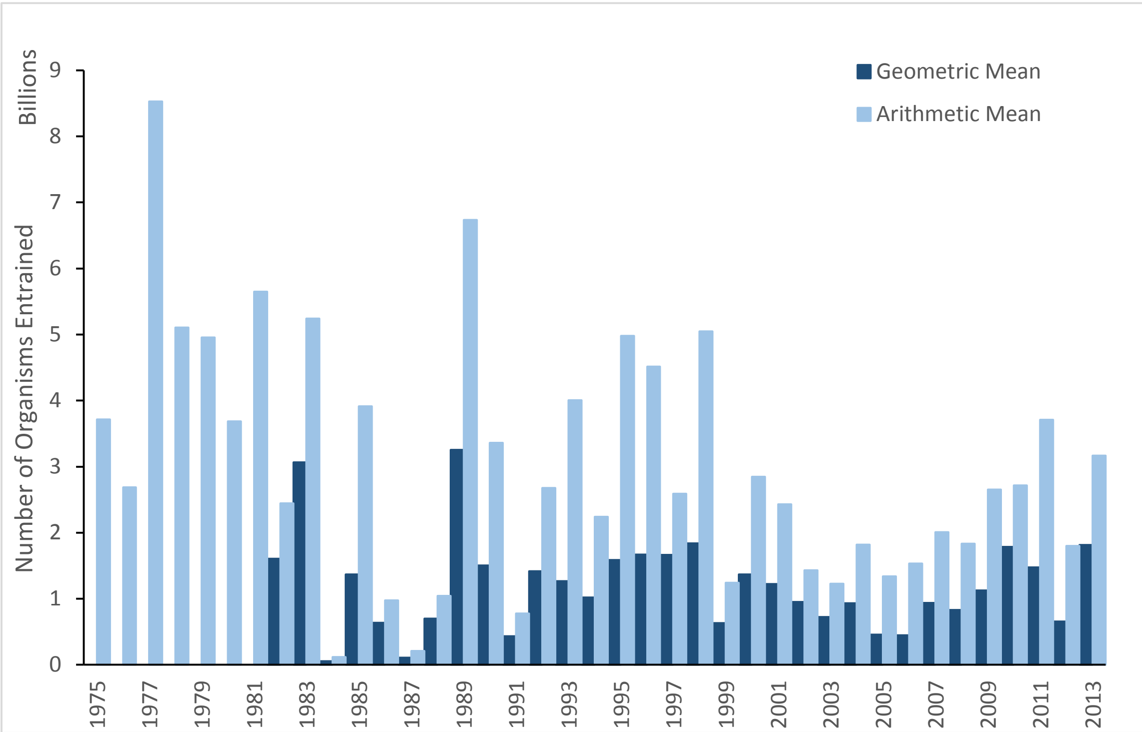
3.1. Entrainment at Pilgrim Nuclear Power Station

Fish eggs, larvae, and other aquatic organisms small enough to pass through the mesh of intake screens become entrained in a facility's cooling system. As previously described, once entrained, the eggs and larvae may be subjected to high velocity and pressure, increased temperature, and chemical anti-biofouling agents in the system. These factors are highly lethal and, in most cases, sensitive early life stages are unlikely to survive entrainment. EPA has found that eggs collected after passing through the CWIS show poor survival and larvae collected after interacting with the CWIS show essentially zero survival. For the purposes of the Final Rule, EPA concluded that no entrained organisms would survive and that, without entrainment control, entrainment is assumed to lead to 100% entrainment mortality. *See* 79 Fed. Reg. at 48,330. For issuance of the draft NPDES permit for PNPS, EPA also assumes 100% mortality of entrained organisms due to the absence of site-specific analysis demonstrating entrainment survival.

Entrainment data is available for PNPS from 1975 to the present, although collection of species-specific data began in 1980. Until 1994, entrainment sampling was conducted weekly from March through September, and semi-monthly during the remaining months. In the current revised protocol, introduced in 1994, entrainment samples representing the morning, afternoon, and night periods are collected during alternate weeks in January, February, October, November and December. From March through September, samples are collected on a weekly basis. All entrainment samples are collected using a 60-cm diameter plankton net mounted 30 meters from the headwall in the discharge canal.

Average annual egg entrainment (arithmetic) from 1975 to 2013 is approximately 2.8 billion eggs per year (range is 593 million to 8.4 billion) while annual average larval entrainment from 1975 to 2013 is about 354 million larvae per year (range is 76 million to 938 million). Based on geometric means, annual average egg entrainment is about 1.3 billion per year (range is 305 million to 3.7 billion) and annual average larval entrainment is about 205 million per year (ranging from 42 million to 744 million). The average (geometric and arithmetic) number of eggs and larvae entrained at PNPS from 1975 through 2013 is presented in Figure 1. According to Normandeau, geometric mean densities cannot be generated from entrainment data collected from 1975-1980 and these years were excluded from comparison (Normandeau 2015). Larval entrainment in 2013 was the highest value recorded in the time series and more than twice the long term mean of the data set, while total egg entrainment in 2013 was less than the long term mean of the data set. Historically low cooling water withdrawals during 1984 and 1987 likely resulted in the relatively low entrainment values during those years. On average, eggs accounted for more than 80% of the total entrainment in any given year.

Figure 1. Average density of eggs and larvae entrained at PNPS from 1975 through 2013 expressed as geometric and arithmetic mean (Normandeau 2015).



The average number of species observed in entrainment samples from 1980 to 2014 is 39 (range is 34 to 45). In 2013, 37 species of fish were identified in the entrainment samples while 38 species were identified in the 2014 entrainment samples. Generally, species that were dominant in entrainment samples in 2013 were the same as those observed in large numbers in the past decade, including: American plaice eggs, Atlantic cod eggs, sand lance larvae, and grubby larvae in the winter and early spring; cunner/tautog/yellowtail eggs and cunner larvae and winter flounder larvae in summer; and tautog/cunner/yellowtail eggs and fourspot windowpane eggs in late summer and autumn. Record high levels of larval entrainment in 2013 can be partly attributed to high densities of tautog, fourbeard rockling, cunner, and winter flounder larvae in July and August. In particular, unusually high densities of tautog were observed on 21 of 27 sampling dates and unusually high densities of fourbeard rockling were observed on 13 of 27 sampling dates in July and August. In both cases, densities in 2013 were the highest ever observed.

The large scale loss of eggs and larvae to entrainment can result in substantial environmental harm that may justify engineering or operational changes to a facility's CWIS. One approach that provides context to the loss of billions of eggs and larvae annually is to standardize losses as equivalent numbers of adult fish using species-specific survival tables based on life history and age-specific mortality rates. EPA recognizes that this approach considers early life stages solely as a means to perpetuate the local population and likely overlooks the critical ecological role eggs and larvae plays as a prey item for many other organisms. Mortality of early life stages is exceedingly high and many aquatic species generate thousands or even millions of eggs when spawning to secure survival of a single individual to adulthood. Still, there is an ecological benefit to early life stages even if they would not survive to adulthood. EPA considers, to the extent possible, the complex ecological benefits of early life stages on a qualitative basis. *See* 79 Fed. Reg. at 48,403. Here, EPA discusses the simplified approach of adult equivalents.

Normandeau (2015) calculated equivalent adults for a subset of species using species- and life-stage specific survival rates from the scientific literature and the number of eggs and larvae entrained. A number of assumptions go into this analysis, including the assumption of a 100% mortality rate for eggs and larvae that transit the facility. Entrainment is highly lethal in most cases, and even if an egg survives initially, its chances of surviving beyond the larvae stage are dramatically lower than eggs that were never entrained. As discussed above, EPA assumes that 100 percent of entrained organisms suffer mortality. *See* 79 Fed. Reg. at 48,318. In addition, adult equivalent analysis is dependent on the life-stage and species-specific survival rates used in the calculation, which are often not well understood, or several, often conflicting, values may be available in the literature.[9] Still, this approach provides a useful perspective on the potential impact of the loss of large numbers of eggs and larvae (in this case, billions of organisms) in terms of adult fish.

Entrainment losses presented as annual equivalent adult losses for several, key species are presented in Figure 2. Equivalent Adult loss estimates are presented for winter flounder, Atlantic cod, cunner, and Atlantic mackerel, because of their ecological value and/or commercial importance. On average, entrainment results in annual losses of 17,047 adult winter flounder, 785,219 adult cunner, 2,508 Atlantic menhaden, 12,837 Atlantic herring, 1,816 adult Atlantic cod, and 1,437 adult Atlantic mackerel. Adult equivalent losses of cunner are an order of magnitude greater than losses of other species because this species is entrained in significantly greater numbers than any other.

[9] In its analysis, Normandeau calculated values for adult equivalents using multiple sets of survival values for each species and calculated an average number of adult equivalents from these values. In most cases, as in Normandeau 2015, EPA presents the average adult equivalent value calculated from the values for each method. For winter flounder, EPA presents the average over three staged methods. For cunner and Atlantic cod, EPA presents adults equivalents based on survival values used in the (remanded) Phase II Rule.

Figure 2. Estimated annual age-specific adult equivalent losses for select species at PNPS from 1980 through 2014 (Normandeau 2015).

Based on mean annual entrainment values provided by Entergy, since coming on-line in 1975, PNPS has potentially entrained more than 100 billion eggs and 13 billion larvae. These entrainment losses have effectively removed more than 590,000 adult winter flounder, 450,000 adult Atlantic herring, and more than 27 million adult cunner, as well as tens of thousands of other adult fish, from the population. In addition to the millions of adult equivalent fish that can be quantified, there are untold additional losses for those species, such as fourbeard rockling and sand lance, for which life history data is insufficient to calculate adult equivalent losses. These species comprise a substantial proportion of entrainment at PNPS and play significant roles in the ecology of Cape Cod Bay. In particular, sand lance are a preferred prey of humpback whales in the Gulf of Maine (*see*, *e.g*., Hain et al. 1995, Hazen et al. 2009, and Friedlaender et al. 2009). As a result, the analysis performed by Normandeau and presented here may underestimate the true impact of adult losses due to entrainment.

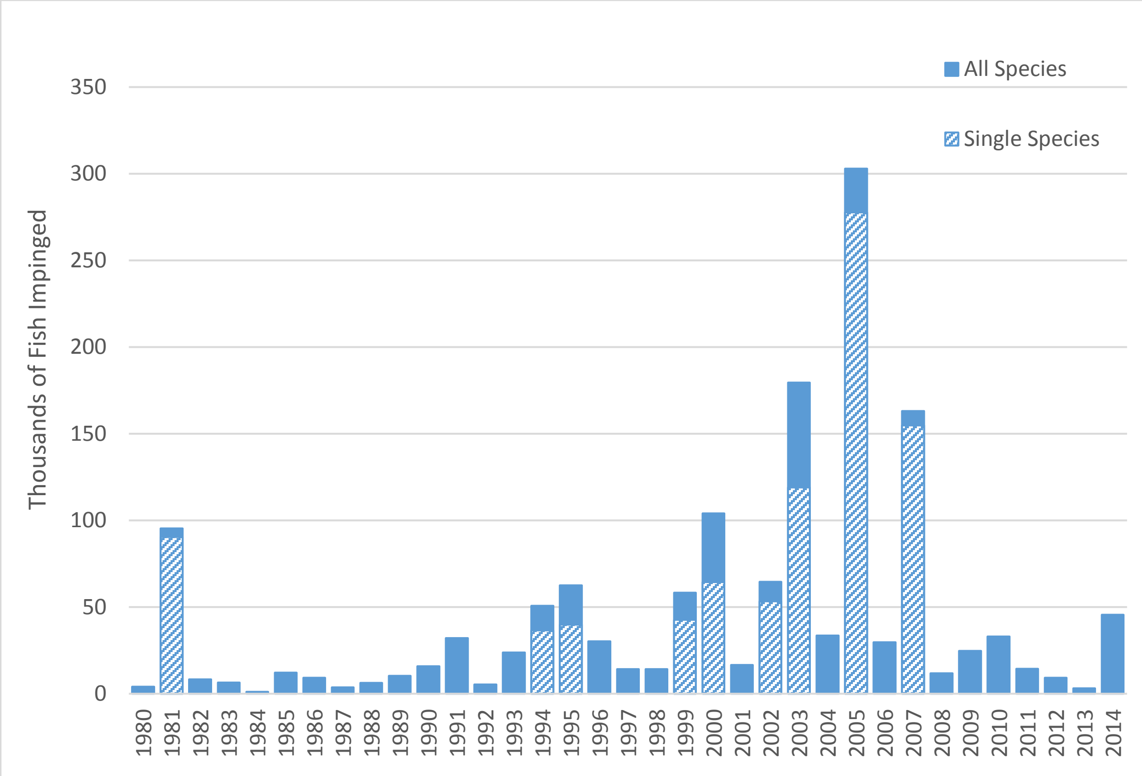
3.2. Impingement at Pilgrim Nuclear Power Station

The impingement of organisms occurs when water is drawn into a facility through PNPS's CWIS and organisms become trapped against the traveling screens. Impinged fish may suffer from improper gill movement, de-scaling, starvation, exhaustion or other injury while trapped against intake screens. If an organism is returned to the waterbody through a debris return trough, it may suffer further injuries from contact with debris in the trough or the trough itself. Upon being returned to the waterbody, any injured or disoriented organisms may be more susceptible to predation. *See* 66 Fed. Reg. 65263 (December 18, 2001) (Preamble to the Phase I Rule).

Impingement sampling at PNPS started in 1980. Currently, samples are taken three times per week and each sample represents an eight hour period. Sample collection occurs in conjunction with entrainment sampling on Monday morning, Wednesday afternoon and Friday night.

Since 1980, PNPS has impinged between 21 and 39 species of fish per year, with a total of 81 different species of fish impinged from 1980 to 2014. Eight species (alewife, Atlantic silverside, blueback herring, cunner, grubby, hakes, rainbow smelt and winter flounder) have been impinged every year. Eight other species (Atlantic herring, Atlantic menhaden, Atlantic tomcod, lumpfish, northern pipefish, rock gunnel, three-spine stickleback and windowpane) have been impinged during 90% of the years since 1980. The number of fish impinged per year at PNPS, illustrated in Figure 3, is highly variable and has fluctuated by 2 orders of magnitude. Above average impingement is commonly associated with high impingement of a single species and, in many cases, corresponds to the occurrence of a high impingement event (see Table 2).

Figure 3. Number of fish impinged at PNPS since 1980 (Normandeau 2015).



The lowest annual total for impingement losses was 1,104 fish (in 1984), while the highest was 302,883 fish (in 2005). The long-term mean for annual impingement losses is 42,806 fish. In 2014, 45,577 fish were impinged, primarily Atlantic silversides (36% of total impingement), Atlantic menhaden (31.1%), red hake (5.7%), rainbow smelt (3.9%), and blueback herring (3.6%). Generally, impingement in 2014 was slightly above the long-term average. Two impingement events occurred in December 2014 in which 8 species were impinged on each date at relatively high rates (a combined rate of 33 and 223 fish per hour for all species). Rainbow smelt and Atlantic silversides dominated the catch on December 3rd (at 33.3% and 30.3%, respectively), while 93.7% of the December 10th catch was Atlantic silversides.

Fish species that experienced the highest mean annual impingement losses primarily include pelagic schooling fish, though substantial numbers of demersal winter flounder were also lost to impingement. From 1980 through 2013, more than 94% of mean annual impingement was comprised of just nine species (Table 1). Since 1980, Normandeau extrapolates that over 1.5 million fish have been impinged, including more than 32,800 winter flounder, 48,800 rainbow smelt, 26,800 blueback herring, 350,000 Atlantic silversides, and 790,000 Atlantic menhaden.

Table 1. Species composition of mean annual impingement at PNPS 1980-2013 (Normandeau 2015).

Species	Percent of Total
Atlantic menhaden	53.5%
Atlantic silverside	23.3%
Alewife	4.7%
Rainbow smelt	3.3%
Sand lance	2.2%
Winter flounder	2.2%
Atlantic herring	2.1%
Blueback herring	1.7%
Grubby	1.3%
Other species	5.7%

Levels of annual impingement that exceeded the long-term mean can be attributed to unusually high levels of impingement of a single species. The current permit for PNPS requires the permittee to report incidents when the impingement rate of fish exceeds 20 fish per hour and the overall total is 1,000 fish or more. These large mortality events commonly result in the impingement of large numbers of schooling fish on the intake screens. At PNPS, Atlantic menhaden and Atlantic silversides accounted for 15 of the 21 recorded impingement events on record. Table 2 lists the large impingement events (defined as an impingement rate of 20 or more fish per hour and total impingement of 1,000 fish or more over the event) at PNPS from 1973 to 2014. Since 1980, these large impingement events account for 22% of the total number of fish impinged at PNPS. The December 2014 impingement events discussed above were not reported here because the total number of fish impinged did not exceed 1,000.

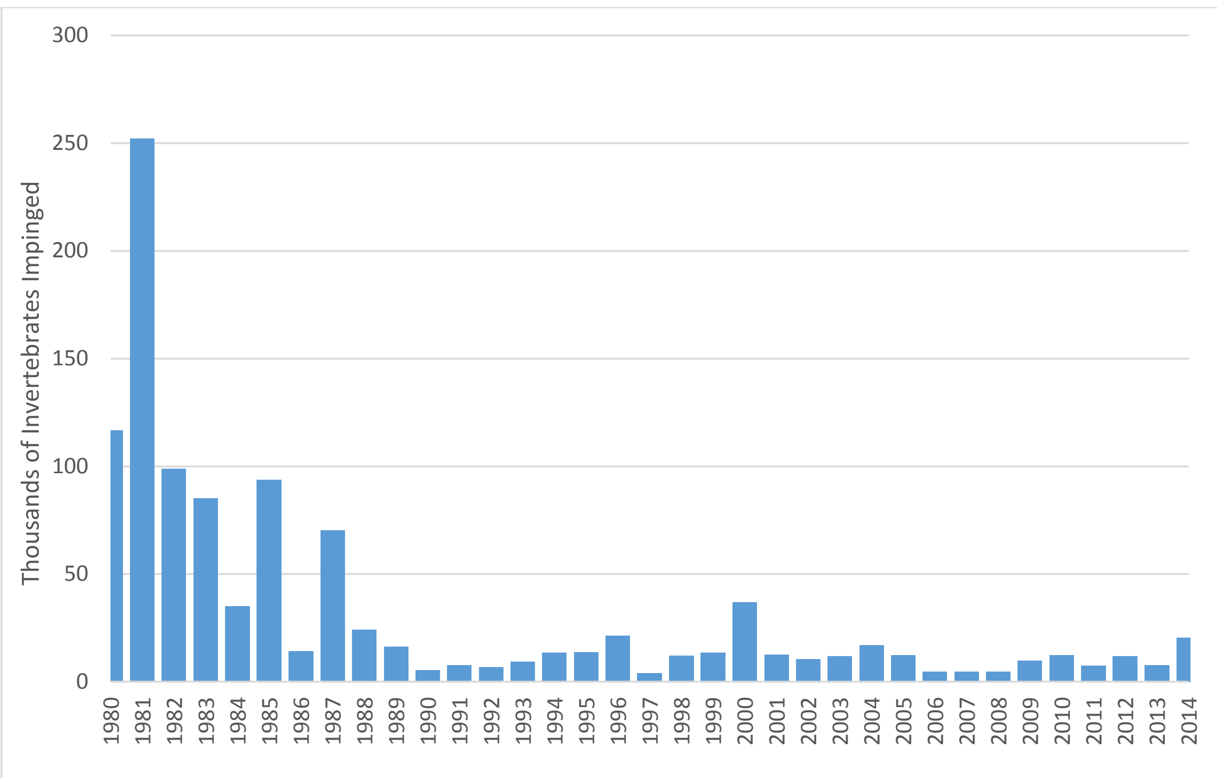
Table 2. Estimated number of species impinged during large impingement events at PNPS since 1980 (Normandeau 2015).

Date	Dominant Species	Estimated Number Impinged (All species)
August-September 1973	Clupeids	1,600
August 5, 1976	Alewife	1,900
November 23-28, 1978	Atlantic menhaden	10,200
December 11-29, 1978	Rainbow smelt	6,200
March/April 1979	Atlantic silverside	1,100
September 23-24, 1981	Atlantic silverside	6,000
July 22-25, 1991	Rainbow smelt	4,200
December 15-28, 1993	Atlantic silverside	5,100
November 26-28, 1994	Atlantic silverside	5,800
December 26-28, 1994	Atlantic silverside and Rainbow smelt	11,400
September 8-9, 1995	Alewife	13,100
September 17-18, 1999	Atlantic menhaden	4,910
November 17-20, 2000	Atlantic menhaden	19,900
August/September 2002	Atlantic menhaden	33,300
November 1, 2003	Atlantic menhaden	2,500
November 12-17, 2003	Atlantic menhaden	63,900
November 19-21, 2003	Sand lance and	17,900

	Atlantic menhaden	
November 29, 2003	Atlantic silverside	3,900
August 16-18, 2005	Atlantic menhaden	107,000
September 14-15, 2007	Atlantic menhaden	6,500
July 29, 2010	Alewife	1,061

In addition to adult and juvenile fish, a wide range of invertebrate species, including crustaceans, bivalves, echinoderms, cephalopods, tunicates, gastropods, jellies, worms and sea anemones, are impinged at PNPS. Figure 4 presents invertebrate losses from 1980 to 2014. On average, 31,739 invertebrates per year are impinged, with the lowest number of impingement losses 1997 (4,107) and the highest number in 1981 (251,997). The greatest number of invertebrates were impinged in 1980 and 1981; impingement during these years was dominated by large numbers of blue mussels. Since 1981, impingement of blue mussels has dropped substantially from these previously high values. In 2014, 20,515 invertebrates were impinged including sevenspine bay shrimp and green crab totals that were more than twice the long-term mean. The number of invertebrates impinged over the 34-year data collection was estimated to be 1,099,652. Invertebrate species that experienced the greatest impingement losses included American lobster, blue mussel, the clam worm, green crab, horseshoe crab, lady crab, rock/Jonah crabs, bay shrimp, sea stars and squid.

Figure 4. Thousands of invertebrates impinged annually at PNPS from 1980-2014.



3.3. Adverse Environmental Impacts at PNPS

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). The withdrawal of cooling water at PNPS removes and kills billions of aquatic organisms, predominantly fish eggs and larvae, but also adult fish, shellfish, crustaceans, and other aquatic life, from Cape Cod Bay. In the Final 316(b) Rule for Existing Facilities, the impacts from aquatic organisms drawn into CWISs are referred to as adverse environmental impact (AEI). *See* 79 Fed. Reg. at 48,303. In addition to these direct impacts, the loss of aquatic organisms due to CWISs can have indirect, ecosystem level effects, including disruption of aquatic food webs, disruption of nutrient cycle and other biochemical processes, alteration of species composition and overall levels of biodiversity, and degradation of the overall aquatic environment. *See* 79 Fed. Reg. at 48,303.

In the discussion above, EPA has documented the primary adverse impacts of impingement and entrainment, which result in the direct mortality of billions of eggs and larvae and thousands of adult and juvenile fish each year. Entrainment mortality has the potential to result in the loss of millions of adult fish each year from the local community in Cape Cod Bay. Through correspondence with EPA Region 1 prior to promulgation of the Final Rule, Entergy has asserted both that (1) "EPA (with DEP's concurrence) has renewed each of PNPS' NPDES permits over this thirty-three year period [since 1975], consistently determining and, as of the Station's recent NPDES permits, expressly stating that PNPS' existing CWIS configuration already constitutes BTA under § 316(b)" and (2) that monitoring data collected by the permittee since 1977 demonstrates "that operation of PNPS' CWIS has not resulted, and was not expected to result, in an adverse environmental impact to the aquatic ecosystem in the vicinity of the Station as a result of impingement or entrainment." See p. 2 of the July 1, 2008 letter from Elise N. Zoli of Goodwin Procter to Damien Houlihan of EPA.

First, since the issuance of PNPS' current permit in 1993, new regulations pertaining to existing facilities (including PNPS) have been promulgated to reduce impingement and entrainment of fish and other aquatic organisms at cooling water intake structures used by existing power generation and manufacturing facilities for the withdrawal of cooling water from waters of the United States. *See* 79 Fed. Reg. 48,300 (Aug. 14, 2014) and the discussion of the application of the Final Rule to PNPS, above. These regulations establish new requirements that reflect the best technology available for minimizing adverse environmental impact that may be, though are not necessarily, different from the consideration of BTA under the current permit and, as such, require that EPA reconsider BTA at PNPS. In fact, as Entergy recognizes, the current NPDES permit specifically requires that "The present design shall be reviewed for conformity to regulations pursuant to Section 316(b) of the Act when such are promulgated." Part I.A.1.i.3 of the current NPDES Permit. With regard to impingement, the new § 316(b) regulations establish nationally-applicable BTA standards without reference to any previous BTA determination for a particular facility. 40 C.F.R. § 125.94(c). For entrainment, the new regulations establish the framework under which a permitting authority must make a site-specific BTA determination and the factors that must be considered in that determination. *Id.* § 125.98(f). Notably, a previous BTA determination for a particular facility does not appear as a factor in that list. *See id.* § 125.98(f)(2). To the contrary, the Final Rule provides that a permitting authority may only determine that "no additional control requirements are necessary beyond what the facility is already doing" if the permitting authority finds that "all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated." *Id.* § 125.98(f)(4).

Second, the preamble to the Final 316(b) Rule for Existing Facilities generally refers to impingement and entrainment mortality associated with the withdrawal of cooling water through a CWIS as an adverse environmental impact. *See, e.g.*, 79 Fed. Reg. at 48,318-21 and 48,328 ("EPA interprets section 316(b) to require the Agency to establish a standard that will best minimize impingement and entrainment—the main adverse effects of cooling water intake structures . . . ."). Thus, 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 constitutes adverse environmental impact under CWA § 316(b). EPA Region 1 has established, in the discussion above, that PNPS is responsible for the loss of billions of eggs and larvae, and millions of fish and other aquatic organisms annually as a result of the operation of its CWIS. Consistent with the Final Rule, these losses represent an adverse environmental impact to Cape Cod Bay.

EPA has established that the loss of aquatic life due to impingement and entrainment at PNPS does constitute an adverse environmental impact.[10] That said, EPA does, however, work to assess the scope and import of the adverse impacts as part of its ultimate determination of the BTA in broader ecological context to the extent possible based on the best, reasonably available information. EPA stated in the May 1977 Draft § 316(b) Guidance that "[t]he magnitude of an adverse impact should be estimated" with reference to the following factors: (1) "absolute damage," (2) "percentage damage," (3) absolute and percentage damage to any endangered species, (4) absolute and percentage damage to any "critical aquatic organism," (5) absolute and percentage damage to commercially valuable and/or sport fisheries yield, and (6) "whether the impact would endanger (jeopardize) the protection and propagation of a balanced population of shellfish and fish in and on the body of water from which the cooling water is withdrawn (long-term impact)." EPA considers whether the losses of the various life stages of a particular species can be shown to have, or not to have, an effect on the local population of that species. EPA also considers whether the losses to one or more species might impact the health of the overall community of organisms in the affected ecosystem. The guidance indicates that adverse impacts ought to be evaluated at all these levels, but does not suggest that adverse impacts are insignificant or immaterial if impacts are not able to be demonstrated at the overall population or community level. Of course, the significance or

[10] This is not a case of a few organisms being entrained and impinged, or even a case of one hundred fish being impinged, or 10,000 eggs and larvae. The data indicate that PNPS's CWIS entrains *billions* of eggs and larvae and impinges hundreds of thousands of juvenile and adult fish. EPA concludes that there is no serious question that entrainment and impingement in this case are sufficient to register as AEI to be appropriately minimized under § 316(b).

magnitude of the impacts may come into play when considering whether the social cost of undertaking particular actions to further reduce impacts is justified by the social benefits.

