State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code – 401-02B
Water Pollution Management Element
Bureau of Surface Water Permitting
P.O. Box 420 – 401 E State St
Trenton, NJ 08625-0420
Phone: (609) 292-4860 / Fax: (609) 984-7938

BOB MARTIN
Commissioner

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7011 2970 0003 7284 4645
June 30, 2015

John F. Perry, VP Salem
PSEG Nuclear, LLC
P.O. Box 236, M/C S05
Hancocks Bridge, NJ 08038

Re: Draft Surface Water Renewal Permit Action
Category: B -Industrial Wastewater
NJPDES Permit No. NJ0005622
PSEG Nuclear LLC Salem Generating Station
Lower Alloways Creek Twp, Salem County

Dear Mr. Perry:

Enclosed is a **draft** New Jersey Pollutant Discharge Elimination System (NJPDES) permit action identified above which has been issued in accordance with N.J.A.C. 7:14A.

Notice of this draft permit action will appear in the *South Jersey Times* and in the July 8, 2015 *DEP Bulletin*. The *DEP Bulletin* is available on the internet at http://www.state.nj.us/dep/bulletin. In accordance with N.J.A.C. 7:14A-15.10(c)1i, the public comment period will close sixty days after its appearance in the newspaper.

A non-adversarial public hearing has been scheduled on Wednesday, August 5, 2015 from 3-5 pm and 7-9 pm (or end of testimony, *whichever comes first*) at the Old County Court House, 104 Market Street, Salem, NJ 08079 to provide an opportunity for interested persons to present and submit information on the proposed action.

As detailed in the *DEP Bulletin* and aforementioned newspaper written comments must be submitted in writing to Pilar Patterson, Chief, Mail Code 401-02B, Division of Water Quality, Bureau of Surface Water Permitting, P.O. Box 420, Trenton, NJ 08625-0420 by the close of the public comment period. All persons, including the applicant, who believe that any condition of this draft document is inappropriate or that the Department's tentative decision to issue this draft document is inappropriate, must raise all reasonable arguments and factual grounds supporting their position, including all supporting materials, during the public comment period.

The Department will respond to all significant and timely comments upon issuance of the final document. The permittee and each person who has submitted written comments will receive notice of the Department's final decision to issue, revoke, or redraft the document.

If you have questions or comments regarding the draft action, please contact Heather Genievich or Rachael Pepe at (609) 292-4860.

Sincerely,

Susan Rosenwinkel
Section Chief
Bureau of Surface Water Permitting

Enclosures

c: Permit Distribution List

Masterfile #: 15647; PI #: 46814

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New Jersey Department of Environmental Protection
Division of Water Quality
Bureau of Surface Water Permitting

PUBLIC NOTICE

Notice is hereby given that the New Jersey Department of Environmental Protection (Department) proposes to renew the New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Surface Water (DSW) Permit NJ0005622 in accordance with N.J.A.C. 7:14A-1 et seq., and by authority of the Water Pollution Control Act at N.J.S.A. 58:10A-1 et seq., for the following discharge:

Permittee	Facility
PSEG Nuclear LLC PO Box 236 Hancocks Bridge, NJ 08038	PSEG Nuclear LLC Salem Generating Station Alloway Creek Neck Rd Lower Alloways Creek Township, Salem County

The permittee operates an electrical generating station that produces 2,449 MWe from Units 1 and 2 using a once through cooling water system. Unit Number 3 is an air-cooled combustion turbine rated at about 40 MWe. This draft renewal permit proposes to authorize the intake of Delaware River waters as well as the discharge of pollutants to Zone 5 of the Delaware River through the discharge serial numbers and monitoring points described below. This draft permit renewal also proposes to incorporate the Department's determination with respect to the permittee's request for a thermal variance from surface water quality standards for heat and temperature pursuant to Section 316(a) of the Federal Water Pollution Control Act, 33 U.S.C. Section 1251 et seq. (Clean Water Act). Further, this draft renewal permit proposes to incorporate the Department's determination pursuant to Section 316 (b) of the Clean Water Act regarding the best technology available for the cooling water intake structure and incorporates the requirements of the newly effective federal Section 316(b) regulations.