Of course, in many cases, the Agency will be unable to draw conclusions about these broader effects in light of the limits on available information and the difficulties of the science of fish population dynamics. Ultimately, EPA completes a reasonable assessment of the adverse impacts in light of the reasonably available information and then factors that into its determination of the BTA in each case, including the weighing of the social costs and benefits of different BTA options. EPA's analysis for the Draft Permit is consistent with these principles.

3.3.1. Species-specific Adverse Environmental Impacts at PNPS

It can be challenging to put the cumulative losses from a CWIS in a meaningful context. Historically, power generating facilities have used commercial fish landings as a point of comparison. This point of comparison has not been very meaningful, because the landings come from geographic areas that are substantially larger than just the receiving water of the power generating facility. Entergy, in its 2008 *Adverse Environmental Impact Assessment for Pilgrim Nuclear Power Station*, focuses on "whether water withdrawals at the CWIS have caused an ecologically significant reduction in the abundance of local and regional populations of susceptible fish and macrocrustacean (American lobster) species" (p. 10). In its analysis, local and regional populations extend from Cape Cod Bay to the entire Gulf of Maine. Arguably, an ecologically-relevant scale is to compare the cumulative losses due to impingement and entrainment at PNPS to a discrete population segment. Determining discrete population segments for marine species can be very difficult; however, some species have very high levels of site fidelity to spawning grounds. This means that individuals in that population will spawn in the same location year after year. EPA has attempted to demonstrate potential adverse impacts of the CWIS on distinct population segments by focusing on a few species with high site fidelity.

Winter Flounder

Studies have shown winter flounder to have an extremely high level of site fidelity to natal spawning grounds (Buckley et al. 2008). To assess the potential impacts of entrainment and impingement on winter flounder in Cape Cod Bay, PNPS conducts an annual trawl survey of 106 square miles of western Cape Cod Bay. The annual survey consists of 80+ trawls to derive an estimate of winter flounder density. In calculating a winter flounder density estimate, it is assumed that the net has an efficiency of 50%. The density estimate is extrapolated over a 106-square mile area to derive a population estimate of winter flounder in western Cape Cod Bay.

To estimate the percentage of the population lost to entrainment and impingement at PNPS, Normandeau compares the number of age-3 equivalent winter flounder lost as eggs and larvae with the area swept population estimate in western Cape Cod Bay three years later. (Normandeau 2015 pp. 19-32). From 1997 to 2011, the percentage lost varies annually from less than 1 percent to as high as 26 percent with an annual average of 9 percent of the area swept estimate. The 2014 equivalent age-3 winter flounder lost to impingement and entrainment amounts to 10.6% of the 2014 area swept estimate. *Id*.

River Herring and Rainbow Smelt

The rivers in and around Plymouth Harbor and Duxbury Bay, including the Jones River and Town River, support spawning habitat for several species of anadromous fish, which grow in estuaries and coastal waters and travel to freshwater rivers to spawn, including alewives, blueback herring (together commonly known as river herring) and rainbow smelt. Because these species spawn in freshwater and migrate to estuaries as young-of-the-year, PNPS entrains few early life stages. However, river herring and rainbow smelt are among the most commonly impinged species at PNPS. Based on impingement data collected from 1980 through 2014, mean annual impingement is 2,776 fish and 1,424 fish for river herring and rainbow smelt, respectively. Both rainbow smelt and alewife have experienced high impingement events, with more than 1,000 alewife impinged during a single event in July 2010 and more than 4,200 rainbow smelt impinged during a single event in July 1991 (Normandeau 2015).

Population estimates for river herring (alewives and bluebacks) in the Jones River have been estimated based on the herring run count at the Elm Street fish ladder since 2005 (Table 3).[11] Fish counters count the number of fish that pass in a 10-minute interval based on the recommendations in Nelson (2006). Impingement losses each year between 2005 and 2014 comprise a substantial percentage of the estimated spawning run in most years. In 4 of the 10 years for which river herring spawning population estimates are available, impingement losses exceeded the estimated spawning run in the Jones River. Losses of this magnitude may potentially negatively impact the population of river herring in the Jones River. Impingement of river herring is most common in November – December (61%), when juveniles emigrate from freshwater, followed by March-April (13%) before fish can make it upriver during the annual spawning migration.

Table 3: Population estimate of river herring in the Jones River compared to river herring impingement losses at PNPS.

Year	Jones River population estimate	PNPS river herring impingement losses	Impingement losses compared to population estimates
2005	804	911	113%
2006	1,843	810	44%
2007	2,651	790	30%
2008	560	278	49%

[11] Data obtained from volunteer counts of herring run as reported in Jones River Watershed Association 2015 Annual Progress Report. Available at http://jonesriver.org/getfile/annual-reports/JRWAProgressReport2015.pdf?57c1ac

2009	637	1,291	203%
2010	4,512	12,951	287%
2011	3,597	2,288	64%
2012	1,596	2,218	139%
2013	4,559	309	7%
2014	5,121	2,905	57%
mean	2,588	2,475	96%

At one time, smelt were an abundant species ranging from Virginia to Labrador (Collette and Klein-MacPhee, 2002). For over 100 years, smelt sustained a commercial fishery with a peak take of 162.8 metric tons in 1966. Landings declined to a low of 1.3 metric tons in 1988. Landings increased in the early 1990s back up to 27.1 metric tons in 1992, but they plummeted to 0.1 metric tons in 2001. Substantial population declines have reduced the southern edge of this species range. The population entering the Jones River and nearby rivers currently represents the southern limit of the species range (Chase 2006). In response to the dramatic range contraction and abundance declines, in 2004 the National Oceanic and Atmospheric Administration (NOAA) listed rainbow smelt as a species of concern. This designation highlights NOAA's concern about the species status, but indicates that insufficient information exists to include this species on the Endangered Species List.

PNPS has impinged large numbers of rainbow smelt that are likely associated with the Jones River run. Comparable population estimates described above for river herring are unavailable for rainbow smelt in the Jones River. However, the MassDMF has been assessed spawning run demographics. Chase et al. (2009) found that the Jones River has a truncated age distribution with an abnormally high percentage of age-1 fish and that these age-1 fish were smaller than comparably aged fish from more northern rivers. In response to stress, spawning at an earlier age in short-lived species is believed to be a tactic that may yield higher evolutionary fitness than staying at sea for additional time to gain larger size (Gross 1987). The high percentage of age-1 fish in the Jones River may be an indication of a population under stress.

PNPS is estimated to have impinged 48,054 rainbow smelt from 1980-2013 with an average of 1,413 fish per year. Rainbow smelt is a schooling fish, so losses tend to come in large events, as described above. As a species, rainbow smelt are in serious decline. The continued mortality of thousands of rainbow smelt each year from impingement at PNPS represents a substantial source of additional mortality on the Jones River population that is inconsistent with stopping further declines and promoting the propagation of this species.

Atlantic Cod

Atlantic cod has been a dominant component of the commercial New England fishery for centuries. However, recent declines in stock have led the National Marine Fisheries Service (NMFS) to implement numerous management measures for protection of Gulf of Maine Atlantic cod. In particular, the most recent stock assessment in 2014 indicates that the Gulf of Maine stock is in poor condition. NMFS concludes that the stock is overfished and that overfishing is currently occurring. *See* Gulf of Maine Atlantic Cod 2014 Stock Assessment Update Report (NMFS 2014). Specifically, spawning stock biomass is the lowest ever estimated and is at about 4% of the biomass necessary to maintain the fishery.[12] Fishing mortality remains high despite the fact that catches in 2012 and 2013 are among the lowest since 2004. In addition, recruitment into the fishery from 2009 through 2013 has declined considerably from recruitment during 2004 to 2009. If recent weak recruitment continues, productivity and rebuilding will be less than projected in the stock assessment. The recent stock assessment prompted the NMFS to take drastic measures to protect the stock. Most recently, the NMFS limited multispecies common pool vessels to 25 pounds of Atlantic cod per trip for the remainder of the year (September 15, 2015 to April 15, 2016), which was an increase from the June 2015 temporary prohibition on any take of Atlantic cod for common pool vessels. *See* 80 Fed. Reg. at 55,561 (Sept. 16, 2015).

PNPS' CWIS results is the mortality of an average of more than 6 million Atlantic cod eggs (range 1.2 million to 20.4 million) and 1.1 million larvae (range 0.1 million to 4.2 million) annually based on entrainment data from 1980 through 2014. Normandeau estimates that these losses, on average, equate to almost 1,900 age-2 Atlantic cod (range 228 to 6,707) lost annually. An additional 66 cod (range 0 to 688) are impinged annually, resulting in an average loss of about 54 age-2 fish. Based on commercial and recreational landings and discard data from 1982 to 2013 (NMFS 2014), the weight-at-age of an age-2 Atlantic cod ranges from 1.1 to 3.0 pounds with a mean of 1.9 pounds. Thus, on average PNPS is taking and average of about 3,700 pounds of cod per year. The loss of millions of eggs and larvae each year at PNPS' CWIS is not consistent with preventing further declines and promoting rebuilding of the Gulf of Maine Atlantic cod stock.

Normandeau asserts that the loss of age-2 adult equivalent Atlantic cod lost to impingement and entrainment mortality is relatively low as compared to the average annual commercial landings for NMFS Area 514 (2,216,258 pounds) from 1995 to 2013, and Massachusetts inland and near shore recreational landings (471,162 pounds) from 1995 through 2014. EPA agrees that, at this scale, the loss of 1,000 pounds of Atlantic cod per year comprises a low percentage of regional commercial and recreational landings. However, EPA also considers that the Gulf of Maine Atlantic cod stock is in poor condition, current projections indicate that conditions are not favorable for rebuilding, and recruitment to the fishery is historically low. While losses at PNPS comprise only a percentage of the overall mortality, this additional and unnecessary

[12] In 2013, the Atlantic cod spawning stock biomass was estimated to be 2,063 metric tons (mt) based on model projections with constant mortality at M = 0.2. The spawning stock biomass necessary to produce the maximum sustainable yield (MSY) is 47,184 mt. Fishing mortality is estimated at 1.3, which is nearly 6 times greater than the estimated fishing mortality necessary to for the stock to produce MSY (0.18). MSY is defined in 50 C.F.R. 600.310(e)(1)(i)(A) as "the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions and fishery technological characteristics (e.g., gear selectivity), and the distribution of catch among fleets. MSY is the basis for fishery management under the Magnuson-Stevens Act and is used to assess whether a stock or stock complex is overfished or if overfishing has occurred.

cropping of early life stages is likely one of many factors contributing to the inability of the stock to rebuild.

Several studies have demonstrated that Atlantic cod exhibits spawning site fidelity at very fine spatial scales (Robichuad and Rose 2001, Skjæraasen et al. 2011, Svedäng et al. 2007), and that the Gulf of Maine stock forms a metapopulation structure (Kovach et al. 2010). The spawning site fidelity likely limits reproductive connectivity among spawning sites, and may increase the vulnerability of semi-discrete spawning populations to overexploitation and extirpation (Zemeckis et al. 2014). For this reason, assessing the potential population-level impacts of mortality at PNPS only as a percentage of regional landings potentially underestimates the impact that the cropping of early life stages may have on the ability of the local subpopulation of Atlantic cod in Cape Cod Bay to prevent further declines and to promote resiliency of the local population.

3.3.2. Summary

EPA evaluated the entrainment and impingement losses at PNPS in light of the nature of the Cape Cod Bay ecosystem and status of affected local populations above. Although Entergy asserts that impingement and entrainment mortality at PNPS are not of a magnitude to constitute an adverse environmental impact under § 316(b), EPA maintains that adverse impacts have clearly been demonstrated. And while the CWIS at PNPS that results in the death of billions of aquatic organisms each year from Cape Cod Bay may be just one of multiple, cumulative stressors that aquatic life in the bay are experiencing, the collective impacts from degraded habitat, poor water quality, fishing mortality, and others may negatively affect a species' resiliency, or ability to withstand stress.

For example, the cumulative stressors of fishing mortality and habitat degradation have likely contributed to the severe decline in groundfish populations in the Gulf of Maine. In an effort to recover these populations, effective regulations for Northeast Multispecies (groundfish) include large reductions in catch limits for Gulf of Maine cod, Georges Bank winter flounder, and Gulf of Maine winter flounder. *See* the Greater Atlantic Region Bulletin from Apr. 23, 2015 titled *Northeast Multispecies (Groundfish) Fishing Year 2015 Regulations*. Continued rolling closures for the commercial fishery restrict vessels during certain times of year in an effort to protect Gulf of Maine cod, whose stock biomass is severely depleted with current estimates at just 3-4 percent of levels deemed sustainable. These restrictions demonstrate the precarious status of New England fisheries and the lengths that the regulatory agencies have gone to protect existing stocks, even declaring a fishery resource disaster for the Northeast Multispecies Groundfish Fishery in 2013. *See, e.g.*, September 13, 2012 letter from Rebecca Blank, Acting Secretary of Department of Commerce to former Governor of Massachusetts Deval Patrick. The Massachusetts Division of Marine Fisheries (MassDMF) spring trawl surveys for Cape Cod Bay and Massachusetts Bay (Regions 4-5) in the past decade have observed declining biomass levels (measured as stratified mean weight per tow) for winter flounder, yellowtail flounder, windowpane flounder, little skate, winter skate, Atlantic cod, red hake, and ocean pout (MassDMF 2015). For several species, among them winter flounder, windowpane flounder, little skate, and Atlantic cod, biomass levels observed during recent surveys are among the lowest values in the time series (1978-2014). While CWISs, such as that operated by PNPS, are not solely, or even largely, responsible for these declines, the imperiled status of groundfish has motivated NFMS to implement drastic measures in order to protect these stocks. At a minimum, facilities contributing to loss of these stocks should also implement measures to minimize mortality of individuals.

4.0 ASSESSMENT OF EXISTING COOLING WATER INTAKE STRUCTURE (CWIS) AT PNPS

In the previous section, EPA established that PNPS entrains billions of eggs and larvae and impinges tens of thousands of juvenile and adult fish each year, and that the cumulative adverse environmental impacts of the existing CWIS have resulted in the mortality of millions of juvenile, adult, and adult equivalent fish and represent an adverse environmental impact of the CWIS on Cape Cod Bay. This section evaluates PNPS's existing technology to determine if the location, design, construction, and capacity of the CWIS reflects the BTA for minimizing these adverse environmental impacts, as required by CWA § 316(b).

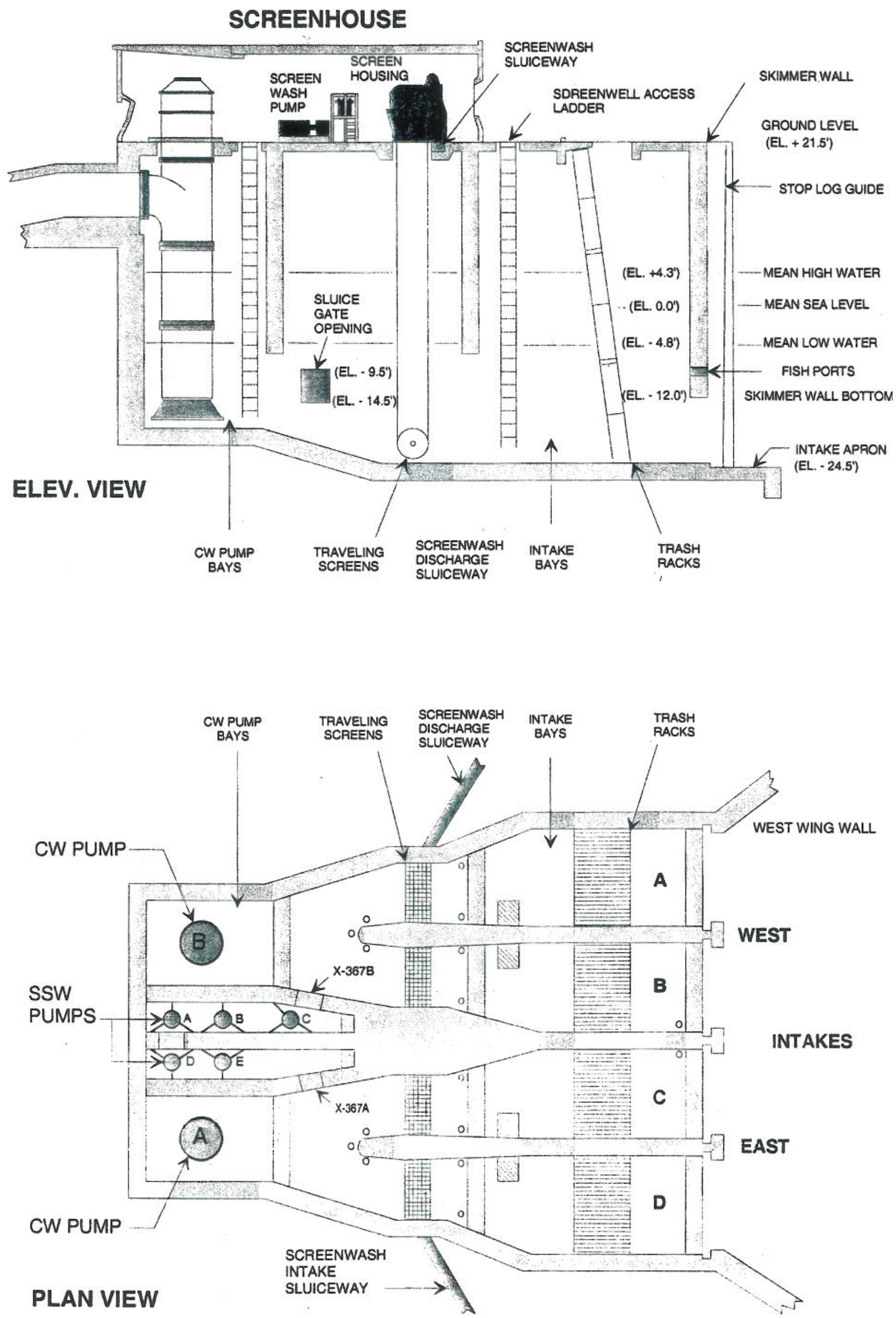
4.1. Existing Cooling Water Intake Structure

The facility's once-through CWIS is located along the shoreline within a small embayment formed by two protective breakwaters. The average velocity at the embayment opening is 0.05 feet per second (fps) at mid-tide with both pumps operating (Enercon 2008, p.5). Seawater drawn through a dredged intake channel passes through trash racks (3-inch spacing) before reaching four intake bays, each containing a traveling screen. Behind the traveling screens are two condenser cooling water (CW) pumps and five salt service water (SSW) pumps, as well as fire protection system pumps[13] and chlorination equipment. The openings to the intake bays are fully submerged at mean low water with the lowest portion approximately 24 feet below mean sea level (MSL). A skimmer wall extends to a depth of 12 feet below MSL to block floating aquatic life and/or debris at or just below the surface. See Figure 5, below.

PNPS's once-through cooling system is designed to withdraw up to 467 million gallons per day (MGD) (equivalent to 324,500 gallons per minute) of water from the Cape Cod Bay. This design relies on large volumes of water for purposes of condensing steam in the power plant's condensers. The majority (96%) of seawater withdrawn is pumped through the main condenser via the CW pumps to promote the efficient generation of electricity. The objective of the circulating water system is to provide the main condenser with a continuous supply of cooling water for the removal of heat rejected primarily by the turbine exhaust and turbine bypass steam. About 4% of the seawater withdrawn is

[13] Fire protection water is normally supplied by the Town of Plymouth but seawater can be used in an emergency.

Figure 5: Elevation view (top) and plan view (bottom) of the cooling water intake structure at PNPS. (Enercon 2008 Attachment 5).



used by the SSW system as the heat sink for nuclear safety-related systems such as the Reactor Building Closed Cooling Water and Residual Heat Removal (Enercon 2008 p.11).[14] According to PNPS, in 2007 the Institute of Nuclear Power Operations (INPO) issued a "Significant Operating Experience Report" (SOER) mandating that nuclear plants evaluate and address all possible factors that could lead to intake cooling water blockage. PNPS states that the SOER is "expected to cause existing operation and maintenance practices at PNPS to be re-evaluated and may lead to design changes affecting CWIS components." *Id*.

The existing operation of PNPS's CWIS is continuous with the exception of planned refueling outages and unplanned reactor shutdowns. Even during these planned and unplanned outages, at least one SSW pump is kept on to maintain essential cooling of nuclear safety-related systems. Entergy estimates that an annual flow reduction of 5.4% from the design flow of 324,500 gallons per minute (gpm) occurs due to planned and unplanned outages and periods of lower SSW flows caused by reduced cooling demands. During April and May, flow reductions from planned outages can be 13.5% to 26.5% less than design flow (Enercon 2008 p.20).

4.2. Location of CWIS

PNPS is located on the northwest shore of Cape Cod Bay, a large embayment in southeastern Massachusetts enclosed on the south and east by Cape Cod and by the mainland on the west. Cape Cod Bay is designated an Ocean Sanctuary by the Commonwealth of Massachusetts. See M.G.L. c.132A § 13(b). Water depths near PNPS average about 12 feet; the maximum depth (180 ft) occurs at the mouth of Cape Cod Bay. About half the surface area of the bay has depths greater than 100 ft, increasing as the sea floor slopes toward the deepest water at the mouth of the bay (NRC 2006). Within Cape Cod Bay, the prevailing ocean circulation moves water in a counterclockwise pattern. Tidal fluctuations largely control the exchange of water with Massachusetts Bay, where the total bay flushing rate is approximately 7.2% per day (NRC 2006). The average water temperature in Cape Cod Bay ranges from about 35°F in winter to about 72°F during the summer at the near surface and about 37°F (mid-winter) to about 54°F (mid-summer) in the near-bottom water (Libby et al. 2006). Water temperatures fluctuate seasonally and due to upwelling, downwelling, and turbulence. The relatively well-mixed waters during winter gradually shift towards a two-layer stratified temperature gradient present from summer through early fall.

The location of a CWIS in the waterbody is an important factor influencing its adverse environmental impacts. For example, a CWIS located in the productive littoral zone (i.e., light-penetrating) rather than deeper waters could result in greater entrainment impacts;

[14] According to PNPS, "nuclear safety" means conditions, actions, or considerations within the customary or exclusive jurisdiction of the Nuclear Regulatory Commission (NRC) associated with the design, construction, operation, and shut down of NRC-licensed nuclear electric steam generating facilities, including without limitation any and all conditions associated with the modified or altered use of equipment, or changes to facility operations, requiring assessment of a station's NRC licensing basis or operating procedures." (Enercon 2008, p 10).

likewise, a CWIS located in a nearshore marine environment (such as an estuary) has a higher potential for entrainment than an intake located in offshore deeper waters where eggs and larvae are not as prevalent. *See* Technical Development Document for the Phase I Rule (EPA 2001) pp. 5-15 to 16. The environmental impacts of CWISs can be affected by the location 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. As an example, the littoral zone (where light penetrates to the bottom) in lakes and reservoirs, as well as the shoreline of rivers, is generally the principal spawning and nursery area for freshwater fish. In nearshore coastal waters and estuaries, which are some of the most biologically productive waters, the distribution and abundance of organisms is influenced by a number of factors including: geographic location, salinity, temperature, oxygen, circulation, and vertical and horizontal stratification.

Impacts of impingement and entrainment can potentially be mitigated by locating CWISs outside of these biologically productive areas (*e.g.*, offshore intakes outside the euphotic zone at depths more than 100 m) (Phase I Rule *Technical Development Document* Chapter 5 pp. 15-16). EPA's *Guidance Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impact* (EPA 1976) recommends selecting CWIS locations to avoid important spawning areas, juvenile rearing areas, fish migration paths, shellfish beds, or areas of particular importance for aquatic life. The location of a CWIS opening within the water column is another important characteristic that affects the structure's capacity to impinge 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 impinge more demersal (i.e., bottom-oriented) species, as well as fish migrating along the shoreline.

Cape Cod Bay is an Ocean Sanctuary and a valuable natural resource that supports a vibrant tourism industry as well as commercial and recreational fisheries. The species composition of finfish in western Cape Cod Bay reflects a transition between the Gulf of Maine and the Mid-Atlantic Bight, serving as the southern-most boundary for several northern Atlantic fish species and the northern-most boundary for several fish species that inhabit the warmer waters south of Cape Cod. This overlap results in a rich and diverse aquatic community, including, but not limited to, a diverse plankton community, 31 species for which essential fish habitat has been designated, and 10 federally-listed threatened and endangered species (at least two life stages of Atlantic sturgeon, 4 species of protected turtles, and 5 species of protected marine mammals). Cape Cod Bay also provides critical habitat for the North Atlantic right whale (*Eubalaena glacialis*), which is among the rarest species of all marine mammals. *See* 59 Fed. Reg. 28,805 (June 3, 1994). The NMFS has recently proposed expanding the designated critical habitat for the right whale to include the entirety of Cape Cod Bay. *See* 80 Fed. Reg. 9,314 (February 20, 2015). Since 1980, 80 species of fish and 39 species of invertebrates have been collected on the PNPS intake screens (Normandeau 2015). As discussed above, fish commonly impinged include winter flounder (*Pseudopleuronectes americanus*), Atlantic menhaden, (*Brevoortia tyrannus*), alewife (*Alosa pseudoharengus*), Atlantic silverside (*Menidia menidia*), blueback herring (*Alosa aestivalis*), cunner (*Tautogolabrus adspersus*), grubby

(*Myoxocephalus aenaeus*), hakes (*Urophysis sp.*), and rainbow smelt (*Osmerus mordax*). Invertebrates commonly impinged include blue mussels (*Mytilus edulis*), Sevenspine bay shrimp (*Crangon septemspinosa*), green crab (*Carcinus maenas*), and rock/Jonah crab (*Cancer sp.*).

Regarding location, PNPS's CWIS is situated on the shore of a productive and ecologically important aquatic community. Its location in a biologically dynamic nearshore environment magnifies the potential for adverse impacts from impingement and entrainment. In fact, as discussed earlier, the CWIS entrains billions of eggs and larvae and impinges tens of thousands of fish each year, resulting in the loss of millions of fish and other aquatic organisms. The preamble to the Final Rule clearly refers to impingement and entrainment as adverse environmental impact, and the magnitude of these adverse environmental impacts in Cape Cod Bay, an Ocean Sanctuary and designated Class SA water providing "excellent habitat" for fish and other aquatic organisms, is undeniable. *See* 79 Fed. Reg. at 48,303 and 48,328.

4.3. Existing Traveling Screen Design and Operation

PNPS's four through-flow traveling screens, two for each condenser water pump, were originally installed in 1970. Screen assemblies were replaced in 2005 (screens C and D) and 2007 (screens A and B). All replacement screens have been functionally equivalent to the original screens (Enercon 2008, p 13). The 10-ft wide screens include ¼-inch wide by ½-inch tall stainless steel screening. Based on the design flow with both condenser pumps running (at 324,500 gpm/4 screens = 81,125 gpm per screen) and a water depth of 19.2 ft at mean low water (MLW), PNPS estimates a through-screen velocity of 1.57 fps. This velocity does not comply with the protective velocity of 0.5 fps identified in the Final Rule. *See* 40 C.F.R. § 125.94(c)(2); (3); 79 Fed. Reg. at 48,373. In addition, because PNPS operates near design flow during most months of the year, the through-screen velocity is unlikely to change substantially whether based on design or actual intake flow.

According to PNPS, the traveling screens are operated "routinely, preemptively, and in response to an alarm" (Enercon 2008, p.6). Six scheduled screen rotations/washes normally occur each week. The screens are rotated continuously to prevent freezing when the ambient air temperature drops below 30°F. A pressure differential between the upstream and downstream sides of the screen assembly can also trigger rotation. The screens use dual spray washing to remove debris and/or aquatic life. A low pressure (15 psi) spray washes organisms from the screen and lifting shelves, after which a high pressure (140 psi) spray removes debris. The screenwash water is dechlorinated with sodium thiosulfate prior to use on the screens.[15]

[15] Sodium hypochlorite solution is applied to each circulating pump bay alternately at an applied maximum dosage of 0.1 ppm for approximately 1 hour per day for control of slime growth and fouling organisms. Water from the screen wash pump discharge header is used as dilution water and the diluted solution enters the intake bay diffusers located downstream of the trash racks. Two separate pumped hypochlorite systems provide a direct feed to either service water pump bays at a dosage up to a maximum of 0.25 ppm. A Dechlorination System pumps sodium thiosulfate to the screenwash pumps to dechlorinate screen wash

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 PNPS, fish and possibly debris washed from the traveling screens during the low pressure spray wash are directed into a trough where they are transported into epoxy coated, corrugated metal sluiceway. The sluiceway makes several turns that vary from 11° to 27° and includes a sharp slope shortly before emptying into the embayment, 300 feet from the intake. The corrugation provides resistance to flow in order to maintain a design water depth of 6 inches and a design water velocity less than 8 fps in the sluiceway. The sluiceway is covered with screen material to prevent predation by birds. With the existing technology, fish and other living organisms may be subjected to significant stress due to the sharp turns, pipe corrugations, and vertical drop to the water. Furthermore, although fish are returned 300 feet from the intake, these fish are still located in the embayment, near the intake screens. This location may increase the chance of re-impingement and impingement mortality.

In summary, the existing traveling screens have the potential to reduce impingement mortality for some species, primarily through the use of a low pressure spraywash and fish return sluiceway. As discussed above, on a national basis the BTA standard for impingement mortality in the Final Rule is based on a modified traveling screen with a fish-friendly return system. *See* 79 Fed. Reg. at 48,344. The traveling screen in operation at PNPS is consistent with some, but not all, of the aspects of a modified traveling screen as defined in 40 C.F.R. § 125.92(s) (and described at 79 Fed. Reg. 48,374):

> 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; additional 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 their 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 handing 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 CWIS is not operated continuously or near-continuously. Further, it is not clear if the mesh panels adequately protect fish from descaling, if the panels' screen baskets minimize turbulence, or if the fish return system meets the requirement to "return fish directly to the source water in a manner that does not promote predation or re-

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water so that marine life is not impacted when the screens are washed. See FSAR, p.3 in Enercon 2008 Attachment 1.

impingement of the fish, or a large vertical drop." *See* 79 Fed. Reg. at 48,374. Entergy has not demonstrated that the existing traveling screens would meet the impingement mortality performance standard at 40 C.F.R. § 125.94(c)(7). Finally, EPA is concerned about the impingement of large numbers of Atlantic silversides, Atlantic menhaden, rainbow smelt, and river herring. The Final Rule provides for additional measures to protect these fragile species, which are unlikely to survive being impinged on the screens. *See* 40 C.F.R. §125.94(c)(9).

4.4. Seasonal Flow Reductions

The mesh size of the traveling screens at PNPS differs from, though performs comparably to, that commonly used in the industry for CWIS screens (3/8 inch square). 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 life stages (*i.e.*, eggs and larvae). As a result, there is no reduction in entrainment mortality associated with the operation of the existing traveling screens. There is, however, an entrainment reduction associated with reductions from design flow associated with the scheduled maintenance outages. Entergy calculated an annual flow reduction of 5.4% from baseline flow, with the greatest reductions in April and May due to the timing of refueling outages. Entergy estimates an annual entrainment reduction of 8.5% based on the mean monthly equivalent adult entrainment averaged over six years. Based on mean density of ichthyoplankton entrained per month from 2002 through 2007, EPA calculated an annual entrainment reduction of about 3% for eggs and about 9% for larvae. Based on entrainment data from 2002 to 2007, the species most affected by flow reductions in April and May include cunner and Atlantic mackerel eggs, as well as sand lance, winter flounder, and grubby larvae.

4.5. Anticipated Changes in Plant Operation During the Next Permit Cycle

As part of the permit application requirements under the Final Rule, a facility must submit a description of the operational status of each unit for which a CWIS provides water for cooling including, among other things, a description of plans or schedules for decommissioning or replacement of units. *See* 40 C.F.R. § 122.21(r)(8). According to the preamble to the Final Rule, "where the remaining plant life is considerably shorter than the useful life of the technology or where a facility has a planned retirement within the next permit cycle, this information is useful to support a determination regarding that specific entrainment technology." (79 Fed. Reg. at 48,366). On October 13, 2015, during the development of a Draft Permit for PNPS, Entergy announced its intention to close PNPS no later than June 1, 2019. *See* Entergy's October 13, 2015 News Release. Entergy cites poor market conditions, reduced revenues, and increased operational costs as factors in its decision to close the plant. Further, Entergy indicates that the exact timing of the shutdown, which may be sooner than June 1, 2019, will be decided during the first half of 2016.

Based on this announcement, EPA expects that within the next permit cycle, and no later than June 1, 2019, PNPS will, at a minimum, permanently eliminate cooling water withdrawals and discharges for the main condenser. This cooling water volume comprises 96% (311,000 gpm) of the once-through cooling water at the plant. Currently, the remaining 4% (13,500 gpm) is used for cooling water for the safety-related equipment, including shut-down systems. Clearly this change in operation of the plant will have a substantial impact on impingement mortality and entrainment at PNPS. As such, EPA has considered the anticipated closure of PNPS in its BTA determination, as discussed below.

5.0 Assessment of Available Entrainment Technologies

In Sections 3.0 and 4.0 of this fact sheet, EPA demonstrated that PNPS's CWIS likely results in the loss of billions of eggs and larvae to entrainment and tens of thousands of fish to impingement each year and further, that the existing intake location and traveling screen technology are not sufficient to minimize the adverse environmental impacts of impingement and entrainment under the current operation. In the following sections, EPA evaluates the availability of technologies to minimize adverse environmental impacts from entrainment and sets the site-specific entrainment BTA requirements after considering a number of factors, including the remaining useful life of the plant and the costs and benefits of available technologies.

To support this BTA determination, EPA requested that Entergy evaluate the availability of technologies designed to minimize entrainment at PNPS's CWIS, including: traveling screen modifications, screen/barrier technologies, an offshore intake location, various flow reduction options, and closed-cycle cooling. Each of these technologies has advantages and disadvantages, both inherent to the technology and as applied specifically at PNPS, and no one alternative commends itself as perfect, proven, and fully protective of the environment. For this analysis, EPA has considered the permit record, including PNPS's June 2008 Engineering Response to US EPA's CWA § 308(a) information request letter and August 2014 Engineering Response Supplement to US EPA's CWA § 308(a) information request letter, as well as other analyses and literature about the feasibility, cost, and effectiveness of entrainment technologies.

5.1. Closed-Cycle Cooling

At PNPS, the existing once-through cooling water design transfers waste heat directly from the main condenser to the receiving water (Cape Cod Bay), and requires the facility to continuously withdraw up to 467 MGD of cooling water. In contrast, closed-cycle cooling water systems transfer waste energy (as heat) from the main condenser to the atmosphere. Steam electric power plants equipped with closed-cycle cooling systems use substantially less water relative to a once-through cooling system by cooling and then recirculating the previously heated water through the condenser. This recirculation reduces not only the volume of water withdrawn for cooling, but also the discharge of heat to the receiving water.

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. The second uses cooling ponds or lakes. *See, e.g.*, 79 Fed. Reg. at 48,333 and EPA's Technical Development Document for the Final 316(b) Existing Facilities Rule (TDD) p.6-3 to 6-6. These two methods dramatically reduce cooling water use requiring only a relatively small amount of "makeup" water to replace cooling water lost to evaporation and leaks. 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"). Dry cooling systems are generally regarded to be more expensive and require more space to install than wet cooling tower systems. *See, e.g.*, 79 Fed. Reg. at 48,333-34; Final Rule TDD p. 6-6 to 6-8. EPA is unaware of any current or proposed nuclear power plants designed to employ dry cooling technology (EPRI 2012).

In its 2008 *Engineering Response to EPA's CWA Section 308 Request for Information* (Enercon 2008), Entergy maintains that the lower efficiencies of evaporative ponds, spray ponds, cooling canals, and dry cooling towers are not capable of providing sufficient cooling to support the condenser temperature required by PNPS's turbine design. Entergy concluded that evaporative ("wet") cooling towers are the most appropriate closed-loop technology for PNPS. EPA agrees that wet cooling towers are an appropriate closed-cycle cooling system consistent with the best performing technology for entrainment. Other closed-cycle cooling systems (e.g., dry cooling) are likely to be substantially more expensive, have larger impacts on plant performance, and impose additional constraints as compared to wet cooling towers. For these reasons, dry cooling is less likely to be feasible at nuclear power plants than wet cooling towers (EPRI 2012).

Below, EPA presents its assessment of the feasibility of closed-cycle cooling at PNPS using wet cooling towers. First, EPA discusses the impacts of retrofitting an existing facility with closed-cycle cooling on plant efficiency and power generation generally, followed by a site-specific evaluation of the impacts of wet cooling towers on power generation at PNPS using two different tower designs. Finally, EPA evaluates the feasibility of a third engineering design, which involves replacing the main condenser to optimize plant efficiency with a closed-cycle system.

5.1.1. Design of a Closed-Cycle Cooling System at PNPS

Boiling water reactors, like the one at PNPS, are governed by a set of administrative limits[16] used to ensure reliability and safety. According to Entergy, these administrative

[16] According to Entergy, administrative limits are PNPS-proceduralized limits used to prevent encroachment of NRC licensed limitations which require a documented Limited Condition of Operation when exceeded. The administrative limits include pump net positive suction head requirements, overall plant control characteristics, core thermal power limits, and core thermal-hydraulic stability. NRC defines

limits govern the operation of various equipment in order to prevent the occurrence of a transient (*i.e*., change in the reactor coolant system temperature, pressure, or both) or scram (*i.e*., the sudden shutting down of a nuclear reactor, usually by rapid insertion of control rods). The limiting parameters for a closed-cycle system at PNPS are the steam turbine backpressure and hotwell temperature.[17] At PNPS, the administrative hotwell average temperature limit is 120°F and administrative limit for steam turbine backpressure is 4 in-Hg (Enercon 2008, Enercon 2014, PNPS Procedure 2.2.93 "Main Condenser Vacuum System", PNPS Procedure 2.1.14 "Power Station", and PNPS 2.2.94, Rev.114 "Seawater System Procedure"). Entergy asserts that an operational hotwell temperature limit of 118°F is used to provide an allowance against the administrative limit, and because the steam turbine backpressure meets the administrative limit at a hotwell temperature of 118°F, the hotwell temperature is the bounding limit in its analysis of cooling towers.

Closed-cycle cooling systems use an evaporative process to cool water that was heated in the condenser, discharges the heat to the atmosphere, and then recirculates that water back to the condenser. Converting PNPS to a closed-cycle cooling system would generally result in higher circulating water temperatures as compared to the existing once-through cooling system. The continued loss of condenser cooling efficiency would eventually lead to an exceedence of the hotwell temperature unless thermal power output from the reactor is reduced. According to Entergy, nuclear power plants are designed as base load generating facilities and continuous power loss as part of normal operation may introduce new risks for potential transients, increase the likelihood of operator error, and may challenge previously accepted equipment reliability acceptance criteria (Enercon 2014). Unlike a fossil fuel generating facility that is able to adjust thermal energy output by reducing the amount of fuel fired (e.g. by burning less coal or oil), a nuclear facility has a narrow range within which it can manipulate the energy generated by the reactor. A nuclear generating facility controls the power of the reactor by inserting control rods, which prevent the neutrons from causing further fissions. Generally, routine manipulation of the control rods is not tenable and may result in an increased risk of power oscillations, or transients, which could lead to frequent plant shutdowns (Enercon 2014).

At PNPS, the core operating limits are delineated by the Maximum Extended Load Line Limit Analysis (MELLLA) rod lines, the Exclusion Region, and the Buffer Zone. PNPS is authorized to operate up to the MELLLA boundary, which allows for the highest thermal power output over most core flow rates and is considered the upper limit for power generation. Operation above the MELLA boundary is generally prohibited (PNPS Procedure 2.1.5 Rev. 112 "Controlled Shutdown from Power"). The Exclusion Region is an area within the operating domain where the possibility exists for the occurrence of thermal-hydraulic oscillations. Normal operation is prohibited in the Exclusion Region.

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limiting condition for operation as the section of Technical Specifications that identifies the lowest functional capability or performance level of equipment required for safe operation of the facility. See NRC Glossary at http://www.nrc.gov/reading-rm/basic-ref/glossary.html.

[17] The maximum hotwell temperature ensures the performance and longevity of the condensate demineralizer system, which maintains the quality of the recirculating water in the steam loop. The maximum steam turbine backpressure limit prevents damage to the turbine.

The Buffer Zone is defined as a region in the operating domain with a parallel boundary to the Exclusion Region and adds an additional margin to prevent occurrences of thermal hydraulic instabilities. The intersection of the Buffer Zone and MELLLA boundary represents the theoretical maximum power reduction possible without movement of the control rods to bring down power level in the plant. Based on the current and past fuel cycles, this point is generally located at approximately 80% thermal power (Enercon 2014). In addition, PNPS maintains operations above a specific core mass flow rate (40 million pounds per hour) to reduce the risk of reactor scram due to a transient or inadvertent operation. Together, the core mass flow rate and the MELLLA boundary dictate that the lowest power that can be consistently achieved without rod movement is approximately 80% of thermal power output (Enercon 2014). Enercon used the performance evaluation of power station efficiency (PEPSE) model to estimate the maximum power output at PNPS using closed-cycle cooling with the existing condenser, and then assessed how often power reductions would be required to meet administrative limits, and how often power reductions greater than 20% thermal power would require PNPS to move the control rods to reduce the risk of a reactor scram.

5.1.2. Anticipated Impacts of Closed-Cycle Cooling on Power Generation

In a closed-cycle system, the performance of the cooling tower (in other words, the ability of the tower to transfer heat from the recirculating water to the atmosphere) is defined by the approach to wet bulb temperature, which is a meteorological measurement that incorporates both moisture content and ambient air temperature. The approach to wet bulb temperature describes the number of degrees above the ambient wet bulb temperature by which the cooling tower can be expected to reduce the recirculating cooling water temperature (*i.e.*, the temperature of the water exiting the cooling towers). This value is used in the design phase to determine the size of the cooling tower. Enercon used an approach to wet bulb temperature of 12°F for its initial analysis (Enercon 2008) and, upon EPA's request, submitted an additional analysis with an approach to wet bulb temperature of 9°F (Enercon 2014).[18]

At PNPS, the main condenser was designed and sized to use a continuous, cold supply of Cape Cod Bay water as a heat sink. Using the existing main condenser in a closed-cycle system with an approach to wet bulb temperature of either 9°F or 12°F will result in a higher recirculating water temperature relative to the existing once-through system under most conditions, and thus, will reduce plant performance as compared to the existing once-through system. This loss of efficiency (or "energy penalty") in turn results in lost power output. In addition, the fans and pumps associated with mechanical cooling towers, like those proposed at PNPS, require electricity to run. The loss in power output

[18] Enercon estimated that lowering the approach to wet bulb temperature to 9°F would result in the need for a 25% larger tower compared to the original analysis at 12°F. Enercon used wet bulb temperature data recorded at the National Weather Service observatory at the Plymouth Municipal Airport from 1997-2006 for the 2008 analysis and 2009-2013 for the 2014 analysis. Corresponding inlet water temperatures were supplied by PNPS from data collected for NPDES discharge monitoring reports.

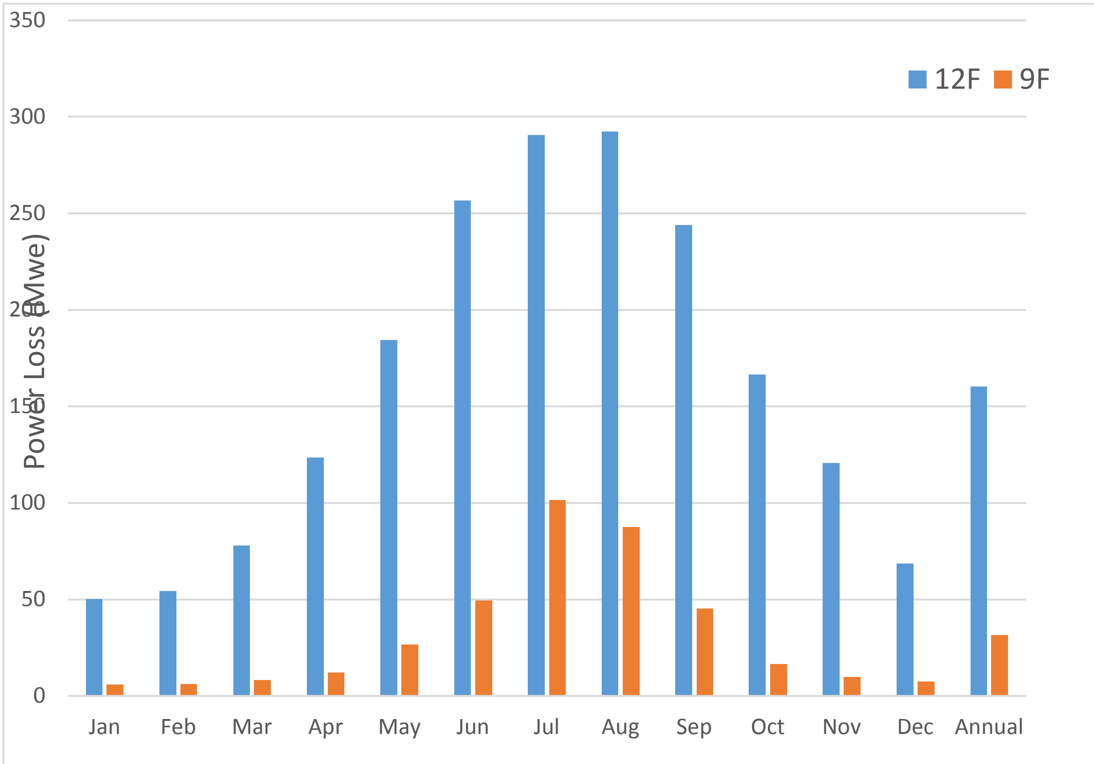
as a result of running the necessary equipment is considered an auxiliary power reduction, or "parasitic loss." At PNPS, Entergy estimates that cooling towers would result in a continuous parasitic loss of 20 megawatts of electric power (MWe), which is about 3% of the total output. EPA considered the loss of output both in terms of the feasibility of installing and operating closed-cycle cooling at PNPS and the additional social costs imposed by the energy penalty.

In its 2008 Engineering Response (Enercon 2008) and 2014 Engineering Response Supplement (Enercon 2014), Entergy provided preliminary engineering evaluations using basic plant operational parameters to calculate the effects of retrofitting PNPS with a closed-cycle cooling system, including the expected power generation loss (*i.e.*, energy penalty). Enercon used the performance evaluation of power station efficiency (PEPSE) modeling software to estimate plant operational parameters and net power generation depending on the cooling water temperature, flow rate, and the approach to wet bulb temperature. The PEPSE model allows for the calculation of system performance and operational conditions while meeting the equipment limitations to ensure reliability and safety of the plant. In its analysis of closed-cycle cooling, Enercon used slightly conservative operational parameters to ensure that the administrative limits, as described above, are not exceeded.

Results

The PEPSE evaluation indicates that retrofitting PNPS with a closed-cycle cooling system would require the plant to operate at less than 80% thermal power (*i.e.*, require movement of control rods) during some periods of the year. Figure 6 illustrates the loss in net power generation (MWe) that would occur over the year based on cooling tower designs with a 12°F or 9°F approach to wet bulb temperature. In both cases, the efficiency of the tower, and therefore the ability to generate power within the existing administrative limits, decreases as ambient air temperatures increase in the spring. Entergy's analysis indicates that cooling towers with a 12°F approach to wet bulb temperature would result in a substantial continuous power loss (greater than 243 MWe including parasitic losses) on 26 to 31 days during each month from June through September (Enercon 2008 Attachment 3, p.3). A larger tower with a 9°F approach to wet bulb temperature improves efficiency of the tower and therefore, increases the ability to generate power within the existing administrative limits. However, Entergy's analysis indicates that this design could still result in a substantial continuous power loss (more than 87 MWe *not* including parasitic losses) on 8 to 14 days during July and August (Enercon 2014 Attachment 1, p.3). An additional, albeit relatively minor, power reduction would occur as a result of operating the 9°F towers.

Figure 6. Annual PNPS Power Reduction with 12°F Approach to Wet Bulb Cooling Tower. (From Enercon 2008 Attachment 3, Section 2, p.3)



The PEPSE model simulation indicates that the power output at PNPS could be substantially impacted by the loss of efficiency with closed-cycle cooling. Power losses at PNPS resulting from closed-cycle cooling could impact operation of the nuclear reactor if net thermal power (MWt) is less than 80% because the facility may be forced to shutdown for safety reasons. Table 4 summarizes the loss of power generation (MWe) and number of days per year that the plant would operate at less than 80% net thermal power (MWt) in order to maintain a hotwell temperature of 118°F with a cooling tower designed with either an approach to wet bulb temperature of 9°F or 12°F. In this analysis, parasitic losses were removed from both sets of data for a direct comparison of gross power generation loss because, according to Enercon, "parasitic losses cannot be precisely estimated without a more detailed design and layout" (Enercon 2014 p.33).

Table 4. Estimated gross power generation loss and net thermal power loss at PNPS for cooling towers with approach to wet bulb temperatures of 9°F and 12°F.		
	Approach to Wet Bulb Temperature	
	9°F	12°F
Average no. days with gross electrical power loss > 20 MWe (3%)	140 days	356 days
Average no. days with gross electrical power loss > 80 MWe (12%)	84 days	308 days
Average no. days with gross electrical power loss > 140 MWe (21%)	41 days	240 days
Annual gross electrical power loss	31.6 MWe	160.4 MWe
Average no. days with net thermal power < 80% MWt	25 days	242.5 days

Enercon estimated that with an approach to wet bulb temperature of 12°F, on average, PNPS would operate for at least one hour at less than 80% net thermal load on 242 calendar days per year. A larger cooling tower, with an approach to wet bulb temperature of 9°F, reduces the risk that PNPS would operate at less than 80% thermal power, but there is still a substantial risk of shutdown during the summer months, particularly during the months of May through September (see Figure 6 and Table 4, above). At this approach to wet bulb temperature, PNPS would experience, on average, 25 days at a net thermal power of less than 80% during the months of June, July, and August (Table 5).

Table 5. Average number of days with operation at less than 80% thermal power (MWt) with closed-cycle cooling at an approach to wetbulb temperature of 9°F.			
Month	<80% MWt	Month	<80% MWt
January	0.0	July	11.8
February	0.0	August	7.2
March	0.0	September	2.8
April	0.0	October	0.2
May	0.6	November	0.0
June	2.4	December	0.0

Entergy states that nuclear power plants operate as baseload plants and are not designed to change the core flow rate on a regular basis. For example, currently the core flow rate is reduced only when the circulating temperature in the plant reaches the ultimate heat sink temperature limit of 75°F, which has occurred three times in the past 14 years. In other words, frequent power loss, in which the core flow rate is decreased to reduce the net thermal heat generated by the plant, is not a normal mode of operation and the long-term impacts on nuclear fuel and plant transients are uncertain. Operating at less than 80% thermal power would require movement of the control rods, and may increase the likelihood of transients and forced shutdowns.

PNPS concluded that conversion to closed-cycle cooling is infeasible because it would substantially impact the capacity of the plant to generate electricity and is generally not consistent with a nuclear power plant designed for baseload generation. However, the

PEPSE results for a 9°F approach to wet bulb tower suggest that that PNPS could operate closed-cycle cooling during the months of November through April without reducing thermal power. In May and October, the simulation indicates that PNPS would have to operate at reduced power for less than one day, on average. From June through September PNPS would either have to maintain the ability to use the existing once-through system or shutdown for a prolonged period when the reduction in plant efficiency requires movement of the control rods.

Finally, EPA is committed foremost to ensuring public safety and will ensure that any BTA determination does not conflict with nuclear safety requirements. The Final Rule expressly considers the impact of any required entrainment technology on nuclear safety at 40 C.F.R. § 125.94(f), which states:

> If the owner or operator of a nuclear facility demonstrates to the Director, upon the Director's consultation with the Nuclear Regulatory Commission, the Department of Energy, or the Naval Nuclear Propulsion Program, that compliance with this subpart would result in a conflict with a safety requirement established by the Commission, the Department, or the Program, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact that would not result in a conflict with the Commission's, the Department's, or the Program's safety requirement.

Entergy states that because closed-cycle cooling would significantly reduce generating capacity, require substantial periods of active power loss, and would, at times, require the plant to down power, closed-cycle cooling is not available at PNPS. EPA agrees that the PEPSE simulation indicates that maintaining the current administrative limits (the hotwell temperature and turbine backpressure) would likely reduce power output and could lead to plant shutdown during some periods the year. EPA is currently consulting with the Nuclear Regulatory Commission (NRC) to confirm PNPS's statements regarding the potential conflicts with nuclear safety requirements. Any required changes to the plant that could affect operation and safety, including cooling towers, would likely be subject to the NRC's process for changes to an existing operating license at 10 C.F.R. § 50.59.

5.1.3. Optimizing Efficiency by Replacing Condenser

In part, the impacts of closed-cycle cooling on the efficiency of the plant could be alleviated by increasing the size of the condenser. The main condenser at PNPS was designed for the use of a stable and coldwater source of cooling water (i.e., Cape Cod Bay). According to Entergy, increasing the size of the condenser at an operational nuclear power plant is unprecedented. As such, Entergy concludes that the current condenser could not be replaced. The location of the main condenser, central to the turbine building, further complicates any modification to the cooling system. Replacing the condenser would likely require a complete disassembly and modification of the turbine building.

According to Entergy, modification of the turbine building of this size and scope has never been attempted at an operational nuclear power plant, therefore modifying the existing cooling equipment is not feasible. EPA agrees with Entergy's position that a modification of the existing cooling system of this size at a nuclear power plant would likely be unprecedented, although it does not necessarily follow that it is therefore infeasible. Nonetheless, replacing the condenser would be difficult and would involve substantial capital costs and construction downtime costs on top of the already substantial cost of converting to closed-cycle cooling. On top of these capital costs, EPA estimates a construction outage of 24 months.[19] The extended outage would be necessary because, according to Entergy, in order to replace the main condenser, the turbine building would have to be extensively modified, if not demolished and re-built. EPA expects that a minimum of 24 months would be required to replace the main condenser and re-build the turbine building based on the construction outages estimated for other plants.[20]

5.1.4. Entrainment Reduction

EPA estimates that an optimized cooling tower can achieve flow reductions of about 95% or more for salt water sources. *See, e.g.*, 79 Fed. Reg. at 48,333 (Aug. 14, 2014) and *Technical Development Document for the § 316(b) Existing Facilities Final Rule* (Final Rule TDD) p. 6-9. Entrainment mortality, which is directly proportional to the amount of cooling water withdrawn, is therefore reduced by 95% using closed-cycle cooling technology both using the existing condenser or replacing the main condenser. In this case, PNPS circulating water withdrawn for cooling at the main condenser could be reduced by 95%, but the volume of safety service water (SSW) would not change because cooling towers would not be tied into this system. A 95% reduction in circulating water withdrawals combined with the existing SSW withdrawals (19,400 gpm) results in a net reduction in cooling water of 91%. Therefore, PNPS would likely experience at least a 91% reduction in entrainment with closed-cycle cooling (either using the existing condenser or replacing the main condenser). In addition, use of a closed-cycle recirculating system is compliant with the BTA standards for impingement mortality under the Final Rule at 40 C.F.R. § 125.94(c)(1).