The Department proposes to continue to authorize the withdrawal of Delaware Estuary water for use in the Salem Station's cooling water processes as well as the discharge of this heated water back to the Delaware Estuary. The withdrawal of Delaware River water for the circulating water system is limited to 3024 million gallons per day as a monthly average. Effluent limitations and monitoring requirements have been set forth in this permit for DSN's 481 – 486 as well as for other outfalls and monitoring points. The thermal and heat components of the discharges from DSN's 481 – 486 are regulated as monitoring points "FAC A", "FAC B", and "FAC C". In summary, this draft permit proposes to grant the permittee's thermal variance request under Section 316(a) and proposes thermal effluent limitations consistent with the Station's existing once-through cooling water system.

The Department is establishing a 60 day public comment period for this proposed permit renewal where comments are due 60 calendar days after publication of this notice in the newspaper. Comments may be submitted in writing to Pilar Patterson, Chief, or Attention: Comments on Public Notice NJ0005622, at Mail Code 401-02B, Division of Water Quality, Bureau of Surface Water Permitting, P.O. Box 420, Trenton, NJ 08625-0420 by the close of the public comment period. Comments via e-mail are also acceptable and can be sent to susan.rosenwinkel@dep.nj.gov. All persons, including the applicant, who believe that any condition of this draft document is inappropriate or that the Department's decision to issue this draft document is inappropriate, must raise all reasonable arguments and factual grounds supporting their position, including all supporting materials, during the public comment period. Specific information regarding the draft document may be obtained from Heather Genievich or Rachael Pepe of the Bureau of Surface Water Permitting at (609) 292-4860.

The Department will hold a non-adversarial public hearing to solicit public comment on the draft permit on Wednesday, August 5, 2015 from 3-5 pm and 7-9 pm (or end of testimony, whichever comes first) at:

Old County Court House
104 Market Street
Salem, Salem County, NJ

The hearing shall be held before a Hearing Officer designated by the Department. The applicant and other interested persons will have the opportunity to present and submit information on the proposed action.

A draft NJPDES permit renewal has been prepared for this facility based on the administrative record which is on file at the offices of the Department, located at 401 East State Street, Trenton, New Jersey. It is available for inspection, by appointment, Monday through Friday, between 8:30 A.M. and 4:00 P.M. Appointment for inspection may be requested through the Open Public Records Act office. Details are available online at www.nj.gov/dep/opra, or by calling (609) 341-3121.

The Department will respond to all significant and timely comments upon issuance of the final document. The permittee and each person who has submitted written comments will receive notice of the Department's permit decision.

New Jersey Department of Environmental Protection
Division of Water Quality
Bureau of Surface Water Permitting

FACT SHEET

Masterfile #: 15647 **PI #:** 46814

This fact sheet sets forth the principle facts and the significant factual, legal, and policy considerations examined during preparation of the draft permit. This action has been prepared in accordance with the New Jersey Water Pollution Control Act and its implementing regulations at New Jersey Administrative Code (N.J.A.C.) 7:14A-1 et seq. - The New Jersey Pollutant Discharge Elimination System (NJPDES).

PERMIT ACTION: Surface Water Renewal Permit Action

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1 Name and Address of the Applicant:

PSEG Nuclear, LLC
P.O. Box 236
Hancocks Bridge, NJ 08038

2 Name and Address of the Facility/Site:

PSEG Nuclear LLC Salem Generating Station
Alloway Creek Neck Road
Lower Alloways Creek Twp, Salem County

3 Overview of Draft Renewal Permit:

The PSEG Salem Generating Station (PSEG-Salem or the Station) is a nuclear powered electric generating station located in Lower Alloways Creek Township, Salem County. The Standard Industrial Classification (SIC) code for this facility is 4911. The facility is classified as a major discharger by the New Jersey Department of Environmental Protection (Department or NJDEP) in accordance with the United States Environmental Protection Agency (EPA) rating criteria.