EPA considered the potential entrainment reduction that could be achieved with seasonal use of a 9°F wet cooling tower. The inability to rely on closed-cycle cooling during the summer months would require PNPS either to shutdown during the summer, which would result in substantial outage costs, or to operate the existing once-through cooling system during the summer, which would reduce the benefits of closed-cycle cooling to minimize entrainment. If PNPS were to operate the existing once-through cooling system during June through August when the cooling tower is most likely to interfere with

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[19] EPA estimated a minimum capital cost of $311 million ($2009 dollars) for replacement of the condenser by doubling the cost of condenser modification at a nuclear facility from EPRI's 2011 *Closed-Cycle Cooling System Retrofit Study: Capital and Performance Cost Estimates.*

[20] EPRI (2011) estimated construction outage periods ranging from 4 to 22 months for retrofitting a nuclear plant (*Closed-Cycle Cooling System Retrofit Study: Capital and Performance Cost Estimates).* EPA estimated 10 months of outage for retrofitting the existing condenser with cooling towers and extended the outage to 24 months of outage given the challenges presented by the location of the main condenser in the turbine building.

PNPS' ability to meet administrative limits, entrainment reductions would be substantially diminished. The highest densities of eggs, which account for 89% of total annual entrainment, occur during June and July when there would be no entrainment controls present. EPA estimates that operating cooling towers from September through May, while operating the existing once-through system from June through August would result in a 19% reduction in entrainment. This performance is not substantially more than could be achieved with variable frequency drives at far lower cost, and is not as effective as other potentially available entrainment controls. Operating closed-cycle cooling year-round would require PNPS to shutdown for a period of time during the summer (when demand is highest), which would result in significant losses in annual revenue (*i.e.*, private costs) and substantial social costs as a result of the need to generate this lost power from an alternative source.

5.1.5. Cost

Because PNPS concluded that closed-cycle cooling technology is not available, Enercon did not provide any cost estimates for this technology. EPA generated baseline cost estimates for converting PNPS to closed-cycle cooling using Entergy's cost estimates for cooling towers associated with assisted recirculation at PNPS, Entergy's cost estimates for cooling towers at Indian Point Electrical Center Units 2 and 3 (Enercon 2010), and EPRI's 2011 *Closed-Cycle Cooling System Retrofit Study: Capital and Performance Cost Estimates.* EPA acknowledges there is a high level of uncertainty underlying these cost estimates driven by the lack of site-specific information about the design and installation of this technology at PNPS. Nonetheless, EPA believes these estimates are a useful baseline for comparison of costs for the purposes of this BTA determination for entrainment. The social costs of closed-cycle cooling are discussed in detail in Section 5.7, below.

5.1.6. Summary

To summarize, a closed-cycle cooling system at PNPS would likely reduce cooling water withdrawals, and therefore, impingement and entrainment, by 91% or more. However, converting to closed-cycle cooling would negatively affect plant performance and, in some cases, cause the plant to experience routine active power losses over a substantial portion of the year forcing the plant to shut down. Frequently shutting down PNPS by moving the control rods may be in inconsistent with its operating license and would potentially impose substantial social costs for another generator to replace the output from PNPS. A larger cooling tower would reduce the likelihood of shutdowns during most of the year, but not during the summer when electricity demand and entrainment are highest. Optimizing the cooling tower by replacing the existing condenser could alleviate some of these operational issues, but a change of this magnitude is unprecedented at an operational nuclear power plant and would result in substantial additional capital and installation downtime costs. Therefore, closed-cycle cooling does not appear to be technologically infeasible at PNPS, but will impose substantial operational inefficiencies and significant social costs once operational, which, given the extensive construction period, would not be until at least four years from permit issuance.

5.2. Variable Frequency Drives

Single-speed pumps have a constant withdrawal rate at design capacity. The two, single-speed circulating pumps used for condenser cooling at PNPS have a combined design pumping capacity of 311,000 gpm (447.8 MGD). In contrast, variable frequency drives (VFDs), also known as variable speed pumps (VSPs), can be operated with a variable withdrawal rate, which enables a facility to adjust the volume of cooling water withdrawn to better match its actual cooling needs. To make the conversion, the existing pump motors would be replaced and equipped with VFDs, which would control the speed of the motors by varying the frequency and voltage of electric power to the pumps.

5.2.1. Design of Variable Frequency Drives at PNPS

Entergy evaluated the feasibility of replacing the existing, single speed drives with adjustable VFDs on each of the two circulating water pumps in order to reduce once-through cooling water withdrawals at the intake. Enercon estimates that the maximum flow reduction through the condenser would be 45% based on the continuous operating limit for hotwell temperature (118°F) and to ensure condenser performance. Use of VFDs could provide a small benefit to PNPS because VFDs require less power to run than single-speed pumps. Entergy anticipates that, on average, less than 0.1% of net power capacity would be saved at a flow reduction of 45% (Enercon 2008, p. 48).

Entergy used the PEPSE model to estimate possible flow reductions achievable with VFDs with active power losses ranging from 0% to 20% (Enercon 2008). With zero active power loss, flow reductions would be limited to 18% to 34% with an annual average reduction of 28%. At 20% active power loss (the maximum available loss without control rod movement[21]), flow reductions of 36% to 45% could be achieved with an annual average reduction of 42%. Reductions would be highest during the colder months when ambient water temperatures are coldest, and lower during the summer when ambient temperatures (and ichthyoplankton densities) are highest.

5.2.2. Entrainment Reduction

Based on average monthly ichthyoplankton densities from 2002 to 2007, EPA estimates that VFDs with Entergy’s predicted maximum monthly flow reductions (at 20% active power loss) could achieve annual entrainment reductions of 41%. However, actual flow reductions and resulting entrainment reductions would be substantially less than predicted in the 2008 Engineering Response. VFDs use less circulating water, which results in a rise in both the discharge temperature (delta T) and maximum temperature.

[21] As described above, the movement of control rods to regulate thermal power increases the likelihood of transients and implicates nuclear safety concerns.

The current NPDES permit limits the temperature rise at the discharge to 32°F and the maximum temperature to 102°F. These limits, which exceed Massachusetts surface water quality standards, have been authorized by the CWA Section 316(a) variance as protective of the balanced, indigenous population. See the discussion in Section 7.0 of the fact sheet. Maximum flow reductions at 20% power loss result in increased thermal impacts, with an annual average rise in temperature of 56.4°F and maximum discharge temperature of 103.9°F. Entergy estimates that reducing flow via VFDs with no power loss results in an annual average discharge temperature rise of 45.3°F, confirming that even at the lower range of flow reductions with no power loss (18% to 34%), PNPS would be unable to meet the current permitted rise in temperature limit of 32°F. In order to achieve the predicted entrainment reduction of 41%, PNPS would exceed the permitted maximum temperature limit and would exceed the permitted delta T limit by nearly 25°F. At this time, Entergy has not demonstrated that the increase in discharge temperature would ensure the protection and propagation of the balanced, indigenous population. To this end, EPA requested that Entergy evaluate the available flow reduction using VFDs within the constraints of the existing thermal discharge limits.

In its 2014 Engineering Response Supplement, Entergy concluded that VFDs are feasible at PNPS from an engineering perspective, but in order to maintain compliance with the current permitted temperature limits, the maximum reduction in flow would be 9% (Enercon 2014, p. 44). This reduction can be attained because PNPS typically operates at a temperature rise of 29°F, which is within the 3°F buffer from the permitted limit of 32°F. The reduction would be less than 9% during the months of July to September unless active power losses occur. As a result, actual flow reductions achievable with VFDs at the current permitted temperature limits would likely be less than 9%. Furthermore, because flow reductions under the current temperature limits are minimal, the through-screen velocity at the traveling screens would continue to exceed 0.5 fps, which is not protective of fragile species that currently experience high mortality at the traveling screens and fish return.

5.2.3. Cost

Of the technologies considered in this determination, VFDs impose the lowest private and social costs. Enercon estimated the total capital cost for conversion of the two circulating water pumps with VFDs is approximately $7 million ($2008). There are no additional operating and maintenance costs associated with VFDs compared to the existing pumps. There is no energy penalty or cost of carbon associated with the operation of VFDs with no active power losses. Entergy proposed achieving greater flow reductions (up to 42%) with a 20% active power loss, which would inflict social costs associated with the loss of output at PNPS. EPA has not considered this option, however, because flow reductions greater than 9% cannot be achieved, regardless of active power losses, without exceeding the current temperature limits. The social costs for this option are discussed in more detail in Section 5.7, below.

5.2.4. Summary

Flow reductions, and therefore entrainment reductions, greater than 9% cannot be achieved with VFDs unless PNPS exceeds both the maximum temperature limit and rise in temperature limit. Entergy concluded that further analysis of VFDs would be required to assess the potential effects of increased discharge temperatures on the balanced, indigenous population. Without fully understanding this trade-off, EPA is not inclined to authorize higher thermal discharge limits at PNPS. Therefore, while VFDs are an available BTA for entrainment at PNPS, this technology would likely result in an entrainment reduction of no more than 9%. In addition, this option provides no additional reduction in impingement mortality beyond the existing traveling screen, which does not improve the survival of fragile species.

5.3. Assisted Recirculation

As discussed above, Entergy determined that converting PNPS to closed-loop cooling is not technologically feasible because the loss in plant efficiency would significantly increase the risk of transients and would likely result in the need to shut down the plant for extended periods of the year. EPA did not determine that closed-loop cooling is infeasible, but concluded that the technology would entail an extensive installation period and would impose substantial social costs resulting from the loss of generating capacity at PNPS. A similar, but alternative option, evaluated here as "assisted recirculation," would be to use cooling towers as part of the existing open-loop system. Similar systems, known as "helper towers" have been used at nuclear plants to reduce cooling water temperatures during hot summer months before discharging the cooling water to the source waterbody (EPRI 2011). Traditional helper towers discharge cooling water from the towers directly to the source waterbody without altering the flow. In contrast, assisted recirculation at PNPS would discharge a portion of the water from the cooling towers back to the intake bay where it would then be mixed with the relatively cooler Cape Cod Bay water and recirculated through the plant. PNPS would supplement the recirculated water from the cooling towers with water that continues to be withdrawn at the CWIS from Cape Cod Bay, but at a lower withdrawal rate than the existing once-through system. The ratio of recirculated water to Cape Cod Bay water could be adjusted as necessary to meet the cooling demands of the condenser, which provides the operational flexibility to overcome many of the limitations of a closed-cycle cooling system without resulting in a loss of generating capacity, while still enabling the plant to reduce cooling water flows and, therefore, entrainment.

In assisted recirculation, circulating water exiting the main condenser is diverted to a cooling tower instead of the discharge canal. A portion of this cooled water is pumped from the cooling tower to the intake where it mixes with water from Cape Cod Bay. The combined Cape Cod Bay and recirculated water is then circulated through the plant via the CW and SSW pumps. The existing CWIS would remain relatively unchanged and would enable PNPS to recirculate a larger volume of the cooled discharge (and reduce once-through cooling water withdrawals) when ambient air and water temperatures are cooler, and increase once-through cooling withdrawals when ambient conditions would cause the plant to operate at or above administrative limits that would result in active power losses with a closed-cycle system (*e.g.*, hotwell temperature). Unlike a closed-cycle cooling retrofit, assisted recirculation would allow PNPS to respond to changing conditions and would not increase the likelihood of transients and scrams. In addition, the reduction in flow through the traveling screens during some periods of the year would reduce the through-screen velocity to less than 0.5 fps, which would likely provide impingement mortality protection for fragile species. *See* 79 Fed. Reg. at 48,336-37.

Assisted recirculation is constrained in a manner similar to closed-loop cooling, in that increasing ambient wet bulb temperatures result in the possible encroachment of PNPS limitations. Unlike a closed-cycle cooling system, assisted recirculation allows PNPS to increase once-through cooling water withdrawals and decrease the volume recirculated through the cooling tower when approaching the administrative limits in order to avoid reducing thermal power and possible shutdown. Under this option, PNPS would likely experience lower flow reductions during summer when ambient temperatures are highest, but would still be able to recirculate a portion of the cooling water. Closed-cycle cooling, in contrast, would require PNPS to either operate the once-through system or shutdown when ambient temperatures are high to avoid transients.

5.3.1. Design of Assisted Recirculation at PNPS

In its evaluation of assisted recirculation, Enercon proposed use of a round hybrid cooling tower located on the western end of the upper parking lot. This location is feasible but would require relocation of the hydrogen storage pad, sewage treatment facility, and sludge dewatering facility. To pump discharge water to the cooling towers, and then to the CWIS to be re-used, a new pump house would be built at the discharge canal. To protect against drawdown, a portion of the discharge canal would have to be made wider and deeper. New pipes would deliver water from the cooling tower to the CWIS. These modifications, on top of the relatively high cost of the hybrid cooling tower, increase capital costs.

Enercon evaluated assisted recirculation with the PEPSE model using the same operational hotwell temperature limit as in the closed-cycle cooling analysis (118°F). In this case, Enercon applied an additional thermal operation limit for the SSW pumps (73°F) because the cooling water recirculated from the tower mixes with the intake water and is used both for the main condenser as well as the SSW system. Enercon predicts that reductions in flow ranging from 35% in August to 92% in January and February can be achieved without a loss in power output. Entergy also evaluated the potential reductions that could be achieved with an active power loss of 5% ranging from a low of 41% in August to a high of 96% in January and February.[22]

[22] The continuous operation limit for the inlet SSW temperature (73°F) sets a static cap on the available flow reduction such that increasing active power loss (MWe) above 5% does not result in additional flow reductions.

5.3.2. Entrainment Reduction

EPA estimated that assisted recirculation without active power loss would result in an annual entrainment reduction of about 52%, while reducing power output by 5% would result in an annual entrainment reduction of about 58%. Using assisted recirculation, Entergy predicts maximum flow reductions greater than 80% in December through April, which coincides with higher abundances of the early life stages of several commercially or recreationally valuable species, including winter flounder and Atlantic cod. In fact, Entergy predicts that flow, and therefore entrainment, can be reduced more than 45% using assisted recirculation in every month except for July, August, and September when flow reductions of 35-43% are possible. These flow reductions can be achieved without any effect on power generation. In addition, because assisted recirculation cools the water prior to discharge, these flow reductions would not result in higher discharge temperatures. In addition, assisted recirculation would result in a through-screen velocity (TSV) less than 0.5 fps from November through May, which would provide impingement mortality controls for fragile species. The TSV would increase as once-through withdrawals increase during warmer months and would range from 0.62 fps in October to a maximum of 1.1 fps in August, compared to a TSV of 1.57 fps using the existing traveling screens at the current flow rate.

5.3.3. Cost

Entergy estimated that the capital cost for assisted recirculation is $364.5 million ($2007) with an annual operational cost of $211,000. Entergy also estimates that the maintenance costs are likely to vary over a 30-year period and include the costs for replacement of components (e.g., pump impellers, motors, or entire assemblies). Entergy estimates annual maintenance costs (in $2007) of $632,000 for the first 5 years, $1,083,000 for years 6 to 15, and $1,978,000 for years 16 to 30. Enercon estimates loss of electrical output of the plant as a result of operating the cooling tower (“parasitic losses”) vary approximately linearly as a function of input flow rate. However, because PNPS could adjust the amount of recirculating water based on ambient conditions, there is no energy penalty, resulting from the loss of efficiency, associated with assisted recirculation. The social costs of this option are discussed in more detail in Section 5.7, below.

5.3.4. Summary

Entergy concluded that assisted recirculation is feasible at PNPS, but that this technological approach is unprecedented at nuclear power stations in the United States. While EPA is not aware of any existing nuclear facilities that use cooling towers in a once-through cooling system to reduce water withdrawals, there are similar “helper tower” configurations in operation at several nuclear plants in the U.S. (EPRI 2011). The only difference between that technology and assisted recirculation is that at PNPS the cooled water would be discharged back to the intake and mixed with cold seawater, rather than being discharged to the source water. Consequently, EPA concludes that assisted recirculation is an available technology for minimizing entrainment.

In its 2008 Engineering Response, Entergy concludes that the theoretical performance of assisted recirculation is similar to that of VFDs, but at an increase in cost by more than fifty-fold. EPA disagrees that the performance of these two technologies is comparable. First, according to Entergy, the maximum flow reduction available using VFDs is 45% and that includes a 20% active power loss. Assisted recirculation does not have the same limitation because this technology would not increase discharge temperatures like VFDs. In fact, because discharge water goes through the cooling tower prior to being discharged, the temperature at the outfall would decrease compared to existing conditions. According to Entergy, the maximum flow reduction that can be achieved through VFDs within the existing thermal discharge limitations is 9%, which is substantially less than the anticipated flow reductions achieved with assisted recirculation.

5.4. Offshore Intake Location

Even over the relatively small scale of Cape Cod Bay, densities of adult and juvenile fish, as well as eggs and larvae, exhibit spatial variation with both distance from shore and depth in the water column. As a result of this variation, the location of a CWIS can influence entrainment. Nearshore coastal waters are typically the most biologically productive areas; therefore, moving an intake for a coastal facility offshore may reduce entrainment relative to an onshore intake (TDD to Final Rule p.6-56 to 6-58). Deeper waters are generally considered less biologically productive, although the site-specific biological community is an important consideration in siting an offshore intake.[23] Offshore intakes can also be fitted with velocity caps[24] or cylindrical wedgewire screens, which can be designed with a sufficiently low velocity to allow fish to avoid impingement. An added benefit of an offshore intake may result from the withdrawal of colder water, which increases the efficiency of the facility and may lower the discharge temperature.

Offshore intakes have been used at nuclear and fossil fuel facilities in coastal locations and on the Great Lakes. Seabrook Nuclear Power Station, which is located about 65 miles north of PNPS, uses an intake that is about 1.3 miles offshore at a depth of about 60 ft (the velocity cap is located 18 ft below the surface). Most offshore intakes, such as the one at Seabrook, were constructed at the same time as the plants rather than retrofit.[25]

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[23] During development of the Phase III Rule, EPA examination of data on densities of ichthyoplankton in the Gulf of Mexico indicated that ichthyoplankton densities at stations less than 50 m deep are more than 4 times the average densities at stations 150 m deep, and can be more than 18 times the average densities at stations greater than 150 m deep. See the Preamble to the Phase III Rule 71 Fed. Reg. 35013 (June 16, 2006) and OW-2004-0002-951.

[24] Velocity caps convert flow from a vertical direction to a horizontal one at the entrance to the intake, which provides a physiological trigger to induce an avoidance response in fish. Velocity caps are also configured with supports and bar spacing designed to prevent larger aquatic organisms from entering the intake pipe and swimming to the forebay. See Technical Development Document for the Final 316(b) Existing Facilities Rule p. 6-59.

[25] In the Technical Development Document for the Final 316(b) Existing Facilities Rule (p. 6-59), EPA recognizes that selecting an appropriate intake location is best considered when siting a new intake or

However, the Oak Creek Power Plant on Lake Michigan completed a retrofit of an offshore intake in 2010 that could serve as a model. A new intake was constructed located 6,000 feet offshore and fitted with 24 cylindrical wedgewire screens with 3/8-inch mesh. Total withdrawals at the intake are 2,200 MGD, which serves both the existing Oak Creek facility plus the new Elm Road Generating Station. The total cost of the retrofit, including modifications to the existing shoreline intake, the intake tunnel, and wedgewire screens was $121 million (We-engeries 2014b).

5.4.1. Design of an Offshore Intake at PNPS

An alternative intake location was examined during the original licensing of PNPS in the early 1970s for construction of Unit 2 but was never built. PNPS proposed an intake located approximately 2800 feet offshore at a depth of 35-40 ft. In 2000, another analysis of intake technologies prepared for PNPS by ENSR suggested an offshore intake could be located about one mile offshore at a depth of 36 feet. A velocity cap was included in the proposed design to minimize impingement by reducing the horizontal design flow to a maximum of 0.5 fps. ENSR concluded that installation of a submerged intake was feasible for PNPS and did not present any safety concerns. However, ENSR raised concerns about the effectiveness of an offshore intake. In particular, ENSR was uncertain if an offshore intake would effectively minimize entrainment of larval winter flounder because larvae of this species may be concentrated at the bottom of the water column. Additionally, the Permittee stated that an offshore intake may impede navigation and would likely disrupt the benthic environment during construction. *See* 316 Demonstration Report – Pilgrim Nuclear Power Station (Redacted) p.6-5 to 6 (ENSR 2000).

In its 2008 Engineering Response, Entergy concluded that an offshore intake at PNPS may be feasible, but site-specific biological data to assess potential entrainment reductions is lacking (Enercon 2008). Entergy states that "[d]etailed field studies of ichthyoplankton and local fish distribution are required to establish whether an offshore location is preferable and what that location would be." Similarly, in its 2014 Engineering Response Supplement, Entergy states that site-specific data are unavailable either to identify potential offshore intake locations or evaluate potential reductions in entrainment compared to the current CWIS (Enercon 2014). Entergy also maintains that an extensive, multi-year field study would be required to determine the optimal location and depth to minimize entrainment.

An offshore intake is feasible, although Entergy did not identify any potential locations for the intake. At EPA's request, Tetra Tech evaluated whether an offshore intake location is available at PNPS and proposed select design parameters and capital costs for an offshore intake at PNPS. *See* Memo dated November 10, 2014 from John Sunda and Kelly Meadows (Tetra Tech) to Damien Houlihan and Jennifer Chan (EPA) titled *Engineering Analysis of Adding a Submerged Offshore Intake at Pilgrim Station* and

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facility, and that changing the intake location is both limited to facilities with available space and often one of the most expensive technologies considered.

Memo dated November 10, 2014 from Ann Roseberry Lincoln and Blaine Snyder (Tetra Tech) to Damien Houlihan and Jennifer Chan (EPA) titled *Pilgrim Station Cooling Water Intake Location Analysis*. Based on the total pump capacity, Tetra Tech proposes a design with two intake riser shafts each with an inner diameter of 9 feet. To avoid extensive impacts to benthic habitat, Tetra Tech suggests using the shaft and deep tunnel design employed at Seabrook and at Oak Creek Stations, instead of excavating, laying, and covering the intake pipe on the ocean bottom.

The PNPS intake design must consider the safety-related system requirements specific to a nuclear facility, including ensuring that the salt service water (SSW) pumps operate with a reliable water supply for the reactor under all conditions, the ability to keep the water elevation at the pumps from dropping below the required pump submergence elevation (and damaging the SSW pumps), and issues related to excavation of the intake tunnel near a nuclear reactor. To ensure that the SSW pump water supply is available under all conditions, Tetra Tech proposes a supplementary intake system design similar to the one at Oak Creek. *See* Memo dated November 10, 2014 from John Sunda and Kelly Meadows (Tetra Tech) to Damien Houlihan and Jennifer Chan (EPA) titled *Engineering Analysis of Adding a Submerged Offshore Intake at Pilgrim Station*. The Oak Creek design provides the option of alternating between the new offshore location and the existing shoreline intake. A similar design would allow PNPS to bypass the offshore intake during emergency conditions to ensure a steady supply of cooling water for the SSW pumps and avoid safety-related issues. Using low-head lift pumps between the intake tunnel outlet basin and the existing intake eliminates the need to modify the existing cooling equipment to compensate for increased head loss and allows for continued use of the existing intake during construction. The low-head lift pumps would provide sufficient pump submergence during normal operations. Finally, because of the potential effect of blasting on the safety and integrity of the reactor, Tetra Tech suggests an alternative method of mechanical shaft boring for construction of the intake tunnel at PNPS.

Tetra Tech investigated suitable offshore locations for a submerged intake by analyzing information on depth, distance offshore, and locational data on sensitive, special, or unique resources (including shellfish suitability areas defined by MassFisheries, core habitat for whales, popular underwater recreational diving sites, presence of eelgrass, and hard or complex seafloor habitat). *See* Memo dated November 10, 2014 from Ann Roseberry Lincoln and Blaine Snyder (Tetra Tech) to Damien Houlihan and Jennifer Chan (EPA) titled *Pilgrim Station Cooling Water Intake Location Analysis*. Based on this evaluation, at least one suitable area for an offshore intake is located between 5,000 and 15,000 ft offshore at a depth of 15 to 20 m, which overlaps with North Atlantic right whale core habitat. The presence of a submerged offshore intake with a low intake velocity may not directly affect right whales, who generally spend the majority of their time in Cape Cod Bay in the upper 5 m of the water column (Parks et al. 2012), but it may indirectly impact right whales by entraining zooplankton species that are the preferred prey in Cape Cod Bay (the copepods, *Centrophages* spp., *Pseudocalanus* spp, and *Calanus finmarchicus*). The patterns of right whale residency and distribution in Cape Cod Bay are closely tied to the distribution of zooplankton. Copepod densities from

January through March are typically concentrated in the water column and whales exhibit bottom feeding. *Pseudocalanus* spp., which are common during late winter and early spring, form dense bottom layers and exhibit diel vertical migrations with concentrations forming at the surface at night. In April, surface concentrations of *C. finmarchicus* often peak in April with and whales are likely to exhibit more skimming and surface feeding. *See*, for example, Leeney et al. 2009. It is possible that a submerged offshore intake may affect North Atlantic right whales if the abundance of preferred prey in Cape Cod Bay is impacted by entrainment. Further evaluation of the potential impacts on right whales must be performed if an offshore intake is considered an available technology at PNPS.

5.4.2. Entrainment Reduction

Offshore intakes can potentially reduce entrainment compared to shoreline intakes by withdrawing water from depths at which the biological productivity (and therefore, density of fish eggs and larvae) is relatively low. The Final Rule recognizes that an offshore intake located in a less biologically productive area may experience a reduction in entrainment, but maintains that these reductions are dependent on the distance from the shoreline, the intake depth, and the site-specific aquatic community at the proposed location (79 Fed. Reg. at 48,331). Because the species found will change as a function of distance, relocating an intake may shift the impacts to a different set of species, rather than reducing entrainment. During development of the Phase III rule and the Final Rule, EPA evaluated available data on the spatial distribution of ichthyoplankton in the Gulf of Mexico, along the western coast of the U.S, and in the Gulf of Maine (see Final 316(b) Rule Docket Reference DCN12-6703 *"SEAMAP and Other Data Applicability to Other Coastal Settings"*). In this study, ichthyoplankton densities tend to decline with depth and distance from shore, and densities are lowest at depths greater than 100 m. Data from the Gulf of Maine suggests that mean ichthyoplankton densities decline dramatically at depths greater than 60 m.

To EPA's knowledge, site-specific studies of the spatial distribution of eggs and larvae are not available to estimate the potential entrainment reductions that may be realized at PNPS by relocating the intake offshore. However, Seabrook Station, located about 65 miles north of PNPS, operates an offshore intake that may serve as a proxy for the performance of this technology at PNPS. Seabrook Station calculated the similarity in the entrainment communities based on biological data collected at Pilgrim and at Seabrook Stations from 2002 to 2006 (Seabrook 2008 PIC). Estimated similarity in the entrainment communities ranged from 61 to 69 for eggs (where 100 represents complete similarity) and from 64 to 78 for larvae. These estimates suggest that PNPS and Seabrook Station entrain similar species and that a comparison of the two intakes may be an adequate representation of the potential entrainment reduction that could be realized at PNPS with an offshore intake. In its 2008 Proposal for Information Collection under the remanded Phase II Rule, Seabrook Station estimated the reductions in entrainment due to the existing offshore intake by comparing entrainment losses at Seabrook to the entrainment losses at PNPS measured as the density of eggs and larvae collected during biological monitoring at each station from 2002 to 2006. On average, the density of ichthyoplankton collected at Seabrook Station was 25% lower than the densities collected at PNPS. Adding the additional reduction in cooling water flow at Seabrook Station resulting from the withdrawal of colder, deeper water resulted in an estimated 31% reduction in entrainment at Seabrook's design flow compared to PNPS's shoreline intake. Based on the analysis of the offshore intake at Seabrook Station, entrainment reductions between 25 to 31% may be possible with an offshore intake at PNPS.

Saila et al. (1997) compared annual equivalent adult losses of winter flounder due to entrainment at Seabrook and Pilgrim Stations during the years 1990 to 1995 and found that PNPS experienced greater losses of adult equivalents in all years despite withdrawing less cooling water. Reductions in equivalent adult winter flounder ranged from 11% to 77% with an average reduction of 58.6%.

Entergy, in its 2008 and 2014 Engineering Responses, maintains that biological data is not available to evaluate potential reductions in entrainment compared to the existing shoreline CWIS. In its review of available biological data, Normandeau suggests that an offshore intake may reduce entrainment of Atlantic menhaden and winter flounder eggs and larvae compared to the existing shoreline location, depending on the depth and location of the intake, but that an offshore intake may increase entrainment of cunner eggs and larvae[26] and American lobster larvae compared to the current location (Normandeau 2008). Meanwhile, Scherer (1984) observed winter flounder larvae throughout the water column (to a depth of 20 m) in the main channel leading to Plymouth Harbor-Duxbury Bay, but found that larvae were more abundant near the bottom than at the surface on 3 of 4 sampling dates. The results of this study demonstrate that withdrawing water from a depth of 15 to 20 m (the preferred depth in Tetra Tech's evaluation of an offshore intake for PNPS) may not reduce entrainment of winter flounder larvae in all locations and highlights the necessity of more site-specific biological data from potential offshore locations at PNPS.

Finally, in an attachment to Entergy's 2014 Engineering Response Supplement, Normandeau discusses potential impacts to species in Cape Cod Bay during construction of an offshore intake, including: increased probability of ship strikes with marine mammals and sea turtles due to increased vessel traffic, interference with communication and prey detection as a result of vessel and construction-related noise, disturbance to benthic habitat, and increased turbidity (Normandeau 2014). Normandeau also identifies the potential for increased entrainment of select forage species, including phytoplankton and zooplankton, as well as the potential for sea turtles to become entrapped at an offshore intake fitted with a velocity cap. EPA acknowledges that the potential for

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[26] Normandeau indicates that cunner entrainment may increase with an offshore intake location; however, a comparison of entrainment and impingement at PNPS and Seabrook Nuclear Power Station during development of the (remanded) Phase II Rule indicates that 1) cunner in Cape Cod Bay typically spawn closer to shore and 2) the mean annual number of cunner eggs and larvae (as estimated by the facility) entrained at Seabrook was only 13% of the mean annual entrainment at PNPS. The mean entrainment data collected at PNPS in the 1990's and reported during the development of the Phase II Rule is consistent with the more recent data evaluated for this BTA determination and lends uncertainty to the statement that cunner entrainment would increase at an offshore location as compared to the existing shoreline intake.

impacts to the aquatic community both during construction of an offshore intake and due to its operation in a new location would need to be addressed during the design phase.

5.4.3. Cost

In its most recent Engineering Response, Entergy maintains that because a specific location for a potential offshore intake cannot be determined, capital and operation and maintenance costs for an offshore intake cannot be accurately estimated (Enercon 2014). In its 2008 Engineering Response, Entergy estimated the capital cost of an offshore intake to be $36.4 million based on the costs estimated for the original offshore intake design from 1980 updated to 2007 dollars. In 2014 dollars, this cost would be $45 million.

This cost is based on construction of a new intake and does not include retrofit costs. The cost of retrofitting PNPS with a submerged offshore intake will depend on the location and the final design, including whether the intake will be equipped with CWW screens or a velocity cap. As a baseline estimate, Tetra Tech evaluated the cost of the retrofit at Oak Creek Station on Lake Michigan. After considering the regional construction cost difference, contingency to account for differences in plant and waterbody type, and inflation, Tetra Tech estimated a comparable cost for a project at PNPS and adjusted the costs for differences in design flow and tunnel length. Tetra Tech estimates capital costs ranging from $56 million to $121 million dollars, depending on the distance offshore and the technology employed (velocity cap or coarse-mesh wedgewire screens). Tetra Tech's estimate is generally consistent with the capital cost of $80.9 million (2000 dollars) and annual O&M costs of $148,000 estimated in Entergy's evaluation of impingement and entrainment technologies from 2000 (ENSR 2000). After evaluating the costs and the preferred location, EPA considers $81 million in capital costs (for intake with velocity cap at a distance 10,000 ft offshore) and $253,000 in annual O&M costs to be representative of the retrofit costs for an offshore intake at PNPS.

5.4.4. Summary

EPA acknowledges that the performance of an offshore intake is subject to a number of site-specific factors and that the available data appear insufficient to assess potential entrainment reductions at PNPS. Still, while a site-specific intake design and precise estimate of the entrainment benefit of relocating the intake offshore cannot be accurately determined at this time, neither EPA nor Entergy have determined that this technology is not feasible at PNPS nor that it would definitively not reduce entrainment losses at PNPS compared to the existing system. EPA does not propose an offshore intake location as the BTA for entrainment at PNPS in this determination because of the uncertainty regarding the feasibility, location, cost, and the inability to estimate the expected biological performance of this technology as compared to other available technologies.

5.5. Cylindrical Wedgewire Screens

A cylindrical wedgewire (CWW) screen uses a "v" or wedge-shaped, cross-section wire welded to a framing system to form a slotted screening element. Wedgewire screens can potentially reduce both entrainment and impingement by physically excluding organisms from being drawn into the CWIS and by operating at a sufficiently low through-screen velocity to allow fish to swim away from the screens (Taft 2000). Typically, CWW screens are designed with a through-screen velocity of no greater than 0.5 fps, which would likely protect even fragile species from impingement mortality. Whether this technology may be effective or not to reduce entrainment at a particular facility depends on a variety of factors, including the screen slot size, water depths, local hydrodynamics, the relative sizes of the screen mesh and the local organisms, and water withdrawal volumes and velocities. The performance of CWW screens relative to entrainment losses depends on, among other things, the presence of sufficient ambient current to sweep eggs and larvae past the intake screens rather than being drawn into or onto them. *See* TDD for Final Section 316(b) Phase II Rule, p. A-13 (Feb. 12, 2004).

Both coarse-mesh and, to a lesser extent, fine-mesh screens have been used at power plants and manufacturing facilities across the U.S. The largest current installation of CWW screens is at Oak Creek Power Plant on Lake Michigan. As described above, this facility employs an offshore intake (located about 6,000 ft offshore) in combination with 24 coarse-mesh wedgewire screens to minimize impingement and entrainment. The original shoreline intake at Oak Creek remains operational and ensures a reliable source of intake flow even in the event that flow from the offshore intake and CWW screens is not available or reduced.

5.5.1. <u>Design of Cylindrical Wedgewire Screens at PNPS</u>

Entergy considered the availability of CWW screens at the PNPS intake, as well as in combination with a new, offshore intake location (Enercon 2008 and 2014). According to Entergy, installation of CWW screens at PNPS is technologically infeasible because the potential for the screens to become dislodged, damaged, or clogged and thereby cut off cooling water supply for the SSW pumps (required for safe shutdown of the plant) presents a nuclear safety concern (Enercon 2008, p. 42). The safety design bases of the SSW system are: (1) no single system component failure can prevent the SSW system from providing a heat sink for the Reactor Building Closed Cooling Water; and (2) the SSW system continuously supplies adequate cooling water to the Reactor Building Closed Cooling Water heat exchangers during transient and accident conditions. Therefore, the permittee maintains that any potential technology that introduces new failure modes into the SSW system, or that could interfere with SSW cooling water supply, would implicate nuclear safety concerns and should be judged as technologically infeasible (Enercon 2008 Response p.24). Entergy indicates that operation of this technology would require PNPS to isolate the SSW supply, which would require extensive modification to the existing CWIS or construction of a new CWIS and result in an extended forced outage (Enercon 2008, p. 42).

As described above, Entergy concluded that CWW screens are unavailable at PNPS due to concerns for nuclear safety related to a reliable cooling water source for the SSW pumps. In its 2014 Engineering Response Supplement, Entergy re-evaluated this technology in response to EPA's request for further consideration of CWW screens as part of an offshore intake configuration (Enercon 2014). Entergy concluded that the engineering feasibility of wedgewire screens cannot be determined with existing information and that further study, including a pilot test, would be required to determine if this technology is available at PNPS. Entergy again highlighted the potential safety-related problems due to clogging and provided documentation of periodic heavy debris loading events that occur at the Station and that could pose a problem if CWW screens are used at the intake. Entergy also raised concerns about the feasibility of an automatic burst system (ABS) to maintain screen performance at an offshore location 1,000 ft or greater from shore, which Entergy states exceeds the limits of known ABS designs.

In response to Entergy's position that CWW screens are not available at PNPS due to nuclear safety concerns related to SSW intake, EPA proposes that there is at least one possible solution to address Entergy's safety-related concerns and ensure a continuous supply of cooling water for the SSW pumps. In its 2000 Demonstration for PNPS, ENSR[27] proposed a design for wedgewire screens for 15 "T"-shaped cylindrical screens of 1 mm slot size located outside the embayment at the end of a 1500-ft tunnel (ENSR 2000, p. 6-7 to 6-8). ENSR specifically considered the potential safety concerns related to clogging of the screens, and included keeping the existing intake structure intact and functional as a backup for the wedgewire screen system in the design to alleviate safety concerns.

Enercon proposed a similar design for CWW screens (*i.e.*, using the existing intake structure as backup for a wedgewire system) for the Indian Point Electric Center (IPEC), on the Hudson River (Enercon 2010). Like PNPS, IPEC withdraws cooling water for the safety service water pumps from the same intake as the circulating water pumps. For IPEC, Enercon proposed circumventing the safety-related issues with the SSW pumps by connecting the CWW screens to the CWISs downstream of the existing traveling screens and maintaining operability of the existing screens. In this way, stop logs and isolation valves would enable the CWW screen arrays to be isolated for maintenance, repair, seasonal operation, or to ensure a reliable supply of cooling water for safety while cooling water supply continues uninterrupted from the existing intake bays (Enercon 2010). The CWW design for IPEC requires that the existing intake pump pits be excavated by approximately 6 feet to ensure the submergence margin and water level would prevent air entrainment (cavitation) in the circulating water pumps that could lead

[27] In 2000, ENSR Corporation, under contract to Entergy, prepared a 316 Demonstration Report for Pilgrim Nuclear Power Station (Redacted Version) which assessed the impacts of thermal discharges and the CWIS on a select set of species in Cape Cod Bay. In 2008 and 2014, Entergy contracted Enercon to provide an assessment of the impacts from the CWIS in response to EPA's information requests under Section 308 of the CWA.

to shutdown. Thus, it does not necessarily follow that, since CWW screens could become dislodged, damaged, or clogged, they are technologically infeasible at PNPS.

At an intake flow of 324,500 gpm and maximum design flow of 0.5 fps per screen, PNPS could possibly require 28 or more CWW screens depending on the size of the screens and the slot size.[28] Enercon does propose the use of an airburst mechanism to clear debris from the screens at IPEC. An airburst mechanism would likely be unavailable at PNPS because the screens would be located too far offshore for the system to be functional. The lack of an airburst mechanism could lead to more fouling issues at PNPS, which highlights the importance of maintaining operability of the existing traveling screens in the event that the CWW screens become clogged and cooling water supply is reduced. Maintaining the existing intake may also minimize unplanned shutdowns related to water elevation, because the alternative, existing intake could be used to raise the water elevation in the intake and prevent air intrusion and cavitation of the pumps.

5.5.2. Entrainment Reduction

When appropriate physical conditions are met (e.g., adequate depth, optimal screen orientation, and sufficient ambient crossflow) and the slot size is small enough to exclude egg and larval life stages, CWW screens can potentially achieve substantial entrainment reductions. To prevent eggs and larvae from passing through the screen, the slot size must be small enough relative to the size of entrained organism to prevent their being pulled through the screens.[29] CWW screens are also designed with a low through screen velocity (no greater than 0.5 fps) which, due the cylindrical shape of the screens, quickly dissipates, thus creating a relatively small flow field in the waterbody. Coupled with optimal screen orientation, this small flow field results in a small profile that minimizes the potential for contact between susceptible organisms and the screen. Finally, the ambient current crossflow (or "sweeping flow") carries free-floating organisms past the screen. When the sweeping flow is dominant over the intake velocity, the hydrodynamic properties of the screens may reduce entrainment. *See* Final Rule TDD p. 6-42. To EPA's knowledge, the performance of CWW screens has not been studied in a nearshore coastal setting like PNPS. However, a study of 0.5 mm slot CWW screens conducted in an estuary in Narragansett Bay, Rhode Island with similar species to PNPS observed entrainment reductions of 92.5% to 99.9% for eggs and 48.8% to 93.3% for larvae, depending on the species and length class (EPRI 2004). This study indicates that under the right conditions and with a sufficiently small slot size, PNPS could experience substantial reductions in entrainment with CWW screens. Site-specific studies would be

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[28] Based on the flow and size of the CWW screens at IPEC, PNPS would need 28, 1.0-mm screens that are 7 ft in diameter and 25 ft long. ENSR proposed a design for PNPS with 15, 1.0 mm slot CWW screens but did not specify a design through-screen velocity in its evaluation. Enercon did not evaluate CWW screens with slot sizes less than 1.0 mm for IPEC, but it is likely that more than 28 screens would be required if the slot size is less than 1.0 mm.

[29] The critical measurement for eggs is diameter. 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.

required to determine the optimal design for screens at PNPS, including, but not limited to screen size, slot size, orientation, depth, location, and sweeping flow.

While the literature suggests that PNPS could reduce *entrainment* by operating CWW screens at the intake, it is not certain that excluding eggs and larvae from being entrained would directly reduce *entrainment mortality* at PNPS. In other words, eggs and larvae that would otherwise have been entrained through the existing screens would be excluded with fine-mesh CWW screens, but could be killed or suffer trauma by contacting the screens or becoming impinged. At present, EPA has insufficient information that directly assesses egg and larval survival after contacting a fine-mesh wedgewire screen. 79 Fed. Reg. at 48,331, 48,335-36, and 48,435. 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 id.*at 48,323; 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. While not the same technology, traveling screens are also designed to 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. *See* the 316(b) Existing Facilities Rule Technical Development Document p.6-46 to 52. These data suggest 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 traveling screen. The literature also suggests, however, that fish larvae are unlikely, or at least are much less likely, to survive contact with a fine-mesh 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, MA (NPDES Permit No. 0003905). *See also* 76 Fed. Reg. 22,186 (Apr. 20, 2011). Similar to GE Aviation, entrainment at PNPS is dominated by eggs and therefore may realize substantial reductions in entrainment mortality if the eggs survive potential impact with wedgewire screens. Still, the intake volume at PNPS is much larger than GE Aviation and there is significant uncertainty in the physical design and location available for installation of CWW screens at PNPS.

5.5.3. <u>Cost</u>

Because it concluded that CWW screens were not feasible, Entergy did not provide a cost estimate for this technology. ENSR estimated a capital cost of $39.1 million (2000 dollars) and annual O&M cost of $142,000. Tetra Tech estimated capital costs for CWW screens located 2,800 ft offshore would be approximately $62 million, with an estimated $175,000 to $350,000 in annual O&M costs (Tetra Tech Nov 2014 Memo). Tetra Tech based this estimate on the cost for the Oak Creek offshore intake retrofit project, which also includes wedgewire screens. Tetra Tech scaled the costs to account for the differences in intake flow, location, and fuel type (nuclear versus fossil fuel). Additional costs could be incurred depending on the slot size and costs related to any modifications to the existing intake system, including any losses in revenue if PNPS would experience a shutdown (e.g., if the circulating water pump pits need to be excavated).

5.5.4. Summary

In sum, under certain environmental conditions, narrow slot wedgewire screen technology may be capable of substantial reductions in entrainment mortality at facilities with certain characteristics. EPA disagrees with Entergy's position that CWW screens would be unavailable at PNPS due to nuclear safety-concerns related to a reliable source of cooling water for the SSW pumps, in part because Entergy has proposed a compatible CWW installation at another of its own nuclear energy facilities with a combined circulating and safety water intake system, and because a similar design was proposed for PNPS by ENSR in 2000. EPA concludes, therefore, that CWW screens may be available to reduce entrainment at PNPS. However, a substantial level of uncertainty remains, including identifying a preferred location that has sufficient sweeping flow, the design of the installation, the optimum slot size, the biological effectiveness of the screens to reduce mortality of eggs and larvae, and the potential that debris and clogging could be sufficiently removed to ensure performance of the screens under most conditions. EPA does not consider CWW screens to be the BTA for entrainment at PNPS based on uncertainty with the design and performance of this technology, as compared to other available technologies.

5.6. Potential Options for the BTA for Entrainment at PNPS

Entergy has evaluated several possible technologies to reduce entrainment of eggs and larvae at PNPS. In its own evaluation of technologies, Entergy concluded that "most of the customary range of technologies, including closed-cycle cooling, is not technologically feasible (including as a matter of nuclear safety) on a site-specific basis." *See* July 1, 2008 letter from E. Zoli of Goodwin Procter to D. Houlihan of EPA. Entergy further concluded that "certain theoretical technologies" were unprecedented and, because they had never been demonstrated through operation at a comparable facility, may not reasonably be considered commercially available.

EPA concludes that there are three potential BTA options for entrainment: closed-cycle cooling, assisted recirculation, and VFDs. Although EPA disagrees with Entergy's elimination of CWW screens for PNPS due to conflicts with nuclear safety requirements,[30] the available information for both an offshore intake and CWW screens is not sufficient to support selection of either as the BTA for entrainment at this time. EPA agrees with Entergy's assessment that assisted recirculation and VFDs are available technologies for the BTA for entrainment at PNPS. EPA does not agree that, based on

[30] As explained earlier, designs proposed by Entergy for the installation of CWW screens at its Indian Point Electric Center suggest that CWW screens could likewise be designed and ultimately installed at PNPS to guarantee that sufficient cooling water is available for the safety service water pumps.

technical feasibility, closed-cycle cooling is not an available technology at PNPS. That being said, retrofitting PNPS with closed-cycle cooling is expected to impose significant costs, either as a result of the reduction in the facility's ability to generate power within its administrative limits using the existing condenser or the large capital and downtime expenses associated with replacing the main condenser.

5.7. Calculation of Social Costs for Available Technologies

The preamble to the Final Rule (79 Fed. Reg. at 48,370) states "[I]n deciding what technology to require a permittee to install to address entrainment, the Director may undertake an evaluation of social costs and benefits of implementing such requirements." Accordingly, the Final Rule indicates that this analysis will be based on information supplied by the applicant, any third parties, and additional information as determined appropriate by the Director. This section presents the calculation of social cost for each of the available technologies: closed-cycle cooling, assisted recirculation, and variable frequency drives. The social cost represents the total burden imposed on the economy and is the sum of all opportunity costs incurred. *See* Chapter 8 of EPA's *Guidelines for Preparing Economic Analyses* (EPA 2010, updated in 2014). Social benefits are considered in Section 6.3.

5.7.1. Regulatory Background

As noted above, pursuant to EPA's Final 316(b) Rule, the permitting authority generally must establish site-specific entrainment requirements reflecting its determination of the "maximum reduction in entrainment warranted after consideration" of a number factors, including "[q]uantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision."[31] 40 C.F.R. § 125.98(f)(2). Additionally, the regulations specify that the permitting authority "may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." *Id.* § 125.98(f)(4).

"Social costs" are defined in the new regulations as:

> costs estimated from the viewpoint of society, rather than individual stakeholders. Social cost represents the total burden imposed on the economy; it is the sum of all opportunity costs incurred associated with taking actions. These opportunity costs consist of the value lost to society of all the goods and services that will not be produced and consumed as a facility complies with permit requirements, and

[31] Because this particular permitting proceeding began prior to October 14, 2014, the Region is not *required* by the new rule to consider social costs in the BTA determination for entrainment for this permit. *See* 40 C.F.R. § 125.98(g) ("In the case of permitting proceedings begun prior to October 14, 2014 . . . [t]he [permitting authority's] BTA determination *may* be based on *some* or all of the factors in paragraphs (f)(2) and (3) of this section." (emphases added). The Region has nonetheless decided to consider social costs in its entrainment BTA determination for PNPS.

> society reallocates resources away from other production activities and towards minimizing adverse environmental impacts.

Id. § 125.92(y). This definition highlights that the permitting authority's evaluation analyzes the costs to society as a whole from the reductions in entrainment that would result from the installation of a particular entrainment technology, rather than costs and benefits that would accrue to limited parties. 79 Fed. Reg. at 48,370.

5.7.1. Methodology

For this BTA determination, EPA retained Abt Associates, Inc. (Abt), working under subcontract to Tetra Tech, Inc., to assist EPA in calculating the social costs of entrainment technologies. Abt developed a cost tool to estimate total social and private cost (the net present value of compliance over time) and the annualized social and private cost of compliance technology alternatives. The analysis of site-specific social costs using the cost tool for PNPS is consistent with the requirements for consideration of cost in the Final Rule. *See* 40 C.F.R. § 122.21(r)(10)(iii).

The preamble to the Final Rule describes a number of cost elements that should be accounted for in assessing the social cost of entrainment technologies, including: capital costs, installation downtime, energy penalty, annual operation and maintenance costs, and administrative expenses. *See* 79 Fed. Reg. at 48,370. Each of these costs is described briefly below and discussed in more detail as it applies to specific technologies in the following sections.

Capital cost. The costs for initial outlay including the capital costs for the technology and any downtime (or outage) associated with the installation of the technology.

Installation downtime: The cost that society must pay for alternative generating units to replace the electricity that would have otherwise been generated at PNPS during any downtime (*i.e*., outage) incurred for installation of the compliance technology. Downtime costs do not include costs associated with lost production if the installation period incorporates routine maintenance outages.

Energy penalty: The cost incurred due to the turbine efficiency loss associated with the conversion of once-through to closed-cycle cooling. At PNPS, which cannot increase fuel consumption to make up the loss, the energy penalty results in a reduction in the electricity generated. In the Final Rule, EPA considers the social cost of the energy penalty as the cost for another facility to generate electricity no longer available for consumption because of the energy penalty. At PNPS, another facility must compensate for the lost electricity at PNPS as a result of the energy penalty. EPA assumes the replacement electricity is supplied by the lowest production cost generating unit available to make up the lost generation at PNPS. *See Economic Analysis for the Final 316(b) Existing Facilities Rule* Appendix I: Energy Effects p. 3-5.

Annual operation and maintenance costs: Annual cost to operate and maintain the equipment, which includes the cost of replacing the output lost as a result of operating the cooling tower fans and additional pumps, or "auxiliary power requirement," as this power is no longer available for consumption. Like the energy penalty, the social cost of the auxiliary power requirement is estimated as the cost incurred by society for another facility to generate the lost power.

Administrative expenses: Social cost of additional permitting or reporting expenses incurred by the facility and EPA.

The Final Rule directs EPA to "consider the costs from the perspective of society as a whole, rather than the costs accruing to limited parties (e.g., very local populations or the permittee, which presents a limited set of information to the Director). *See* 79 Fed. Reg. at 48,370. Social costs differ from private costs (*i.e.*, compliance costs incurred by the facility) in several key ways:

- The compliance costs used to estimate social costs are considered without accounting for any tax effects. Social costs are the full value of the resources used, whether they are paid for by PNPS or by all taxpayers in the form of lost tax revenue.
- The cost to society accounting for installation downtime, energy penalty, and auxiliary energy requirement is the increase in electricity production costs, including any increase in CO_2 emissions, from other generators needing to supply the electricity otherwise produced by PNPS. The lost generation at PNPS must be made up by another generating unit because PNPS, as a baseline nuclear facility, is unable to compensate for lost power generation by, for example, burning more fuel.

Costs are tallied over the expected life of the technology or the remaining life of the facility and presented both as net present value and annualized values using an appropriate social discount rate. For the analysis of social costs, EPA had to assume a capital outlay schedule for each of the available technologies. EPA assumed that installation of cooling towers, both for closed-cycle cooling or assisted recirculation, would begin in 2016 and would take four years, which is consistent with the assumption used to estimate social costs under the Final Rule. *See* Chapter 7 (Total Social Costs) in *Economic Analysis for Final 316(b) Existing Facilities Rule* (p. 7-2). EPA assumed that installation of variable frequency drives would begin in 2016 and take 12 months to install. The majority of the funds (87%) would be expended in the first 6 months of installation, based on the division of procurement costs compared to implementation costs provided by Entergy in the work scope for variable frequency drives (2008 Engineering Response Attachment 3, p.3). EPA also assumed that facilities would continue to incur O&M costs, auxiliary energy requirement, energy penalty, and administrative costs through one cycle of useful technology life (30 years for cooling towers and 15 years for variable frequency drives). In other words, after the initial capital outlay, EPA assumed annual social costs would be incurred through 2031 for variable frequency drives and 2050 for assisted recirculation and closed-cycle cooling.

EPA uses available indices to adjust values from the year in which the cost components are reported to a common dollar year (in $2015), and then to the year in which they are incurred: the McGraw Hill Construction Cost Index (CCI) (for technology costs), the Bureau of Labor Statistics Employment Cost Index (ECI) (for administrative costs), and the Gross Domestic Product (GDP) deflator index published by the U.S. Bureau of Economic Analysis (for general inflation). EPA used the *Annual Energy Outlook 2014* electricity price projections published by the Energy Information Administration (EIA) of the U.S. Department of Energy for construction outage and energy effects that are accounted for as reduced electricity sales.

EPA accounts for the fact that benefits and costs do not always take place in the same time period using an appropriate social discount rate. The Office of Management and Budget (OMB) regulatory analysis guidance Circular A-4 (OMB 2003) recommends discounting future impacts because benefits or costs that occur sooner are more valuable. The further in the future the costs or benefits are expected to occur, the more they should be discounted. OMB's basic guidance (OMB 2003 p. 33-34) indicates that real discount rates of 3 percent and 7 percent should be used in regulatory analysis. After developing the year-explicit schedule of total social costs and adjusting them for predicted real change to the year of their incurrence, EPA calculated the present value of these cost outlays as of the anticipated year that costs will first be incurred by discounting the cost in each year back to $2015 using both the 3 percent and 7 percent discount rates.

5.7.2. Cost of Technology

As described above, EPA used the cost tool developed by Abt Associates to estimate the social costs resulting from installing and operating each of the potentially available technologies (closed-cycle cooling, assisted recirculation, and variable frequency drives). Social costs include the capital cost, fixed and variable operation and maintenance (O&M) cost, auxiliary energy requirement, energy penalty, cost associated with installation downtime, and administrative cost to implement the BTA. In calculating social costs, administrative cost applies both to the permitting authority (in this case, EPA) and to the permittee. Table 6 presents the social costs for each of the potentially available technologies.