PSEG Nuclear, LLC (PSEG or the permittee) is the operator of the Salem Generating Station. PSEG shares ownership of the Station with Exelon Corporation. The owners are members of the Pennsylvania, New Jersey, Maryland Interconnection, L.L.C. (PJM) regional transmission organization and PSEG-Salem sells its electricity in the PJM power pool.

The permittee has applied for a NJPDES Surface Water Renewal Permit Action through an application dated January 31, 2006. Until such time as this renewal permit is finalized, the existing permit remains in full force and effect pursuant to N.J.A.C. 7:14A-2.8(a).

This draft renewal proposes to authorize the intake of water from the Delaware River as well as the discharge of wastewater to the Delaware River. This draft permit renewal incorporates the Department's determination with respect to a thermal variance from the New Jersey Surface Water Quality Standards (SWQS) for heat and temperature pursuant to Section 316(a) of the Federal Clean Water Act (CWA). Further, this draft renewal permit incorporates the Department's best technology available determination pursuant to Section 316(b) of the CWA for PSEG-Salem's cooling water intake structure.

A list of abbreviations and acronyms as used in this document is included at the end of this Fact Sheet.

4 Facility Description:

A. Description of the Station

The Station is located in Lower Alloways Creek Township, Salem County, NJ at River Mile (R.M.) 50 on the Delaware Estuary (river or estuary), and 18 miles south of the Delaware Memorial Bridge. The detailed planning process for design and construction of Salem Units 1 and 2 began in 1968, and construction began in 1970. The Station is located on a projection of land known as Artificial Island on the eastern shore of the Delaware Estuary. The Station is bordered on one side by the Delaware Estuary and by marshes and uplands on the other two sides. The estuary in the area of the Station is approximately 2.5 miles wide. The river in the vicinity of the Station is characterized by variable salinity, tidal currents and a high quantity of particulate material suspended in the water column.

The Station was designed and has been operating as a base load plant. The Station consists of two nuclear reactor generating units, Units 1 and 2, both of which are pressurized water reactor systems as described below. PSEG-Salem Unit 1 has a gross electrical output of 1,244 Megawatts electric (MWe), and PSEG-Salem Unit 2 has a gross electrical output of 1,205 MWe. The operating license of the Station was extended where Unit 1 expires in 2036 and Unit 2 expires in 2040 (see www.nrc.gov/info-finder/reactor/).

The PSEG-Salem units are currently on an 18-month refueling cycle. PSEG has implemented practices intended to target refueling outages of 25 days. To ensure that both units are operational during the peak winter and summer demand periods, the refueling outages are scheduled for spring and fall on a staggered schedule for the units.

The plant design is a pressurized water reactor. Reactor coolant water is pumped at high pressure through each reactor in closed loops to remove heat and transfer it through four heat exchangers (steam generators). The steam generators contain thousands of small diameter tubes through which the heated primary system reactor coolant water flows. Around the outside of these tubes is where the secondary system water flows to be converted to steam. The secondary system steam generator water absorbs heat from the reactor coolant water, and, because it is under less pressure than the primary system reactor coolant water, turns to steam. There is no physical contact between the primary system reactor coolant water and the secondary system steam generator water. The steam is piped to a turbine, which rotates as the steam passes through it. Each rotating turbine is connected to an electrical generator to produce electricity. The steam exhausted from the turbine passes into that unit's three-shelled condenser, where it is cooled. The Station's circulating water system draws cooling water from the estuary through the Cooling Water Intake Structure (CWIS). This water is pumped through tubes inside the condensers to cool the turbine exhaust steam. As the exhaust steam is cooled, it is condensed and returned to the steam generators as feed water. There is no physical contact between the steam and the cooling water which is discharged back into the river.

B. Description of Cooling Water Intake Structure

The CWIS is located on the shoreline at the southwestern side of Artificial Island and supplies water to cool the condensers of Salem Units 1 and 2. The intake structure includes 12 separate intake bays (six for each of the two Salem units) each approximately 11 feet wide and 50 feet high. Each of the 12 bays services a circulating water pump.

PSEG-Salem's design flow is 185,000 gallons per minute (gpm) per pump. The existing NJPDES permit limits the maximum flow into the circulating water system for the two PSEG- Salem units to a monthly average of 3,024 million gallons per day (MGD), which is equivalent to an average flow rate of 175,000 gpm per pump. The actual flow rate may vary from time to time due to many factors that affect the operation and efficiency of the circulating water system. This could include pump condition, suction pressure (head), system pressure losses, system cleanliness, and pump outages.

The CWIS is comprised of several parts as described below:

- Ice Barriers - In the winter, removable ice barriers are installed on the face of each of the 12 intake bays to prevent damage during severe icing conditions. The barriers are constructed of pressure-treated lumber and structural steel. The ice barriers are removed in early spring and reinstalled in the late fall.

- Trash Racks - River water enters the intake bays through fixed bar racks called trash racks that are designed to prevent large floating or submerged debris from entering the system. The trash racks are constructed of half inch wide steel bars on 3.5 inch centers; the size of the clear slot opening is three inches. PSEG employees inspect the trash racks and, if required, remove any debris using a mobile clamshell-type mechanical rake. There are two trash rakes which are self-contained and traverse the entire width of the intake. The trash rakes contain a hopper that transports the debris to basket-lined pits at each end of the intake. The removed debris is de-watered by gravity and disposed off-site.

- Traveling Screens - After passing through the trash racks, intake water flows through vertical traveling screens of a modified Ristroph design. The traveling screens have been upgraded over time where there have been three distinct traveling screen designs at Salem. The most recent upgrades were required as a condition of the July 20, 1994 permit and took place in 1995. These upgrades were made to improve performance and reliability and increase the survival rates of impinged fish. The traveling screens are described in greater detail later in this document.

- Fish Return System - Each screen panel has a 10-foot long composite material fish bucket attached to its bottom support member. As the bucket travels over the head sprocket of the traveling screen, organisms slide onto the screen face and are washed by the low pressure spray system. This low pressure wash is designed to minimize descaling and other injuries that could occur to impinged fish with conventional high pressure spray headers. As the panel rotates to the fish removal position, the spray wash water helps to slide fish on the screen surface over a flap seal into a bi-directional fiberglass fish trough. As the panels continue to travel, the remaining debris is removed into a bi-directional concrete debris trough using two inside high pressure (90 pounds per square inch (psi)) spray headers with spray nozzles. The fish and debris troughs are joined after the troughs leave the fish counting pools/building. Fish and debris washed from the screens are normally returned to the river through a detrital discharge pipe (DDP) that extends approximately 600 feet offshore to a submerged discharge on the river bottom.

  The DDP was installed in the spring of 2012 to increase the distance of discharge from the intake structure of fish and debris to further reduce the potential for re-impingement as well as to reduce the effects of heavy detrital loading on the CWIS intake screens. Specifically, a 48-inch diameter discharge pipe was installed from the north fish counting pool discharge where it extends below the water line 600 feet out into the Delaware River. In addition to aiding in the reduction of the detritus loading, the intent of the DDP installation was to remove the necessity of routine sluice changes that occur with changes in tide, and allow for a continuous and uninterrupted sluice discharge specifically to the north. This modification made the north fish counting pool the primary location for all future impingement sampling.

C. Description of Service Water System Intake

The service water system (SWS) is a safety-related cooling water system that supplies a dependable, continuous flow of cooling water (under normal and emergency conditions) to the nuclear and turbine area heat exchangers. The SWS withdraws cooling water from the estuary through an intake structure and pump system separate from those of the circulating water system. Sodium hypochlorite is added to the SWS as a biocide to prevent fouling of critical heat exchanger surfaces and components. During normal Station operations, the four service water pumps provide 43,500 gpm which is equivalent to 62.64 MGD. The service water intake flow is approximately 4% of Salem's circulating water system intake flow.