At annualized costs ranging from $229 million to $243 million (at a 7% and 3% discount rate, respectively), closed-cycle cooling with a cooling tower designed with a 12°F approach to wet bulb temperature is by far the most expensive option to minimize entrainment at PNPS. The energy penalty resulting from the loss in turbine efficiency due to converting from once-through to closed-cycle at PNPS causes the plant to shut down for some periods of the year in order to meet the administrative limits, which results in a severe loss of power output. Because generating units are dispatched in order of increasing production costs, and because PNPS is a nuclear baseload generator with relatively low production costs, the cost of regional replacement generation will be greater than PNPS.[32] A tower with an approach to wet bulb temperature of 9°F, or replacing the condenser with one sized more appropriately for the conversion, reduces the energy-related social costs, but still imposes substantial social costs of about $100 million per year. Although assisted recirculation imposes far lower energy-related social costs than closed-cycle cooling with the existing condenser, the relatively high cost of cooling towers results in annualized costs ranging from $35 million to $45 million (at a 3% and 7% discount rate, respectively). VFDs, at an annualized cost of less than $1 million, are far less expensive than the other available technologies because they impose a relatively low capital expense and have no energy-related social costs. EPA discusses the basis for the social cost estimates presented in Table 6 in the following sections.

[32] The cost tool estimates the cost of regional replacement generation as the non-baseload generation-weighted average of all non-baseload generating units with a fuel cost of production greater than or equal to PNPS.

Table 6. Present Value and Annualized Social Cost of Available Technologies for Entrainment Controls at PNPS with Energy Effects Valued as Cost of Regional Generation Increase (presented as $millions in 2015 dollars).

($millions)	Present Value at 3.0% Discount Rate					Present Value at 7.0% Discount Rate				
	CCC 12°F	**CCC 9°F**	**CCC New**	**AR**	**VFD**	**CCC 12°F**	**CCC 9°F**	**CCC New**	**AR**	**VFD**
Present Value										
Capital Outlay	$472.7	$472.7	$1,104.0	$459.8	$8.7	$451.2	$451.2	$1,043.9	$438.9	$8.7
Construction Outage Cost	$214.6	$214.6	$583.3	$0	$0	$214.6	$214.6	$583.3	$0	$0
Total Initial Cost	$687.3	$687.3	$1,687.3	$459.8	$8.7	$665.8	$665.8	$1,627.2	$438.9	$8.7
Annual O&M	$43.8	$43.8	$43.1	$45.7	$0	$21.5	$21.5	$20.4	$22.4	$0
Reg. Generation Increase	$4,029.4	$1,159.3	$253.2	$174.0	$0	$2,177.3	$626.4	$131.9	$94.0	$0
Totaled Annual Costs	$4,073.3	$1,203.1	$296.3	$219.7	$0	$2,198.9	$647.9	$152.3	$116.5	$0
Administrative Expenses	$0.17	$0.17	$0.17	$0.13	$0.16	$0.10	$0.10	$0.09	$0.07	$0.12
Present Value, Total Cost	$4,760.8	$1,890.6	$1,986.7	$679.7	$8.8	$2,864.8	$1,313.9	$1,779.6	$555.4	$8.8
Annual Equivalent Cost	$242.9	$96.5	$101.2	$34.7	$0.74	$229.0	$104.0	$136.8	$44.8	$0.97

CCC 12°F = Closed-cycle Cooling with Existing Condenser and 12°F Cooling Tower
CCC 9°F = Closed-cycle Cooling with Existing Condenser and 9°F Cooling Tower
CCC New = Closed-cycle Cooling with New Condenser
AR = Assisted Recirculation
VFD = Variable Frequency Drives
Useful life of technology: 30 years for cooling towers (CCC and AR) and 15 years for VFDs.
"Totaled Annual Costs" is the sum of costs incurred annually (e.g., maintenance, regional generation replacement costs) over life of the technology. "Annual Equivalent Cost" is the equivalent cost per year each year the technology is in operation. Depreciation period is 20 years for cooling towers and 15 years for VFDs. Analysis assumes PNPS would renew its operating license with the NRC and continue operation after its current license expires in 2032.

Capital Outlay (Including Installation Downtime)

EPA used capital costs provided by Entergy for assisted recirculation and variable frequency drives (Enercon 2008, Attachment 1 p. 16 and Attachment 3, p.3). Using the cost calculator, EPA estimated that the capital cost (in $2015) for assisted recirculation ranges from $438.9 to $459.8 million (at a social discount rate of 7% and 3%, respectively) and the capital cost for conversion of the two circulating water pumps with VFDs is approximately $8.7 million. EPA assumed that the final installation for both technologies could be achieved during the scheduled, 3-week refueling outage and therefore neither compliance technology would incur costs associated with installation downtime.

Entergy did not provide any cost estimate for closed-cycle cooling, either using the existing condenser or with replacement of the main condenser, because Entergy concluded that closed-cycle cooling was not technically feasible at PNPS. Therefore, EPA estimated capital costs for closed-cycle cooling at PNPS using cost estimates provided by Enercon (2010) for the conversion to closed-cycle cooling of Unit 2 at Indian Point Energy Center (IPEC), which is a large nuclear facility owned by Entergy on the Hudson River. For this facility, Enercon estimated the costs of a nuclear retrofit using a round hybrid cooling tower with fairly substantial site preparation and modification requirements. Enercon also estimated the cost of the conversion of IPEC Unit 3, but EPA chose to use the IPEC Unit 2 costs as a proxy for closed-cycle cooling at PNPS, because the estimate for Unit 3 included additional costs to relocate a natural gas pipeline that are not relevant to PNPS. EPA then scaled the costs from IPEC Unit 2 (1078 MW) to PNPS (670 MW) using the ratio of capacity factor to estimate capital costs for PNPS with the existing condenser. This capital cost was used to for both the analysis of a 12°F tower and a 9°F tower, although EPA notes that it is likely a 9°F tower, being larger than a 12°F tower, would be more expensive. For this reason, the social costs for the 9°F tower may be underestimated to some degree.

To estimate the capital cost of closed-cycle cooling with a new condenser, EPA started with cost estimates provided in EPRI 2011 for substantial condenser modifications associated with a closed-cycle cooling retrofit at a nuclear facility located in an estuary. EPA then doubled the cost estimate for this modification to approximate the cost of a new condenser at PNPS and added it to the capital costs described above from IPEC Unit 2.

EPA estimated that closed-cycle cooling would take 4 years to install using the existing condenser and 5 years if the main condenser were replaced. The installation downtime for the existing condenser was assumed to be 10 months (40 weeks) minus the regular 3 week refueling outage. EPA assumed a conservative estimate of 24 months (104 weeks) of downtime (minus one 3-week refueling outage) to replace the main condenser, considering that the turbine building would have to be taken offline and likely dismantled and rebuilt. Installation downtime requires a one-time, temporary shutdown for the facility that will impose both private costs (through loss of revenue from electricity sales) and social costs (for replacing electricity not generated at PNPS at another generating unit). In the Final Rule, EPA estimates the social cost of installation downtime as the increase in energy production costs from using alternative generating units to supply electricity compared to the cost that would have been incurred if regulated units remained in service, *not* the loss in net income to PNPS. *See Economic Analysis for the Final 316(b) Existing Facilities Rule* Appendix I: Energy Effects p. 9-11. Production costs for electricity generation at nuclear facilities are relatively low; therefore, replacing the lost generation at PNPS from alternative units would likely result in an increase in energy production costs.

EPA acknowledges that these estimates are not site-specific and are only an approximation of the costs that may be required for the conversion of PNPS to a closed-cycle cooling system. Still, these capital costs are based on real estimates for conversions of nuclear power facilities to closed-cycle cooling and the cost elements (*e.g.*, round hybrid cooling tower, design and engineering costs) are comparable to the costs provided by Entergy for assisted recirculation. Using the cost calculator, EPA estimated that the capital cost, including installation downtime costs, for cooling towers at PNPS (in $2015) could range from a low of about $666 million for a retrofit using the existing equipment to nearly $1.7 billion for optimizing the cooling towers by replacing the main condenser.

Energy-Related Costs

Closed-cycle cooling systems use an evaporative process to cool water exiting the condenser. This heat is discharged to the atmosphere, and the cooled water recirculated back to the condenser. Converting a cooling system from once-through to closed-cycle reduces the turbine efficiency compared to once-through cooling, which reduces the amount of power a plant can generate using the same amount of fuel. At a nuclear facility like PNPS, which cannot compensate for this loss by burning more fuel, the loss of output must be replaced by another generating unit in that region. EPA assesses this reduction in plant efficiency as an "energy penalty." *See, e.g.*, 79 Fed. Reg. at 48,333 and *Economic Analysis for the Final 316(b) Existing Facilities Rule*, Appendix I: Energy Effects. Depending on the loss of efficiency, the energy penalty can result in substantial additional costs to the facility (in loss of electrical sales as a result of the reduction in power output) and social costs (in this case, assessed as the additional cost to replace this power by an alternative regional generator). The cost of generating the replacement electricity is assumed to be supplied by the lowest production cost generating unit available to make up the lost generation at PNPS. *See Economic Analysis for the Final 316(b) Existing Facilities Rule* Appendix I: Energy Effects pp. 3-5 and 9-11. Production costs for electricity generation at nuclear facilities are relatively low; therefore, replacing the lost generation at PNPS from alternative units would likely result in an increase in energy production costs.

In this analysis, only closed-cycle cooling with the existing condenser has an energy penalty (lost output due to loss of thermal efficiency). Neither assisted recirculation nor variable frequency drives results in a loss of thermal efficiency because PNPS can shift towards using more once-through cooling water from Cape Cod Bay when necessary.

Closed-cycle cooling with a new condenser can be optimized to eliminate impacts from thermal efficiency loss.

EPA used the cost tool to estimate the social costs (in terms of the cost of replacing that power using an alternative generating unit in the region) of the energy penalty for closed-cycle cooling using Entergy's estimates of the average daily reduction in power output per month for a cooling tower with a 12°F and 9°F approach to wet bulb temperature. Using Entergy's estimates of average daily lost power output (in MWe), EPA estimated the lost generation as a result of converting to closed-cycle cooling without re-optimizing the main condenser. Safe operation of the reactor requires that PNPS maintain thermal power at levels greater than 80%. For the 12°F tower, EPA assumed that the plant would operate at less than 80% power and have to shutdown (*i.e.*, loss of 670 MW) when estimated power output losses would be greater than 240 MWe, which occurs every day during the months of June through September. The frequent need to shut down the plant results in an energy penalty of 49%, an annual cost which, summed over the 30-year life of the cooling towers, results in an estimated total social cost (including cost to replace the electricity in the region) ranging from $2 billion (at 7% discount rate) to $4 billion (at 3% discount rate). For a 9°F tower, the average daily output losses are lower and the plant would likely shutdown for only 25 days per year, which EPA assumed would occur in July. This penalty reduces output by almost 12% and results in a total social cost of about $648 million (at 7% discount rate) to about $1.2 billion (at 3% discount rate) over the life of the technology (30 years).

In its 2008 Engineering Response, Entergy provided an estimate of the auxiliary power requirements (or "parasitic loss") from operating the cooling tower (Attachment 2 Table 3, p. 13). Entergy estimated that the electricity required to operate the fans and pumps associated with cooling towers would result in a continuous parasitic loss of 20 megawatts of electric power (MWe). Using these values to estimate the annual cost associated with the auxiliary power requirement for closed-cycle cooling results in a loss of about 3% of total plant generation. For the existing condenser, the social cost for replacement of the generation lost to the auxiliary energy requirement is combined with the thermal energy penalty costs presented in Table 6 as regional generation increase (ranging from $626 million over the life of the technology for a 9°F tower at 7% discount rate to $4 billion for a 12°F tower at a 3% discount rate). The social cost of regional generation increase with a new main condenser is limited to the auxiliary energy requirement ($132 million to $253 million over the life of the technology at 7% and 3% discount rate, respectively).

Entergy's 2008 Engineering Report included an estimate of the average parasitic loss with assisted recirculation (Enercon 2008 Attachment 2 p. 13). The energy requirements for assisted recirculation, which average about 13.6 MWe, are less than the requirements for closed-cycle cooling because when recirculating flows are reduced (*i.e.*, when ambient temperatures require that PNPS rely more on Cape Cod Bay water), the towers require less electricity to operate. Using these values to estimate the annual cost associated with the auxiliary power requirement for assisted recirculation results in a loss of about 2% of total plant generation. Because assisted recirculation has no energy penalty, the social cost for regional generation increase is solely due to the replacement of this output from another generator over the life of the cooling tower, which ranges from about $94 million (at 7% discount rate) to $174 million (at 3% discount rate). Variable frequency drives require no additional electricity to operation and therefore impose no auxiliary energy requirements; in fact, VFDs require are slightly more efficient that the existing single speed pumps and would result in a minor cost savings for PNPS.

Annual Operation and Maintenance

Mechanical draft cooling towers require annual maintenance to ensure optimal operation, which imposes an annual cost primarily as labor and materials. In addition, mechanical draft cooling towers require energy to run the recirculating pumps and evaporative fans, which imparts an annual cost for this electricity, which would otherwise have been available for consumption. *See* 79 Fed. Reg. at 48,386. Estimating the cost of this auxiliary energy requirement follows the same procedures as those outlined above for the energy penalty. In other words, the loss of generation resulting from the electricity requirement for cooling towers at PNPS would impart a social cost to replace that power at another generating unit.

Entergy's 2008 Engineering Report included an estimate of the annual operation and maintenance requirements for cooling towers for the assisted recirculation technology option (Enercon 2008 Attachment 2 p 14-15), which EPA used to estimate annual costs for operating cooling towers with both closed-cycle cooling and assisted recirculation. Entergy projected that cooling towers would impose an annual operational cost of $211,000 ($2007). Entergy estimates that the maintenance costs are likely to vary over a 30 year period and include the costs ($2007) for replacement of components (e.g., pump impellers, motors, or entire assemblies): $632,000 per year for the first 5 years, $1,083,000 per year for years 6 to 15, and $1,978,000 per year for years 16 to 30. Variable frequency drives have no annual operation and maintenance requirements beyond the expenditures for the existing CWIS and related system.

Administrative Expenses

Administrative costs include the initial permitting costs for the facility and the permitting authority as well as annual costs for compliance monitoring and recordkeeping. In this case, EPA assumed no costs for initial permitting, since this determination is based on information already submitted to EPA by the permittee during development of the draft permit. EPA assumed annual compliance monitoring consistent with the compliance alternatives analyzed and recordkeeping costs for the permittee and the permitting authority.

5.7.3. Sensitivity Analysis

The costs presented in Table 6 and discussed above are EPA's best estimate of the actual cost of the compliance technologies based on the best available information. Nonetheless, EPA acknowledges that these costs are estimated and rely on a number of assumptions regarding the construction schedule, installation downtime, capital costs, and associated costs for replacement energy and carbon emissions. However, in order to determine how uncertainty over any one of the assumptions in the input data affect the total social cost, EPA conducted a sensitivity analysis by varying each assumption individually and recalculating the social costs. This analysis enables EPA to assess the robustness of the results to changes in the input data.

The results of the analysis indicate that Entergy's estimated capital cost for cooling towers for assisted recirculation is relatively high compared to other estimates and that the social costs based on Entergy's assisted recirculation estimate may be overestimated by about 15%. However, EPA assumed that assisted recirculation could be tied in during a scheduled maintenance outage with no additional outage period. A construction outage of up to 6 months would increase the total and annualized cost of assisted recirculation by about 15% to 20% due to the costs associated with a prolonged outage.

For closed-cycle cooling, again, EPA's estimated capital costs were as much as 23 to 50% higher than other retrofit estimates, including estimated costs for other nuclear facilities. However, because the total social costs for retrofitting closed-cycle cooling with the existing condenser are dominated by energy penalty (i.e., cost of replacement generation and social cost of carbon) associated with the loss of efficiency, adjusting the capital costs only resulted in an increase in total social cost of 2% to 8%.

EPA assessed the total social costs of closed-cycle cooling over a range of energy effects, from a minimum of 2.5% of output to a maximum of 60% of output. Even at a penalty of 10% of output, which, based on the PEPSE analysis and current administrative limits would likely be a conservative penalty for PNPS, the total social cost of closed-cycle cooling would exceed $1 billion dollars.

Of the technologies considered in this determination, VFDs impose the lowest private and social costs. Enercon estimated the total capital cost for conversion of the two circulating water pumps with VFDs to be approximately $7 million (2008 dollars). There are no additional operating and maintenance costs associated with VFDs compared to the existing pumps. Entergy proposed achieving greater flow reductions (up to 42%) with a 20% active power loss, which would inflict social costs associated with the loss of output at PNPS. EPA has not considered this proposed option in its analysis, however, because flow reductions greater than 9% cannot be achieved, regardless of active power losses, without exceeding the current temperature limits.

5.7.1. Summary

As shown in Table 6 and discussed above, the social cost of VFDs is minimal and primarily consists of capital outlay for the purchase of pumps and associated equipment. On the other hand, the social cost of closed-cycle cooling is substantial and includes not only significant capital outlay to construct cooling towers, but imposes high social costs associated with the cost of replacing the lost output at PNPS with production from another generating unit in the region. The social cost for assisted recirculation falls between these two available technologies; the capital cost for assisted recirculation is considerably greater than for VFDs, but the energy-related costs are much lower than with closed-cycle cooling.

The total social cost of cooling towers using the assisted recirculation compliance option ranges from about $555 million (annualized to $44.8 million per year) at a 7% discount rate to $680 million (annualized to $34.7 million per year) at a 3% discount rate. These costs are substantially less expensive than any of the closed-cycle cooling options. Replacing the main condenser or converting to closed-cycle cooling using the existing condenser and a 9°F cooling tower is almost 3 times more expensive than assisted recirculation. Converting to closed-cycle cooling using the existing condenser and a 12°F cooling tower is about 5 to 7 times more expensive (at 7% and 3% discount rate, respectively) than assisted recirculation. The annualized cost for the incremental gain (per percentage increase in entrainment reduction) from assisted recirculation (at 54% annual reduction) versus closed-cycle cooling (at 91% annual reduction) ranges from about $1.7 million per percent reduction between assisted recirculation and closed-cycle cooling with new condenser or 9°F cooling tower to $5.6 million per percent reduction in entrainment between assisted recirculation and closed-cycle cooling with a 12°F tower. The additional benefit associated with reducing entrainment by 91% compared to 54% would have to be considerable to justify the additional expenditure of $62 million to $208 million per year for closed-cycle cooling over assisted recirculation. In Section 6.0, EPA considers the social costs of the available technologies in relation to the estimated benefits as one of the factors in determining the site-specific entrainment requirements for PNPS.

6.0 Consideration of Factors for Site-Specific Entrainment Requirements

As described above in the discussion of EPA's approach to this re-issuance under the Final Rule (Section 2.0), EPA is making a BTA determination based on the information submitted to date, which it has determined is sufficient for such a determination pursuant to 40 C.F.R. § 125.98(g). Also described in Section 2.0, under the ongoing permit proceedings provision of the Final Rule, the BTA determination "may be based on some or all of the factors" in § 125.98(f)(2). Having said that, EPA's analysis is necessarily informed by the Final Rule, which is currently in effect at the time of this writing, and EPA intends that its determination is consistent with the requirements of the rule, including consideration of the factors listed at § 125.98(f)(2): (i) the numbers and types of organisms entrained; (ii) impact of changes in particulate emissions or other pollutants associated with entrainment technologies; (iii) land availability; (iv) remaining useful plant life; and (v) quantified and qualitative social benefits and costs of available technologies when such information is of sufficient rigor to make a decision and § 125.98(f)(3): (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 (the effective date of the rule); (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.

In Section 5.0, EPA presented its assessment of Entergy's evaluation of available technologies to reduce entrainment at PNPS, and concluded that closed-cycle cooling, assisted recirculation, and VFDs are potentially available as the BTA for entrainment. In this section, EPA presents its analysis of factors in § 125.98(f) as listed above that could affect determination of the BTA for entrainment in the absence of Entergy's decision to close the plant. EPA also explains both its determination of the maximum reduction in entrainment warranted after consideration of these factors and, in compliance with § 125.98(f)(1), its rejection of any entrainment control technologies or measures that perform better than the selected technologies or measures. Finally, Section 7.0 summarizes the permit conditions related to the BTA in the Draft Permit and presents EPA's determination for impingement mortality under § 125.98(g) that is consistent with the BTA standards for impingement mortality at § 125.94(c).

6.1. Consideration of § 125.98(f)(2) factors for site-specific entrainment controls

Cooling towers, either in a closed-cycle cooling system or for assisted recirculation, and variable frequency drives are potentially available as the BTA for entrainment at PNPS. In the discussion above, EPA established that an alternative source of cooling water is unavailable and the potential for increased thermal impacts limit the use of VFDs for reducing entrainment. EPA turns now to the factors listed at 40 C.F.R. § 125.98(f)(2) to be considered in a site-specific BTA determination for entrainment under the Final Rule, including the numbers and types of organisms entrained, change in particulate and other air emissions, land availability, and remaining useful plant life. The social costs and benefits of available technologies are discussed in Section 6.3, below. The regulations provide that "the weight given to each [of the above] factor is within the [permitting authority's] discretion based upon the circumstances of each facility." 40 C.F.R. 125.98(f)(2).

6.1.1. <u>Remaining Useful Plant Life</u>

In the *Technical Development Document for the Final 316(b) Rule*, EPA states "[m]aking major structural and operational changes (such as retrofitting to closed-cycle cooling) to a facility may not be an appropriate response for a facility or unit that will not be operating in the near future" (Chapter 6: Technologies and Control Measures p.12). In other words, retrofitting with a sophisticated and potentially expensive technology to reduce entrainment at a plant that is nearing the end of its useful life may not result in sufficient benefits to warrant the cost of the technology. In the preamble to the Final Rule, EPA states, for example, "retrofitting to a closed-cycle cooling system at a facility that is scheduled to close in three years will result in little entrainment reduction as compared to retrofitting at a facility that will continue to operate for a significantly longer period." 79 Fed. Reg. at 48,342. For this reason, the Final Rule requires that remaining useful plant life be considered when determining the site-specific entrainment requirements. *See* 40 C.F.R. § 125.98(f)(2)(iv).

As part of the permit application requirements under the Final Rule, a facility must submit a description of the operational status of each unit for which a CWIS provides water for cooling, including, among other things, a description of plans or schedules for decommissioning or replacement of units. 40 C.F.R. § 122.21(r)(8). According to the preamble to the Final Rule, "where the remaining plant life is considerably shorter than the useful life of the technology or where a facility has a planned retirement within the next permit cycle, this information is useful to support a determination regarding that specific entrainment technology." 79 Fed. Reg. at 48,366. During the later stages of EPA's development of a Draft Permit for PNPS, Entergy announced its intention to close PNPS no later than June 1, 2019. *See* Press Release, Entergy, Entergy to Close Pilgrim Nuclear Power Station in Massachusetts No Later than June 1, 2019 (Oct. 13, 2015). Entergy cites poor market conditions, reduced revenues, and increased operational costs as factors in its decision to close the plant. *Id.* Further, Entergy indicates that the exact timing of the shutdown, which may be sooner than June 1, 2019, will be decided during the first half of 2016. *Id.* ISO New England Inc. (ISO-NE) reviewed Entergy's Non-Price Retirement request pursuant to ISO-NE Planning Procedure No. 10 (Planning Procedure to Support the Forward Capacity Market) and determined there is not a local reliability need for this resource, and accordingly the NPR request has been accepted. *See* December 18, 2015 letter from Stephen J. Rourke (ISO NE system Planning) to Marc Potkin (Entergy Nuclear Power Marketing).

PNPS has indicated that it will effectively eliminate seawater withdrawals for the main condenser by June 1, 2019, which falls within the next permit cycle. This cooling water volume comprises 96% (311,000 gpm) of the once-through cooling water at the plant while the remaining 4% (13,500 gpm) is used for cooling water for the safety-related equipment, including shut-down systems. After terminating generation of electricity, a safety-related cooling water will continue to be withdrawn, in addition to a limited volume of seawater to support other decommissioning activities. Entergy anticipates operating no more than four SSW pumps at any time plus limited use of a single circulating water pump not to exceed 5% of the time on a monthly basis. Based on use of the SSW pumps and limited use of the circulating water pump for seawater intake following shutdown, PNPS will reduce intake flows by about 96% on an average monthly basis.

In the evaluation of the potential BTA options, EPA concluded that variable frequency drives (VFDs) and cooling towers (either as a closed-cycle system or used to cool and recirculate cooling water in a flexible, assisted recirculation system) are available as the BTA for entrainment. However, based on the available information submitted by Entergy, cooling towers are likely to take a minimum of 4 years to construct. In other words, if constructed, cooling towers would not be operational before the plant would otherwise already decrease its cooling water withdrawals by approximately 96%, which is an even greater reduction than would be achieved through the use of cooling towers. Thus, no reduction in entrainment would be realized with either closed-cycle cooling or assisted recirculation before the plant shuts down. For this reason, EPA considers that neither closed-cycle cooling nor assisted recirculation are available as the BTA within the remaining useful life of the plant. Because neither technology would be operational before the scheduled closure, EPA does not consider them further in this determination. EPA determined that VFDs, however, could be installed and operational within one year from the effective date of the permit and are an otherwise available technology that could achieve entrainment reductions prior to shutdown of the plant in 2019.

6.1.2. Numbers and Types of Organisms Entrained, Land Availability, and Increased Air Emissions

EPA presented a detailed analysis of the numbers of organisms lost to entrainment at PNPS in Section 3.1 and examined the potential impacts of entrainment on the waterbody in Section 3.3. EPA established that PNPS entrains billions of eggs and larvae each year, and that the adverse environmental impacts of the existing CWIS have resulted in the mortality of millions of juvenile, adult, and adult equivalent fish. EPA concluded that the number of eggs and larvae entrained, and the estimated numbers of equivalent age-1 adult fish lost as a result of this entrainment, constitutes an adverse environmental impact from PNPS's CWIS.

The use of VFDs to reduce flow at PNPS would require a modification to the existing single-speed circulating water pumps, but would not result in the use of any additional land area. Nor would the use of VFDs result in increased air emissions, but may actually result in decreased air emissions by a very minor amount, since, at times, VFDs would require less power to operate.

6.2. Consideration of § 125.98(f)(3) factors for site-specific entrainment controls

In determining site-specific entrainment requirements for a facility, the Final Rule allows that the permitting authority *may* consider several factors specified in 40 C.F.R. § 125.98(f)(3), including flow reduction credits, impacts on water consumption, alternative sources of cooling water, energy reliability, impacts on thermal discharges, and entrainment impacts on the waterbody. EPA is not bound by the regulations to consider these factors, either under the requirements for entrainment BTA determinations at § 125.98(f) or by the ongoing permit proceeding provision at § 125.98(g), but, to the extent that any of these factors affect the availability of VFDs, EPA considers them here.

Entergy evaluated the use of treated recycled water (*e.g.*, grey water) to augment the use of seawater in the plants cooling systems. If all of the wastewater generated in the Plymouth County area (7 municipal wastewater treatment plants) were routed to PNPS, it could supplant only 7.8% of the cooling water flow needed by the Station for condenser cooling and may require up to 166 miles of pipeline (Enercon 2008, p. 55). EPA agrees with Entergy that "[d]ue to the limited sources of grey water in the vicinity of PNPS, grey water is not considered a technologically feasible means of significantly reducing impingement mortality and entrainment" (*Id*., p. 55).