Service water is withdrawn from the estuary through an intake located approximately 400 feet north of the CWIS. The SWS intake has trash racks and traveling screens, where debris is collected to prevent interference with pump or heat exchanger operation. To dislodge collected debris, the traveling screens are backwashed with service water. The backwash water and debris are discharged into a trough and directed through trash baskets, where the water is returned to the estuary and debris is collected and disposed. The intake water then passes through the service water pumps to the service water strainers which are designed to remove small particles from the intake water to prevent clogging and damage to the heat exchangers in the SWS. Service water is discharged to the estuary via connections to the cooling water structure (CWS) pipes. The traveling screens on the service water intake do not have a modified Ristroph design or a fish return system.

D. Discharge Location Information

Outfall Designators			
General Information		**Watershed Information**	
Receiving Water:	Delaware River	Downstream Confluences:	Delaware River
Via :	Submerged pipe	Receiving River Basin:	Delaware River
Classification (a):	Zone 5	Watershed Management Area:	Maurice, Cohansey Salem
County:	Salem	Watershed:	Alloways Creek/ Hope Creek
Municipality:	Lower Alloways Creek Twp	Subwatershed:	Delaware Bay (Stow Ck to Fishing Ck)
HUC 14 (b):	02040206060100	Water Quality Impairments (c):	Chlordane in fish tissue, DDT in Fish Tissue, Mercury in Fish Tissue and Dieldrin
DSN 481			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 482			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 483			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 484			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 485			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 486			
Latitude: 39° 27' 38"		Longitude: 75° 32' 16"	
DSN 487 – North Yard Drain			
Latitude: 39° 27' 46"		Longitude: 75° 32' 17"	
DSN 488 – West Yard Drain			
Latitude: 39° 27' 41"		Longitude: 75° 32' 12"	

DSN 489 – South Yard Drain	
Latitude: 39° 27’ 40”	Longitude: 75° 32’ 00”
DSN 490 – Yard Drain	
Latitude: 39° 27’ 40”	Longitude: 75° 31’ 52”
DSN 491 – East Yard Drain	
Latitude: 39° 27’ 40”	Longitude: 75° 31’ 50”:
DSN 492 – Area Stormwater Drain	
Latitude: 39° 27’ 40”	Longitude: 75° 31’ 55”:
DSN 493 – Stormwater Drain	
Latitude: 39° 27’ 40”	Longitude: 75° 31’ 58”:

Footnotes:
(a) The designated uses for this waterbody classification can be found at N.J.A.C. 7:9B-1.13
(b) HUC 14 = 14 digit Hydrologic Unit Code
(c) These parameters are listed on Sublist 5 as impaired for this waterbody as per New Jersey’s 2012 Integrated Water Quality Monitoring and Assessment Report (includes 305(b) Report and 303(d) List).

Zone 5 is that part of the Delaware River extending from R.M. 78.8 to R.M. 48.2, Liston Point, including the tidal portions of the tributaries thereof.

The quality of waters in Zone 5 shall be maintained in a safe and satisfactory condition for the following uses:

1. industrial water supplies after reasonable treatment;
2. a. maintenance of resident fish and other aquatic life,
   b. propagation of resident fish from R.M. 70.0 to R.M. 48.2,
   c. passage of anadromous fish,
   d. wildlife;
3. recreation;
4. navigation.

As noted above, this segment of the Delaware River is impaired for Chlordane in fish tissue, DDT in fish tissue, Mercury in fish tissue, and Dieldrin.