The use of VFDs to reduce entrainment at PNPS could potentially increase thermal impacts through the discharge of warmer water. In fact, Entergy has demonstrated that substantial reductions in entrainment could not be achieved without exceeding the current maximum temperature and rise in temperature limits and concluded that further analysis would be required to assess the potential effects of increased discharge temperatures on the balanced, indigenous population (BIP) (Enercon 2008 and 2014). Attachments B and C to the Fact Sheet provide the Agencies' analysis of Entergy's initial 1316(a) variance request which is consistent with the current permit limits. The analysis determined that the requested limits remain protective of the BIP in Cape Cod Bay. Entergy has neither requested nor have the Agencies' considered the impacts of a higher thermal variance on the BIP. Further, it is unlikely that a study of the potential impacts of increasing the temperature limits, followed by installation of VFDs, could be completed before PNPS is scheduled to shutdown, after which the facility will achieve a 96% reduction in flow. Without fully exploring the trade-off between a higher thermal variance in exchange for a reduction in entrainment, EPA is not inclined to authorize higher thermal discharge limits at PNPS, which limits the maximum entrainment reduction from VFDs to 9%.

6.3. Analysis of Social Costs and Benefits of VFDs

As noted above, pursuant to EPA's Final Rule, the permitting authority must establish site-specific entrainment requirements reflecting its determination of the "maximum reduction in entrainment warranted after consideration" of a number factors, including "[q]uantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision." 40 C.F.R. § 125.98(f)(2). Additionally, the regulations specify that the permitting authority "may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits." *Id.* § 125.98(f)(4). Based on the evaluation of technologies and factors described above, EPA has concluded that VFDs are the only available technology that could be installed and deliver any reduction in entrainment within the limited remaining useful life of the plant. Therefore, EPA provides only an evaluation of whether the social costs of VFDs are justified by the social benefits. Had Entergy not made the decision to close PNPS within this permit cycle, EPA may have considered the costs and benefits for other available technologies, including closed-cycle cooling and assisted recirculation.

EPA's analysis of the social costs of VFDs was presented in Section 5.7, above. In this section, EPA highlights the qualitative and quantitative benefits of VFDs, and considers the benefits that would accrue over the remaining life of the plant (*i.e.*, through June 2019) relative to the expenditure for installation and operation of the technology. As discussed above, the Final Rule at 40 C.F.R. § 125.98(f)(2)(v) directs the permitting authority to consider the quantified and qualitative social benefits and costs of available entrainment technologies in establishing site-specific entrainment requirements for BTA.

6.3.1. Social Benefits

The Final Rule defines "social benefits" as:

> the increase in social welfare that results from taking an action. Social benefits include private benefits and those benefits not taken into consideration by private decision makers in the actions they choose to take, including effects occurring in the future. Benefits valuation involves measuring the physical and biological effects on the environment from the actions taken. Benefits are generally treated one or more of three ways: A narrative containing a qualitative discussion of environmental effects, a quantified analysis expressed in physical or biological units, and a monetized benefits analysis in which dollar values are applied to quantified physical or biological units. The dollar values in a social benefits analysis are based on the principle of willingness-to-pay (WTP), which captures monetary benefits by measuring what individuals are willing to forgo in order to enjoy a particular benefit. Willingness-to-pay for nonuse values can be measured using benefits transfer or a stated preference survey.

40 C.F.R. § 125.92(x). This definition highlights that the analysis is focused on the benefits to society as a whole from the reductions in entrainment that would result from the installation of a particular entrainment technology, rather than costs and benefits that would accrue to limited parties. *See* 79 Fed. Reg. at 48,370. In this analysis, EPA focuses on the first two types of benefits valuation described in the definition of social benefits above: a narrative containing a qualitative discussion of environmental effects and a quantified analysis expressed in physical or biological units (in this case, number of organisms saved).

The *Benefits Analysis for the Final 316(b) Existing Facilities Rule* (Chapter 4: Economic Benefits Categories) (EPA 2014) provides a detailed explanation of the types of benefits that can result from reductions in entrainment and impingement mortality. The predominant benefits include market (*e.g.*, the price, quantity, and/or quality of commercial fish harvest), non-market (*e.g.*, higher catch rates for recreational fishing), and non-use benefits. Both market and non-market benefits may be direct (*e.g.*, increased commercial or recreational landings), or indirect (*e.g.*, improvements resulting as an indirect consequence of fishery or habitat improvements, such as increase in bait and tackle sales). Non-use benefits accrue where individuals value improved environmental quality without any past, present, or anticipated future use of the resource in question. Individuals may gain value from knowing that a particular resource is protected (i.e., existence value) or from knowing that the resource is available for future generations (i.e., bequest value). Non-use benefits may include population resilience and support, nutrient cycling, natural species assemblages, and ecosystem health and integrity. Nonuse values include improving the survival probability of a threatened or endangered species. Monetizing non-use benefits (i.e., assigning a dollar value to quantified physical or biological units) is particularly difficult for several reasons. *See* 79 Fed. Reg. at 48,371. First, non-use values are not associated with easily observable behavior. Second, these values may be held by both users and non-users of a resource, which may have different familiarity with the services provided by the resource and therefore, may value the resource differently. Third, methods to estimate non-use benefits are often time- and resource-intensive and may be subject to certain biases. Finally, efforts to disaggregate total value into use and non-use components can be difficult. That being said, recent economic literature provides substantial support for the hypothesis that economic value of non-use benefits are greater than zero (*e.g.*, Freeman et al. 2003, Turner et al. 2003, Zhao et al. 2013). When a substantial fraction of the population holds even small per capita nonuse values, these values can be very large in the aggregate. Both EPA's *Guidelines for Preparing Economic Analyses* (EPA 2010) and the Office of Management and Budget's (OMB) Circular A-4 governing regulatory analysis (OMB 2003) support the need to assess non-use values. Excluding non-use values from consideration is likely to understate substantially total social value.

Generally accepted techniques for estimating non-use values include stated preference methods or benefit transfer analysis based on stated preference studies (OMB 2003, EPA 2010, EPA 2014). Stated preference methods rely on carefully designed surveys to estimate a household's willingness to pay (WTP) for ecological improvements from which values are estimated by statistical analysis of survey responses. EPA developed an original stated preference survey to assess public values for reductions in impingement mortality and entrainment for the Final Rule. *See* Chapter 11 in *Benefits Analysis for the Final 316(b) Rule for Existing Facilities*. EPA did not rely on the results of that study for estimating the benefits of the Final Rule. *See* 79 Fed. Reg. at 48,407-09. For this site-specific BTA determination, developing and implementing a stated preference survey to elicit total use and non-use value resulting from compliance is not practical.

Benefits transfer involves adapting research (*e.g.*, data on stated preference) conducted for another purpose to address policy questions at hand. Boyle and Bergstrom (1992) define benefit transfer as "the transfer of existing estimates of nonmarket values to a new study which is different from the study for which the values were originally estimated." For the Final Rule, EPA used a benefit transfer approach to estimate recreational angling benefits and non-use benefits based on revealed and stated preference data in the North Atlantic and Mid-Atlantic Regions. See 79 Fed. Reg. at 48,405, 4840708, and *Benefits Analysis for the Final 316(b) Rule for Existing Facilities* Chapter 8: Nonuse Benefit Transfer Approach. For the North Atlantic, EPA used a Bio-indicator based Stated Preference Valuation (BSPV) method which addressed Rhode Island residents' preferences for the restoration of migratory fish passage over dams in the Pawtuxet watershed (Johnston et al. 2012, Zhao et al. 2013).

EPA has not endeavored to produce a monetized estimate of benefits – such as by undertaking a stated preference study to estimate non-use benefits – because EPA decided that doing so would be prohibitively difficult, time-consuming and expensive for this permit. Although estimating the commercial use value of fish that would be saved by a particular option can be fairly straightforward, commercial use values are not expected to be significant in this case. Recreational use values are likely to be more significant in this case, but estimating such 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 is not readily accessible on a permit-by-permit basis. It could take years to develop this type of complete monetized benefits estimate and it could cost hundreds of thousands of dollars in contractor support. EPA currently does not have such resources to apply to this permit. In any event, EPA concluded that the available information is adequate for assessing the available technology in this case. At the same time, EPA recognizes the importance of considering benefits that have not been quantified, but are potentially significant, and also recognizes that where relevant benefits have not been quantified, it is appropriate to consider them qualitatively. *See, e.g., EPA Guidelines for Preparing Economic Analyses* (EPA 2000a). A complete analysis of ecological benefits should attempt to consider, if not monetize, the non-use values. As EPA states on p. 23 of the *Framework for Assessment of Ecological Benefits* (2000):

> Many ecological services are not provided through markets or are not readily associated with market transactions. As a result, it may be more difficult or impossible to provide a dependable monetized measure of the benefits associated with many ecological changes. For those benefits that are not monetized, a qualitative, and when possible, quantitative, assessment of the economic value of the changes provides a measure of the service's importance and the degree of change, even when a dollar value cannot be assigned to that change.

The preamble to the Final 316(b) Rule specifically directs the permitting authority to consider non-quantified benefits:

> In evaluating benefits, the Director should not ignore benefits that cannot be monetized or quantified or consider only the impingement and entrainment reductions that can be counted. To result in appropriate decisions from society's standpoint, the assessment of benefits must take into account all benefits, including categories such as recreational, commercial, and other use benefits, benefits associated with reduced thermal discharges; reduced losses to threatened and endangered species; altered food webs; benefits accruing non-locally due to migration of fish; nutrient cycling effects; and other nonuse benefits…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.

79 Fed. Reg. at 48,351. Elsewhere, the preamble states, "[a]bsent the availability of stated preference surveys, non-use values should be evaluated quantitatively and/or qualitatively." 79 Fed. Reg. at 48,371. Similarly, Circular A-4, OMB's guidance on cost-benefit analysis, states "[a] complete regulatory analysis includes a discussion of non-quantified as well as quantified benefits and costs. A non-quantified outcome is a benefit

or cost that has not been quantified or monetized in the analysis. Where there are important non-monetary values at stake, you should also identify them in your analysis so policymakers can compare them with the monetary benefits and costs" (OMB 2003 p. 3).

Therefore, in this case, EPA has qualitatively considered the value of the Cape Cod Bay ecosystem and the organisms that occupy it and the quantitative benefits (measured as number of organisms saved) that may result from the implementation of VFDs at PNPS's CWIS. As part of a qualitative evaluation, EPA seeks to compare the cost of VFDs with "the magnitude of the estimated environmental gains (including the attainment of the objectives of the Act and § 316(b))." *In re Central Hudson Gas and Electric Corp.*, EPA Decision of the General Counsel, NPDES Permits, No. 63, at p. 381 (July 29, 1977). The relevant "objectives of the Act and § 316(b)" include minimizing adverse environmental impacts from cooling water intake structures, restoring and maintaining the physical and biological integrity of the Nation's waters, and achieving, wherever attainable, water quality 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).

6.3.2. Benefits Valuation

As presented in detail above, EPA has concluded that the CWIS at PNPS has caused adverse environmental impacts from impingement and entrainment of fish and shellfish. These adverse impacts include the loss of billions of individual organisms and millions of adult fish, including vast numbers of several commercially and recreationally important species, forage species critical to the biological community in Cape Cod Bay, and several species that have experienced significant population declines in recent decades. EPA believes that these losses have contributed to adverse effects in Cape Cod Bay and may be partly inhibiting or preventing the recovery of several fish stocks.

Massachusetts has classified Cape Cod Bay as a Class SA water, 314 CMR 4.06 Figure X, which is the most protective classification provided for coastal and marine waters in the state's Water Quality Standards. *See* 314 CMR 4.05(4). As such, SA waters are to provide "excellent habitat" for fish and other aquatic life and wildlife as a designated use. 314 C.M.R. 4.05(4)(a). The water quality standards also specify that, "in the case of a cooling water intake structure (CWIS) regulated by EPA under 33 U.S.C. § 1251 (FWPCA § 316(b)), the Department has the authority under 33 U.S.C. § 1251 (FWPCA § 410), M.G.L. c. 21, §§ 26 through 53 and 314 CMR 3.00 to condition the CWIS to assure compliance with narrative and numerical criteria and protection of existing and designated uses." 314 C.M.R. 4.05(4)(a)(2)(d); *see also Entergy Nuclear Generation Co. v. Dep't of Envtl. Prot.*, 944 N.E.2d 1027 (Mass. 2011) (upholding 314 CMR 4.05(4)(a)(2)(d), among other provisions, as a "valid exercise of the authority vested in the Department of Environmental Protection by the Clean Waters Act").

In addition, Cape Cod Bay is a designated Ocean Sanctuary under the Massachusetts Ocean Sanctuaries Act, M.G.L. ch. 132A, §§ 12A-16K, 18, and associated regulations, 302 CMR 5.00. Pursuant to the Ocean Sanctuaries Act, all ocean sanctuaries "shall be protected from any exploitation, development, or activity that would significantly alter or otherwise endanger the ecology or the appearance of the ocean, the seabed, or subsoil thereof….” M.G.L. ch. 132A, § 14. While the Act and its associated regulations permit the “operation and maintenance of industrial liquid coolant discharge and intake systems and all other activities, uses and facilities associated with the generation . . . of electrical power” as “allowed activities” in the Cape Cod Bay sanctuary, they specify that such activities shall be in compliance with applicable general or special statutes, rules, regulations, and orders. M.G.L. ch. 132A, § 16; *see also* 302 CMR 5.08(1). The regulations further provide that state environmental policy shall include, among other things, “[s]upporting the attainment of the national water quality goals for all waters within the ocean sanctuaries through coordination with existing water quality planning and management activities” and “ensuring that all activities in the ocean sanctuaries . . . are consistent with federal and state effluent limitations and water quality standards.” 302 CMR 5.05(1)(c). The state regulations under the Ocean Sanctuaries Act also “form a part of the Commonwealth's Coastal Zone Management Program,” 302 CMR 5.02(2), established pursuant to the federal Coastal Zone Management Act, *see* 16 U.S.C. §§ 1451-1466.

Finally, Cape Cod Bay is included as part of the designated Massachusetts Bay National Estuary under the National Estuary Program established under Section 320 of the 1987 CWA Amendments. Congress established the National Estuary Program because the “Nation’s estuaries are of great importance for fish and wildlife resources and recreation and economic opportunity…[and,] maintaining the health and ecological integrity of these estuaries is in the national interest…” Water Quality Act of 1987, Pub. L. No. 100-4, § 317(a)(1)(A) and (B), 101 Stat. 7, 61 (adding § 320 to the CWA, 33 U.S.C. § 1330). In addition, Congress has found, among other things, that “the concerted efforts of all levels of Government, the private sector, and the public at large will be necessary to protect and enhance the environmental integrity of Massachusetts Bay.” Massachusetts Bay Protection Act of 1988, Pub. L. No. 100-653, § 1003(a)(8), 102 Stat. 3825, 3835-36. As a result of the designation, substantial federal and state resources have been directed to the Massachusetts Bay Estuary Program to enhance knowledge about, and the conservation of, Massachusetts Bay, including Cape Cod Bay.

Although difficult to monetize, the judgment by the Commonwealth or Congress that Cape Cod Bay should provide “excellent habitat” for fish and other aquatic life, that it must be protected from “activity that would significantly alter or otherwise endanger” its ecological integrity as an Ocean Sanctuary, or that it is part of an estuary of national significance demonstrate that lawmakers and, by extension, citizens, place significant value on the benefits provided by the bay.

Changes in the operation of the CWIS at PNPS in compliance with the use of VFDs as BTA would be expected to directly increase the number of commercial, recreational, and forage fish (eggs, larvae, juveniles and adults), as well as other types of aquatic organisms (e.g., invertebrates). The more that entrainment is reduced, the more likely it is that those reductions will contribute to increased populations of juvenile and adult fish. But reducing the loss of eggs and larvae is valuable in and of itself because of the role they play at the base of the food web and other benefits that they provide, such as contributing to species' compensatory reserve. Beyond these direct benefits to aquatic life, reducing entrainment will also likely result in additional indirect benefits to the ecosystem and the public's use and enjoyment of it. Examples of such indirect benefits include increasing recreational and educational opportunities, increasing or maintaining biological diversity, and increasing populations of resident and migratory birds and other terrestrial wildlife dependent on the resource for food.

Ultimately, Entergy's decision to close PNPS will provide the greatest benefit to the aquatic community in Cape Cod Bay and to the public's use and enjoyment of this natural resource by removing the CWIS as a significant source of mortality. A comparatively small amount of cooling water withdrawals will continue to be necessary for the spent fuel rods for a period of time after the plant ceases operation. While the precise cooling water requirements after June 1, 2019 are not definite, PNPS anticipates that four of the facility's five SSW pumps would continue to operate with a maximum daily cooling volume of 15.6 MGD (10,800 gpm), which is a reduction of more than 96% as compared to the current seawater withdrawal. PNPS anticipates that this cooling water requirement would extend about 5 years after shutdown until the spent fuel will be ready for dry cask storage, at which time all cooling water withdrawals would be eliminated. Based on the mean number of eggs and larvae entrained each year, shutting down the plant in 2019 and reducing cooling water withdrawals by 96% for five years after ceasing operations will save nearly 38 billion eggs and larvae through the current operating license (2032) compared to operating the existing CWIS.

EPA has concluded that the anticipated reduced operation of the CWIS during decommissioning of the plant will result in a reduction of cooling water withdrawals better than could be achieved with closed-cycle cooling, which is widely regarded to be the best performing entrainment technology in the industry. Following decommissioning, PNPS will cease to withdraw cooling water from Cape Cod Bay and eliminate any adverse environmental impacts from the CWIS. Therefore, this BTA determination focuses instead on any action warranted to minimize the impacts of the CWIS during the period beginning with the issuance of a final permit decision until the scheduled closing date, in June 2019 and potentially continuing through the decommissioning period, which may extend for 5 years from the date of shutdown. During this period, VFDs are available but, because of the administrative and existing thermal limits described above, are likely to reduce entrainment by a maximum of 9%. To quantify the benefits of VFDs for the interim period between permit issuance and shutdown, EPA assumed VFDs would begin operating in June 2017 (*i.e.*, installed within the first year of operation following issuance of a final decision). Compared to the existing CWIS, the addition of VFDs would be expected to save an additional 406 million eggs and larvae, which is a total reduction of 4.2% over 3 years (from June 2016 through June 2019).

6.3.3. Comparison of Costs and Benefits of Technology

EPA's analysis of the social costs of variable frequency drives (VFDs) was presented in Section 5.7, above. For the comparison of costs and benefits, EPA used Abt's cost tool to recalculate the net present value and annualized cost of VFDs through the year 2019, rather than over the life of the technology (15 years). In this case, total capital outlay (in $2015) is estimated to be $8.5 million at a 3% discount rate and $8.2 million at a 7% discount rate with no additional costs for operation and maintenance or energy-related effects. The annualized cost through 2019 is about $4.5 million dollars (at both 3% and 7% discount rates). Based on the quantitative analysis of the entrainment benefits above, installing VFDs on the circulating pumps would impose a social cost of about $8.5 million for a 4.2% reduction in entrainment over the operating period, which is about $2 million per percent reduction in entrainment. By far the highest density of ichthyoplankton, on average, occurs in the month of June. The likely timeline of final permit issuance and technology installation would likely push operation of VFDs past June 2017, which means that June 2018 would be the only month during the remaining useful life of the plant in which VFDs on the circulating pumps would provide these maximum entrainment benefits. Given the relatively high cost of VFDs and that only minor benefits would accrue for an extremely limited operating period, EPA does not believe the cost of VFDs is justified by the benefits in this case.

6.4. BTA Selection

The Final Rule requires that the permitting authority establish site-specific requirements for entrainment that:

> …reflect the 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. These entrainment requirements may also reflect any control measures to reduce entrainment of Federally-listed threatened and endangered species and designated critical habitat (e.g., prey base).

40 C.F.R. § 125.98(f). The Final Rule further specifies that the "Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit under 40 CFR 124.7 or 124.8. The written explanation 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." *Id.* § 125.98(f)(1).

EPA's evaluation of the technologies determined that three options were potentially available at PNPS: closed-cycle cooling, assisted recirculation, and variable frequency drives. Neither closed-cycle cooling nor assisted recirculation, however, could be installed and made operational within the remaining useful life of the plant, which is scheduled to close no later than June 1, 2019. And, as explained above, the social cost of VFDs is not justified by the social benefits that would be provided over the extremely limited period during which they would operate. For these reasons, EPA proposes that, considering the applicable factors at § 125.98(f)(2) and (3) and in light of Entergy's announcement to shut down the facility thereby drastically reducing its cooling water intake, instituting no additional entrainment control requirements prior to the earlier of the cessation of electricity generation or June 1, 2019 and, thereafter, eliminating water withdrawals for the main condenser and reducing other cooling water and other miscellaneous water withdrawals, resulting in a 96% reduction in flow, represents the best technology available for minimizing entrainment at PNPS. This conclusion is predicated on the closure of PNPS no later than June 1, 2019. Should the plant operate beyond June 2019, EPA would have to reconsider not only the cost-benefit comparison for installation of VFDs but also the potential availability of other, better performing technologies (*e.g.*, assisted recirculation) which have been eliminated from this analysis due to the limited remaining useful life of the plant.

7.0 Site Specific BTA Requirements to Minimize Impingement at PNPS

In the Final Rule for existing facilities, the BTA for minimizing the adverse impacts of impingement mortality is modified traveling screens with a fish-friendly return. *See* 40 C.F.R. § 125.94(c)(5); 79 Fed. Reg. at 48,337. In addition, the Final Rule provides six alternative methods of compliance. Briefly, these alternative compliance methods include:

1) Operate a closed-cycle recirculating system;
2) Operate a cooling water intake structure with a maximum through-screen design intake velocity of 0.5 fps;
3) Operate a cooling water intake structure with a maximum through-screen actual intake velocity of 0.5 fps;
4) Operate an offshore velocity cap (installed prior to October 14, 2014);
5) Operate any other combination of technologies, management practices, and operational measures that the Director determines is BTA for impingement reduction; or
6) Achieve a 12-month impingement mortality performance standard of all life stages of fish and shellfish of no more than 24 percent mortality.

40 C.F.R. § 125.94(c). The Final Rule also provides the permitting authority with discretion to require a permittee to comply with additional measures to protect shellfish and fragile species from impingement mortality. *See* 40 C.F.R. § 125.94(c)(8), (9).

EPA has made a site-specific BTA determination for entrainment mortality under 40 C.F.R. § 125.98(g) in consideration of the factors at 40 C.F.R. § 125.98(f)(2) and (3). Section 125.98(g) also authorizes EPA to proceed with a determination of BTA standards for impingement mortality that may be based on the BTA standards for impingement mortality at 40 C.F.R. § 125.94(c). Today's determination proceeds under § 125.98(g) and is based on information sufficiently similar to the information required by the Final Rule at 40 C.F.R. § 122.21(r) and which has been provided by the permittee in response to EPA's requests under § 308 of the CWA as well as supplemental biological information provided by the permittee.

7.1. BTA for Impingement Mortality

In its evaluation of the BTA for entrainment, EPA described Entergy's decision to shutdown PNPS no later than June 1, 2019 and, as of that date, reduce cooling water needs at the facility to the minimum required to support decommissioning activities. Entergy anticipates that PNPS would continue cooling water withdrawals for the salt service water (SSW) pumps, at a maximum daily intake of 15.6 MGD, which represents a reduction in cooling water flow of about 96%, which surpasses the flow reduction that PNPS would likely achieve through the use of closed-cycle cooling. Limited use of the circulating water pumps may be required to support decommissioning activities, which Entergy indicates would not exceed 5% of the time.

In addition, at a maximum daily intake volume of 15.6 MGD, the through-screen actual velocity at the traveling screens would be 0.06 fps, which is well below, and therefore consistent with, the BTA standard for impingement mortality at 40 C.F.R. § 125.94(c)(3) (*i.e.*, ≤ 0.5 fps). At PNPS this intake velocity will likely provide greater reductions in impingement mortality than traveling screens because it would allow fish to avoid being impinged on the screens in the first instance, which offers more protection for fragile species (e.g., rainbow smelt and river herring) that are unlikely to survive impingement. Swim speed studies suggest that an intake velocity of 0.5 fps or less will result in 96 percent or better reductions in impingement mortality for most species. *See* 79 Fed. Reg. at 48,337. Therefore, the BTA for impingement mortality during decommissioning activities beginning no later than June 1, 2019 will be met by maintaining a through-screen actual intake velocity no greater than 0.5 fps.

The following sections present EPA's interim BTA determination for impingement mortality during the period from the effective date of the permit until June 1, 2019 (or when PNPS terminates power generation if that should occur before June 1, 2019).

7.2. Interim BTA for Impingement Mortality

In light of, among other things, the current design, location, and operation of the CWIS at PNPS, Entergy's announcement to shut the facility down by June 1, 2019, and EPA's BTA determination for entrainment discussed in Section 6 above, it will be impracticable, if not impossible, for Entergy to comply with certain alternative BTA standards for impingement mortality at 40 C.F.R. § 125.94(c) within the period prior to shutdown. For instance, as discussed in Section 6 above, construction of a closed-cycle recirculating system would be expected to take at least 4 years. *See* 40 C.F.R. § 125.94(c)(1). Similarly, PNPS does not currently have a maximum through-screen design velocity of 0.5 fps or a velocity cap. *See id.* § 125.94(c)(2), (4). While Entergy has announced a drastic reduction in flow that will enable PNPS to comply with the 0.5 fps standard at

§ 125.94(c)(3) by June 1, 2019, compliance with this standard prior to shutdown would require a substantial reduction in cooling water flow, which the facility could not achieve without a significant impact on the production of electricity. Section 5.1 of this fact sheet describes how the administrative limits (*e.g.*, hotwell temperature) and safety buffers (e.g., MELLA boundary and use of control rods) together determine the cooling requirements and generation of electricity at the facility. Here, EPA considers the three remaining compliance alternatives in more detail to determine appropriate interim control requirements for impingement mortality at PNPS.

7.2.1. Modified Traveling Screens

One of the remaining compliance options for impingement mortality in the Final Rule is to operate a modified traveling screen that the owner or operator demonstrates is or will be optimized to minimize impingement mortality of all non-fragile species. *See id.* § 125.94(c)(5).

The Final Rule defines “modified traveling screen” as

> a traveling water screen that incorporates measures protective of fish and shellfish, including but not limited to: screens with collection buckets or equivalent mechanism 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 practicable; 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.

Id.. § 125.92(s). Examples of modified traveling screens in the definition include 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. *Id.*

In Section 4.3 of this determination, EPA presents several reasons why the existing traveling screens at PNPS are not consistent with the definition of modified traveling screens at § 125.92(s) as required to meet the BTA standard for impingement mortality at § 125.94(c)(5). The existing screens are comprised of stainless steel screening, rather than alternative materials that would protect fish from abrasive injury, and rotate just six times per week (or when triggered by loading or temperature), rather than continuously or near-continuously as directed by the rule. In addition, the narrow shelves (2–3 inches wide) that carry debris and fish as the screen rotates are designed primarily for moving debris, not fish and are not similar to the fish buckets associated with modified traveling screens because they do not minimize turbulence or prevent loss of fish from the collection system. Finally, the primary sluiceway returns fish to the embayment just 300 feet to the east of the CWIS, and the secondary sluiceway (used when debris loading is unusually high) empties into the discharge canal where the water temperature can be up to 32°F above ambient.