Locations for Internal Points
DSN 48C – Non-Radioactive Liquid Waste Disposal
Discharges to: DSNs 481, 482, 484, and/or 485
DSN 487B – #3 Skim Tank
Discharges to: DSN 48C

Overall Facility Monitoring Points	
FAC A - Thermal	
Description: Thermal Loading for Unit 1	DSNs 481, 482 and 483
FAC B - Thermal	
Description: Thermal Loading for Unit 2	DSNs 484, 485 and 486
FAC C – Overall Facility	
Description: Intake Flow and Thermal Loading for Facility	Intake and DSNs 481 to 486

E. Description of Discharges

1. DSNs 481 - 486

The Station is designed to discharge, at a maximum, approximately 3,200 MGD of once-through, non-contact condenser cooling water through six submerged pipes or outfalls designated as Discharge Serial Numbers (DSNs) 481– 486. The pumps and piping are designed to discharge water to the estuary at a velocity of 10.5 feet per second at a depth of 31 feet below the surface at mean low tide. The six 120 inch discharge pipes (three from each unit) designated as DSNs 481 – 486 run along the riverbed from the shoreline toward the middle of the estuary, and are buried for most of their length. The pipes run for a distance of approximately 500 feet from the Station bulkhead, nearly directly westward beneath the estuary. At their western end, the pipes discharge nearly horizontally into the estuary, perpendicular to the dominant flow. At the discharge point, the pipes are located at a depth of about 30 feet.

The discharge flow from DSNs 481- 486 is composed primarily of wastewater used as once-through condenser cooling water from the circulating water system as well as the service water system as described below. DSNs 481, 482, 484 and 485 periodically include a limited contribution of flow from the Radioactive Liquid Waste System and DSN 48C as detailed below:

- Circulating Water System- Intake water from the river passes through the condensers for non-contact cooling of the secondary steam loop and is discharged back to the river through DSNs 481 - 486. This once-through cooling water from the circulating water system comprises the vast majority of the flow through DSNs 481 – 486. Treatment chemicals (e.g. chlorine) are not added to this once-through condenser cooling water.

- Service Water System- The service water system is a nuclear safety-related system where its discharge is classified as a low volume waste stream pursuant to 40 CFR 423. Past history has demonstrated that macro invertebrate fouling does occur in the system. Sodium hypochlorite is continuously added at the suction of the service water pumps or on the discharge side of the service water strainers (at a target concentration of 500 micrograms per liter (ug/L)), so residual chlorine may be present in the eventual discharge through DSNs 481 through 486. The circulating water system effluent residual chlorine monitor provides an electronic signal to the sodium hypochlorite injection pumps to shut down the addition of sodium hypochlorite prior to exceeding the residual chlorine effluent limitations for DSNs 481 – 486.

- Radioactive Liquid Waste System- Effluent from the radioactive liquid waste system (also known as monitor tank effluent) discharges through DSNs 481, 482, 484 and/or 485. The radioactive liquid waste system collects system leakage, floor drains, equipment leakage, decontamination liquids, wash waters, system drains, ventilation system drains, laboratory drains and sample wastes from areas of the Station which contain or may contain radioactive materials. These waste streams may also contain trace quantities of organics, analytical laboratory chemicals, decontamination solutions, or normal housekeeping and cleaning products where typical chemicals used within the areas that can drain to this system include low concentrations of chromates, hydrazine, and boron. The radioactive liquid waste system segregates, collects, processes, provides monitoring capability, recycles, and discharges waste streams that potentially contain radioactivity from various Station processes within the power generation area during normal operations, maintenance evolutions and transient conditions.

  PSEG states in its application that the effluent from the radioactive liquid waste system is normally discharged in a batch mode only after being collected in waste tanks, sampled for radioactivity, sampled for potential chemical contaminants, and the calculations are performed to ensure effluent limitations are met. The United States Nuclear Regulatory Commission (USNRC) regulates this waste stream through radiological effluent limitations, associated monitoring requirements and other licensing requirements. Solids created by the treatment of these liquid waste streams in the radioactive liquid waste system are transported to a facility licensed by the USNRC for disposal in accordance with USNRC requirements.