Ideally, the primary sluiceway would return fish to Cape Cod Bay outside of the embayment to minimize the potential for organisms to be re-impinged, and the secondary sluiceway would return fish to a location where they would not be exposed to dramatic increases in temperature that could potentially result in acute mortality. EPA requested that Entergy evaluate the availability and cost of an upgraded fish return sluiceway that maximizes survivability and returns fish outside of the intake embayment. Entergy proposed two possible modifications to the fish return sluiceway in its 2014 Engineering Response, while maintaining that the current sluiceway configuration already promotes high survival rates as demonstrated in the MRI 1984 survival study and a that modified sluiceway is not likely to improve survivability.

The first option that Enercon evaluated routes the fish sluiceway along the existing debris return trough on the west side of the intake structure and along the embankment to the west side of the discharge canal before emptying into Cape Cod Bay west of the discharge plume approximately 300 ft offshore at a depth of 10 ft. The modified sluiceway would be a closed 16-inch pipe with smooth material, long radius bends (to prevent abrasion), a minimum water depth of 6 inches, and velocity of 4.6-8.4 fps.[33] Enercon estimates the cost of this sluiceway configuration (including total construction and engineering cost) is $2,880,000 (2014 dollars). This estimate does not include engineering site support or staff support during construction.

The second option that Enercon evaluated modifies the existing fish sluiceway that travels on the eastern side of the intake structure and extends the outlet of the sluiceway outside of the east breakwater of the embayment. A new pipe would extend about 2000 ft under the embayment and east breakwater and return fish outside of the embayment. This option would require PNPS to dig a new trench under the embayment using horizontal directional drilling. The modified sluiceway would be made of smooth material (including replacing the existing section of corrugated pipe) with a minimum water depth of 3.2 inches. Enercon estimates the cost of this sluiceway configuration (including total construction and engineering cost) is $3,020,000 (2014 dollars). This estimate does not include engineering site support or staff support during construction, nor does it consider the costs of additional geotechnical investigations that may be required beyond the initial investigation to determine bore path selection for the drill.

For the reasons described above, the existing traveling screens at PNPS lack specific measures for the protection of fish and, as such, are not consistent with modified traveling screens as defined in the Final Rule. 40 C.F.R. § 125.92(s). In order to meet the definition of modified traveling screens under the BTA standard for impingement mortality at 40 C.F.R. § 125.94(c)(5), PNPS would likely have to retrofit the screens to

[33] The modified sluiceway would be comprised of three separate piping configurations each with a different construction methodology and a unique water depth, pipe diameter, and flow velocity.

include smooth mesh (or a similar screening material that decreases abrasion) and fish collection buckets to reduce turbulence. In addition, PNPS would have to initiate continuous (or near-continuous) rotation. PNPS may also have to alter the existing fish return system if the current outlet is not sufficiently far from the CWIS to minimize the potential for re-impingement. Even if the permittee were to make these specific changes, however, compliance with this alternative is demonstrated through a two-year impingement technology performance optimization study after the technology is installed. 79 Fed. Reg. at 48,347. The upgrades themselves would likely require additional time to design, install, and begin operating. Thus, PNPS may not complete the necessary upgrades and two-year study before the facility would comply with the actual through-screen velocity BTA simply by virtue of the significant reduction in flow associated with shutdown expected by June 1, 2019. Or at best, the improvements to the traveling screen and fish return and the accompanying performance study necessary to satisfy § 125.94(c)(5) might be in place for only a very limited period prior to shutdown. Moreover, such improvements to the traveling screen and fish return are not expected to provide as great a reduction in impingement mortality as that associated with shutdown, which is expected to decrease the actual through-screen velocity to 0.06 fps, as discussed in section 7.1. As such, any investments to improve the traveling screen and fish return would shortly be rendered obsolete. In light of these considerations, EPA has decided not to mandate upgrades to PNPS' existing screens and fish return systems in this case. Had Entergy not decided to shutter the facility by June 2019, EPA's analysis here may have been different.

7.2.2. System of Technologies

Another option to comply with the BTA standards for impingement mortality under the Final Rule that could be applicable as an interim BTA at PNPS is "a system of technologies, management practices, and operational measures, that, after review of the information required in the impingement technology performance optimization study at 40 C.F.R. 122.21(r)(6)(ii), the Director determines is the best technology available for impingement reduction at your cooling water intake structures." 40 C.F.R. § 125.94(c)(6). PNPS would comply with this option by performing the necessary study and demonstrating that its system of technologies, including the existing traveling screens and maintenance outage flow reduction, has been optimized to minimize impingement of all non-fragile species, including Atlantic silversides. Under this option, the permitting authority's BTA determination is to be informed by comparing the total system performance to the impingement mortality performance standard at § 125.94(c)(7) – that is, no more than 24 percent mortality, including latent mortality, for all non-fragile species together. *Id.* § 125.94(c)(6).

However, complying with this alternative during the interim period between the effective date of the permit and plant shutdown presents a challenge, because, as with the option to upgrade the traveling screens, the permittee must submit a study including two years of biological data collection demonstrating that the operation of the system has been optimized to minimize impingement mortality for non-fragile species. Given the anticipated closure of the plant in June 2019 and the timeline for a final permit decision, the permittee is expected to achieve an actual through-screen velocity of 0.5 fps or less close to or by the time the optimization study is completed.

7.2.3. Impingement Mortality Performance Standard

Finally, facilities may meet the BTA standards for impingement mortality in the Final Rule by achieving 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. *Id.* § 124.94(c)(7). Under this compliance alternative, a facility must conduct biological monitoring at a minimum frequency of monthly to demonstrate the impingement mortality performance. *Id.* The 12-month impingement mortality performance is the total number of fish killed divided by the total number of fish impinged over the course of the previous 12 months. *Id.*

The BTA standards for impingement mortality in § 125.94(c)(5) and (7) both distinguish between non-fragile and fragile species, specifically applying only to the former (*e.g.*, "the owner or operator of the facility must demonstrate the technology is or will be optimized to minimize impingement mortality of all non-fragile species." *Id.* § 125.94(c)(5)). *See also id.* § 125.92(m) (defining "fragile species"). For the purposes of evaluating impingement data as the basis of the standard in the Final Rule, EPA excluded data for fragile species because the observed mortality data from fragile species might, in large part, reflect conditions other than technology performance. *See* Chapter 11 of the § 316(b) Existing Facilities Rule Technical Development Document p.11-3.

On average, nine species account for more than 94% of annual impingement at PNPS from 1980 to 2013: Atlantic menhaden (53.4%), Atlantic silversides (23.3%), alewife (4.7%), rainbow smelt (3.3%), sand lance (2.2%), winter flounder (2.2%), Atlantic herring (2.1%), blueback herring (1.7%), and grubby (1.3%). Of these nine species, the Final Rule defines five (Atlantic menhaden, alewife, rainbow smelt, Atlantic herring, and blueback herring) as "fragile" species, meaning that the impingement survival rate is less than 30 percent even when the BTA technology of modified traveling screens are in operation. *Id.* § 125.92(m); *see also* 79 Fed. Reg. at 48,364. Exhibit 11-2 in the Technical Development Document for the Final Rule classifies Atlantic silversides, sand lance, winter flounder, and grubby as non-fragile species for the basis of the impingement mortality limitation at 40 C.F.R. § 125.94(c)(7).

Entergy considers Atlantic silversides a fragile species for the purposes of its evaluation of its modified traveling screen (see, for example, Appendix A Table 5 in the 2008 Entrainment and Impingement Report). A site-specific study conducted from 1980-1983 at PNPS (MRI 1984) observed generally low initial and latent survival of impinged Atlantic silversides (0 to 20%); a 2005 study performed by Normandeau (Normandeau 2005) observed initial survival up to 62% with continuous screen rotation. Based on EPA's analysis of impingement data for the Final Rule, however, Atlantic silversides could experience survival rates higher than 70% and are considered non-fragile, meaning that this species would be included in the calculation of impingement performance. It is not clear why the survival of silversides at PNPS would be lower than at other facilities, but in this case, the lower survival of this species may prevent PNPS from achieving the mortality standard because silversides comprise a large percentage of impingement on an annual basis. As an example, in April 2014, PNPS impinged 2,647 fish classified as non-fragile species, including 2,479 Atlantic silversides (Normandeau 2015). In order to comply with the 24% latent mortality standard, survival of silversides would have to exceed 76%.

Given the existing data at PNPS, a survival rate of 76% for Atlantic silversides is unlikely with the existing equipment. Further, it is not certain that improving the traveling screens consistent with the definition of modified traveling screens described in Section 7.2.1 would improve survival of Atlantic silversides at PNPS. For example, replacing the screen material with smooth mesh, or altering the location of the fish return, may not improve survival of this species. EPA demonstrated in the sections above that PNPS is expected to achieve an actual through-screen velocity of 0.5 fps no later than June 1, 2019, which is likely to occur before the permittee could invest in equipment upgrades that may not be effective. An actual through-screen velocity of less than 0.5 fps is a more protective technology than modifying the screens for a species that, at least in this case, experiences relatively high impingement mortality. For these reasons, EPA is not requiring PNPS to invest in improvements that will likely not be operational and effective before the permittee can comply with a more protective BTA standard and may not benefit Atlantic silversides.

7.2.4. Determination of Interim BTA for Impingement Mortality

EPA is making this BTA determination under the ongoing permitting proceedings provision of the Final Rule at 40 C.F.R. § 125.98(g), which states

> 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).[34]

Therefore, the Final Rule authorizes, but does not require, EPA to use the BTA standards under the Final Rule in setting permit conditions for an ongoing permit proceeding such as this one. Still, EPA has determined that the BTA for impingement mortality at PNPS will be to comply with an actual through-screen intake velocity of no more than 0.5 fps at the existing traveling screens consistent with 40 C.F.R. § 125.94(c)(3). Compliance with the alternative shall be no later than June 1, 2019, at the same time as compliance with the entrainment requirements established in this determination.

Compliance with the impingement mortality BTA standard at the same time as compliance with the site-specific entrainment requirements is consistent with the Final Rule. In particular, the Final Rule provides that, "[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*

[34] So in original. Should be § 125.9<u>4</u>(c).

soon as practicable" and that EPA "may establish interim compliance milestones in the permit." 40 C.F.R. § 125.94(b)(1) (emphasis added). The preamble explains that EPA revised the impingement mortality compliance requirements in this way in the Final Rule in response to comments received on the proposed rule and "synchronized decision making about technology requirements, avoiding situations where investments in [impingement mortality] would later be rendered obsolete by entrainment control requirements." 79 Fed. Reg. at 48,356.

Where there will be some period of time necessary to comply with the BTA standards for impingement mortality and entrainment, such as in this case where the facility will not comply until shutdown (no later than June 1, 2019), the Final Rule at 40 C.F.R. § 125.94(h) authorizes EPA to consider site-specific interim BTA measures:

> An owner or operator of a facility may be subject to interim BTA requirements established by the Director in the permit on a site-specific basis.

The existing technology to minimize impingement mortality at PNPS consists of coarse mesh traveling screens equipped with a low pressure spraywash to rinse organisms from the screen and a sluiceway to return organisms to the receiving water. EPA evaluated whether use of this technology, either as it exists or with upgrades, would meet one of the other compliance alternatives, namely, the protection of non-fragile species using the existing technology under 40 C.F.R. §§ 125.94(c)(5), (6), or (7), during the interim period before the facility shuts down. As described above, EPA has concluded that PNPS is not likely to comply with any of these BTA standards for impingement mortality under the Final Rule in the interim period because the necessary upgrades and studies are not likely to be completed before the facility shuts down, and because the site-specific impingement survival studies submitted by the permittee indicate that, without significant upgrades that might only be in place for a brief period (and even then, the benefit for Atlantic silversides is uncertain), PNPS would be unlikely to 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.

While PNPS is not likely to meet any of the alternative compliance options under 40 C.F.R. § 125.94(c) during the interim period between the effective date of the permit and the cessation of electricity generation, it will be able to comply with the BTA standard for impingement mortality of a maximum through-screen actual velocity of 0.5 fps (*i.e.*, § 125.94(c)(3)) by reducing it to roughly 0.06 fps for the period following cessation of electricity generation but preceding complete cessation of cooling water withdrawals. Moreover, EPA has chosen to synchronize the deadlines for compliance with the impingement mortality and entrainment mortality standards, because the improvements necessary to comply with the alternative impingement control technologies during the interim period are likely to result in situations where the investments would be rendered obsolete, in some cases even before, and in others only a short time after, they are operational. Accordingly, EPA finds that compliance with the BTA for impingement mortality shall be required on June 1, 2019 or when the facility ceases electricity generation. That said, it may be feasible for PNPS to implement some steps as an interim BTA to improve the survival of impinged fish using the existing technology.

Laboratory studies, field studies, and site-specific data collected at PNPS indicate that, for some species, impingement survival is likely to be greater than zero. A site-specific study conducted from 1980-1983 at PNPS (MRI 1984) indicates that the element that was observed to have the greatest impact on impingement survival for all species was continuous rotation, which PNPS does not currently employ at its existing traveling screens. Fragile species, including rainbow smelt and menhaden, experienced high mortality in both 8-hour and continuous wash cycles, supporting the conclusion that these species are not likely to survive impingement regardless of screen rotation parameters. On the other hand, survival of less fragile species was observed to be substantially higher during continuous rotation cycles. For example, initial survival of grubby – which the rule expressly considers a non-fragile species, *see* Exhibit 11B-1 in Chapter 11 Appendix B of the § 316(b) Existing Facilities Final Rule Technical Development Document (EPA 2014) – increased from 37.5% with 8-hour washes to nearly 78% with continuous wash cycles. For all species combined (including fragile species), initial survival increased from 8.9% under the 8-hour wash cycle to 29.6% under the continuous wash cycle. For non-fragile species, initial survival increased from 13% under the 8-hour wash cycle to 47% under the continuous wash cycle. In addition to grubby, initial survival of winter flounder, pollock, and northern pipefish was substantially greater with continuous rotation. Similarly, PNPS' 2005 Impingement Monitoring Report (Normandeau 2006) evaluated initial survival with continuous and static rotation and indicated that initial survival for all impinged species combined was greater when traveling screens were continuously rotated (34%) than when screens were rotated once every 8 hours (19%). In particular, Normandeau (2006) indicated that the higher initial survival of Atlantic silversides with continuous rotation (62%) compared to static rotation (15%) attributed to the overall greater survivability with continuous rotation. The site-specific Normandeau and MRI studies, as well as other laboratory studies (EPRI 2003), supports the conclusion that continuous wash cycles are likely to improve survival of many impinged fish. EPA concludes that as an interim BTA condition, PNPS should implement continuous or near-continuous rotation of the existing traveling screens to minimize impingement mortality for non-fragile species.

8.0 Permit Requirements Based on BTA Determination

For this permit, EPA is making a 316(b) determination for this facility under the ongoing permitting provision of the Final Rule at 40 C.F.R. § 125.98(g) in consideration of the factors at 40 C.F.R. § 125.98(f)(2) and (3). EPA has considered the design, construction, and capacity of the existing CWIS, the schedule for shutdown proposed by Entergy, and available technologies to minimize impingement mortality and entrainment and determined that the following measures represent BTA:

1. Upon termination of generation of electricity or no later than June 1, 2019, the permittee shall:

   a. Operate the traveling screens with a maximum through-screen intake velocity no greater than 0.5 feet per second. Limited exceedances of the maximum through-screen velocity are authorized for the purposes of maintaining the CWIS and when the circulating water pumps are required to withdraw water to support decommissioning activities not to exceed five (5) percent of the time on a monthly basis.

   b. Monitor the through-screen velocity at the screen at a minimum frequency of daily. Alternatively, the permittee shall calculate the daily maximum through-screen velocity using water flow, depth, and screen open area. For this purpose, the maximum intake velocity shall be calculated during minimum ambient source water surface elevations and periods of maximum head loss across the screens. The average monthly and maximum daily through-screen intake velocity shall be reported each month on the DMR. See Part I.B.1. of this permit.

   c. Cease cooling water withdrawals for the main condenser and reduce total cooling water withdrawals to an average monthly rate of 7.8 MGD. Cooling water withdrawals at the salt service water pumps shall be limited to a maximum daily flow of 15.6 MGD.

   d. Withdrawal of seawater using a single circulating water pump not to exceed five (5) percent of the time on a monthly basis is authorized to support decommissioning activities.

   e. Continuously rotate the traveling screens when operating the circulating water pumps.

2. From the effective date of the permit until termination of generation of electricity, no later than June 1, 2019, the permittee shall continuously rotate the traveling screens.

3. Any change in the location, design, or capacity of any CWIS, except as expressed in the above requirements, must be approved in advance and in writing by the EPA and MassDEP.

Attachment E
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MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
COMMONWEALTH OF MASSACHUSETTS
1 WINTER STREET
BOSTON, MASSACHUSETTS 02108

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ECOSYSTEM PROTECTION
REGION I
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 SECTION 301, 316(a), AND 402 OF THE CLEAN WATER ACT (THE "ACT"), AS AMENDED, AND REQUEST FOR STATE CERTIFICATION UNDER SECTION 401 OF THE ACT.

PUBLIC NOTICE PERIOD: May 18, 2016 – July 18, 2016

PERMIT NUMBER: **MA0003557**

PUBLIC NOTICE NUMBER: MA-010-16

NAME AND MAILING ADDRESS OF PERMITTEE:

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

NAME AND ADDRESS OF THE FACILITY WHERE DISCHARGE OCCURS:

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

RECEIVING WATER: **Cape Cod Bay, Class SA water**

PREPARATION OF THE DRAFT PERMIT:

The U.S. Environmental Protection Agency ("EPA") and the Massachusetts Department of Environmental Protection ("MassDEP") have cooperated in the development of a draft permit for the above identified facility. The effluent limits and permit conditions imposed have been drafted to assure compliance with the Clean Water Act ("CWA"), 33 U.S.C. sections 1251 et seq.,, the Massachusetts Clean Waters Act, G.L. c. 21, §§ 26-53, 314 CMR 3.00 and State Surface Water Quality Standards ("WQS") at 314 CMR 4.00. In addition, the draft permit includes thermal effluent limitations for temperature and rise in temperature, or "delta T." The thermal component of the facility's discharge is subject to effluent limitations under CWA § 301, 33 U.S.C. § 1311, and WQS that provide that temperature of a class SA water "[s]hall not exceed 85°F (29.4°C) nor a maximum daily mean of 80°F (26.7°C), and the rise in temperature due to a discharge shall not exceed 1.5°F (0.8°C)." 314 CMR 4.05(4)(a)(2)(a).

The permittee has filed a request for alternative, less stringent effluent limitations for the thermal component of the discharge. Consistent with CWA § 316(a) and 314 CMR 4.05(4)(a)(2)(c), the draft permit contains some thermal limits that are less stringent than WQS, but which EPA and MassDEP have determined nonetheless assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the water body receiving the thermal discharge. These effluent limits are an effluent temperature of 102°F and delta Ts of 32 °F pre-shutdown and 3°F post-shutdown for Outfall 001 (cooling water) and an effluent temperature of 115°F for Outfall 002 (thermal backwash water). These limits are described in Sections 6.1.4 and 6.2.4 of the fact sheet. EPA has formally requested that the State certify this 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:

A fact sheet or a statement of basis (describing the type of facility; type and quantities of wastes; a brief summary of the basis for the draft permit conditions; and significant factual, legal and policy questions considered in preparing this draft permit) and the draft permit may be obtained at no cost at: http://www.epa.gov/region1/npdes/draft_permits_listing_ma.html or by writing or calling EPA's contact person named below:

George Papadopoulos, US EPA
5 Post Office Square
Suite 100 (OEP 06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1579

The administrative record containing all documents relating to this draft permit is on file and 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 this draft permit is inappropriate, must raise all issues and submit all available arguments and all supporting material for their arguments in full by **July 18, 2016**, to the U.S. EPA, George Papadopoulos, 5 Post Office Square, Suite 100, Mailcode OEP 06-1, Boston, Massachusetts 02109-3912. Any person, prior to such date, may submit a request in writing to EPA and the MassDEP 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 (30) days public notice whenever the Regional Administrator finds that response to this notice indicates significant public interest. In reaching a final decision on this draft permit the Regional Administrator will respond to all significant comments and make the responses available to the public at EPA's Boston office.

FINAL PERMIT DECISION AND APPEALS:

Following the close of the comment period, and after a public hearing, if such hearing is held, the Regional Administrator will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the final permit decision any interested person may submit petition to the Environmental Appeals Board to reconsider or contest the final decision.

David Ferris, Director
MASSACHUSETTS WASTE WATER PROGRAM
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Ken Moraff, Director
OFFICE OF ECOSYSTEM PROTECTION
ENVIRONMENTAL PROTECTION AGENCY

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
COMMONWEALTH OF MASSACHUSETTS
1 WINTER STREET
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ECOSYSTEM PROTECTION
REGION I
BOSTON, MASSACHUSETTS 02109

JOINT **EXTENSION OF PUBLIC COMMENT PERIOD** AND PUBLIC NOTICE OF A **PUBLIC HEARING** PERTAINING TO THE ISSUANCE 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, AS AMENDED, AND UNDER SECTIONS 27 AND 43 OF THE MASSACHUSETTS CLEAN WATERS ACT, AS AMENDED.

DATE OF ORIGINAL NOTICE PERIOD: May 18, 2016 – July 18, 2016

PUBLIC NOTICE EXTENDED TO: July 25, 2016

REASON FOR EXTENSION: The public notice is hereby extended (40 CFR §124.10) in response to a request for a public hearing.

PERMIT NUMBER: MA0003557

PUBLIC NOTICE NUMBER: MA-012-16

NAME AND MAILING ADDRESS OF APPLICANT:

Entergy Nuclear Generation Company
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

NAME AND ADDRESS OF THE FACILITY WHERE DISCHARGE OCCURS:

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

RECEIVING WATER: Cape Cod Bay – Class SA water

PREPARATION OF THE DRAFT PERMIT:

The U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP) have cooperated in the development of a draft permit for the above identified facility. 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., the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53, 314 CMR 3.00 and State Surface Water Quality Standards at 314 CMR 4.00. EPA has formally requested that the State certify this draft permit pursuant to Section 401 of the Clean Water Act and expects that the draft permit will be certified.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ECOSYSTEM PROTECTION
REGION I
BOSTON, MASSACHUSETTS 02109

JOINT **CORRECTION TO PUBLIC HEARING INFORMATION** PERTAINING TO THE ISSUANCE 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, AS AMENDED, AND UNDER SECTIONS 27 AND 43 OF THE MASSACHUSETTS CLEAN WATERS ACT, AS AMENDED.

REASON FOR CORRECTION: Original public notice of public hearing listed the incorrect street address for the Plymouth Public Library (public hearing location).

PERMIT NUMBER: MA0003557

NAME AND ADDRESS OF THE FACILITY WHERE DISCHARGE OCCURS:

Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

PUBLIC HEARING:

The Regional Administrator has determined, pursuant to 40 C.F.R. § 124.12, that a significant degree of public interest exists on the proposed permit and that a public hearing should be held to consider this draft permit.

A public hearing and meeting (information session) will be held on the following date and time:

DATE: Thursday, July 21, 2016

MEETING TIME: 6:15 p.m. - 7:00p.m.

HEARING TIME: 7:15pm

LOCATION: Plymouth Public Library (side door entrance)
132 South Street
Plymouth, MA 02360

MEETING ROOM: Otto Fehlow Meeting Room

In accordance with 40 C.F.R. § 124.12, the following is a summary of the procedures that shall be followed at the public hearing:

a. The Presiding Officer shall have the authority to open and conclude the hearing and to maintain order; and
b. Any person appearing at such a hearing may submit oral or written statements and data concerning the draft permit.

INFORMATION ABOUT THE DRAFT PERMIT:

A fact sheet (describing the type of facility; type and quantities of wastes; a brief summary of the basis for the draft permit conditions; and significant factual, legal and policy questions considered in preparing this draft permit) and the draft permit may be obtained at no cost at http://www.epa.gov/region1/npdes/draft_permits_listing_ma.html or by writing or calling EPA's contact person named below:

George Papadopoulos
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1579
Papadopoulos.george@epa.gov

The administrative record containing all documents relating to this draft permit is on file and 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.

DAVID FERRIS, DIRECTOR
MASSACHUSETTS WASTEWATER MANAGEMENT PROGRAM
DEPARTMENT OF ENVIRONMENTAL PROTECTION

KEN MORAFF, DIRECTOR
OFFICE OF ECOSYSTEM PROTECTION
ENVIRONMENTAL PROTECTION AGENCY – REGION 1

Public notice of this draft permit was provided in the *Old Colony Memorial* newspaper (Plymouth, MA) and sent to the permittee and other interested parties by mail and electronic mail on May 18, 2016. While that original public notice indicated that at least thirty (30) days' advance notice would be provided for any public hearing, in accordance with 40 C.F.R. § 124.10(b)(2), the version of the notice mistakenly posted to EPA's website on May 18, 2016 erroneously noted that at least sixty (60) days' notice would be provided. The version posted on EPA's website has since been replaced with the original notice. Accordingly, this public hearing notice provides at least a thirty (30) day notice prior to the scheduled hearing.

INFORMATION ABOUT THE DRAFT PERMIT:

A fact sheet (describing the type of facility; type and quantities of wastes; a brief summary of the basis for the draft permit conditions; and significant factual, legal and policy questions considered in preparing this draft permit) and the draft permit may be obtained at no cost at http://www.epa.gov/region1/npdes/draft_permits_listing_ma.html or by writing or calling EPA's contact person named below:

George Papadopoulos
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Telephone: (617) 918-1579
Papadopoulos.george@epa.gov

The administrative record containing all documents relating to this draft permit is on file and 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 HEARING**:**

The Regional Administrator has determined, pursuant to 40 C.F.R. § 124.12, that a significant degree of public interest exists in this proposed permit and that a public hearing should be held to consider this draft permit.

A public hearing and meeting (information session) will be held on the following date and time:

DATE: Thursday, July 21, 2016

MEETING TIME: 6:15 p.m. - 7:00p.m.

HEARING TIME: 7:15pm

LOCATION: Plymouth Public Library (side door entrance)
~~120 Central Street~~ **132 South Street**
Plymouth, MA 02360

MEETING ROOM: Otto Fehlow Meeting Room

In accordance with 40 C.F.R. § 124.12, the following is a summary of the procedures that shall be followed at the public hearing:

a. The Presiding Officer shall have the authority to open and conclude the hearing and to maintain order; and
b. Any person appearing at such a hearing may submit oral or written statements and data concerning the draft permit.

EXTENSION OF PUBLIC COMMENT PERIOD:

All persons, including applicants, who believe any condition of this draft permit is inappropriate, must raise all issues and submit all available arguments and all supporting material for their arguments in full by midnight **July 25, 2016**, to:

George Papadopoulos
U.S. Environmental Protection Agency – Region 1
5 Post Office Square, Suite 100 (OEP06-1)
Boston, MA 02109-3912
Papadopoulos.george@epa.gov

FINAL PERMIT DECISION:

Following the close of the comment period, and after the public hearing, the Regional Administrator will respond to all significant comments and 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.

DAVID FERRIS, DIRECTOR
MASSACHUSETTS WASTEWATER MANAGEMENT PROGRAM
DEPARTMENT OF ENVIRONMENTAL PROTECTION

KEN MORAFF, DIRECTOR
OFFICE OF ECOSYSTEM PROTECTION
ENVIRONMENTAL PROTECTION AGENCY – REGION 1