2. DSN 48C – Non-Radioactive Liquid Waste Disposal System (NRLWDS)

DSN 48C is an internal, low volume waste stream that discharges on a batch-type basis into DSNs 481, 482, 484 and/or 485. The purpose of the NRLWDS is the collection and treatment of secondary plant waste water

which may contain chemicals, especially acidic and caustic wastewater before discharge. The NRLWDS processes and treats the non-radioactive low volume wastes from various Station processes including:

- Regenerant, reject, and backwash waste from demineralizers and reverse osmosis units used to produce ultrapure water at Salem and at the adjacent Hope Creek Generating Station. These waste streams contain dilute acid and caustic regenerants as well as the impurities removed from the Station's well water (i.e. groundwater is also a source of water for the Station).

- Waste from chemical unloading area drains; chemical feed tank drains and floor drains; the demineralizer area sump; the No. 3 oil water skimmer; and drains from the acid and caustic area and ammonium hydroxide filling connections. The chemical unloading area drains can contain residuals due to leakage or spillage during acid or caustic truck transfers as well as precipitation. The chemical feed tanks are utilized for handling and adding feedwater treatment chemicals, primarily ammonium hydroxide, hydrazine, and ethanolamine. The tank drains, tank overflows and floor drains may contain residual treatment chemicals or wash water containing dilute cleaning agents. Effluent from the No. 3 oil skimmer may contain boiler treatment chemicals. The demineralizer sumps collect leakage, spillage, overflows, floor drains, service water sampling, venting and leakage, analytical laboratory drains from the demineralizer plant, and tank drainage from the acid and caustic storage areas. The waste from floor drains may also contain small amounts of cleaning solutions and lubricants.

- Waste from secondary analytical laboratory drains and in-line instrumentation that measures the purity of process water in the feedwater cycle. This small volume waste stream consists primarily of pure water with analytical reagents and treatment chemicals.

- Steam generator blowdown can be an influent to the NRLWDS, but is normally directed to the condensers for reuse in the system. Steam generator blowdown and drainage contains ammonium hydroxide, polyacrylic acid, hydrazine (most of which is converted to ammonia at operating temperatures), ethanolamine, trace minerals and metals.

- Recycled water and discharge from vents, drains, the analytical laboratory, and floor drains. This influent may contain NRLWDS treatment chemicals.

- Regenerant wastes from the condensate polishers where the condensate polishers remove impurities by demineralization from the steam cycle condensate water. Because these polishers are regenerated using dilute acid and caustic, the regenerant wastes contain dilute acids and caustics, impurities removed by demineralization, and residual treatment chemicals.

Influents to the NRLWDS are collected in the equalization mixing basin where some self-neutralization of the dilute acid and caustic waste occurs. If necessary, the waste stream may be treated with sodium hypochlorite or hydrogen peroxide to reduce the concentrations of ammonia and hydrazine. The waste stream is then normally routed through the No. 2 clarifier for solids removal by settling; the mix tank for pH adjustment to induce precipitation of any remaining metals; and the No. 1 clarifier for final clarification and metals precipitation. After monitoring, the discharge from DSN 48C is routed to DSNs 481, 482, 484 and/or 485. The mix tank normally is used for the addition of caustic to facilitate precipitation of metal which could include the addition of a coagulant aid.

Although the NRLWDS is designed for treatment of non-radioactive wastes, very low levels of radioactive materials can enter the system. The primary source of radioactive materials in the system is from regeneration of the condensate polisher resins. DSN 48C is a USNRC monitored pathway.

Solids generated in the NRLWDS are collected in the sludge pit, the clarifiers, or the equalization basin and are analyzed prior to disposal to determine the appropriate disposition of the residual wastes. Historically, the wastes have been classified as radioactive thereby requiring disposal in a USNRC approved facility.

3. DSN 487

Yard drains is the term used for the systems designed to collect and transport precipitation runoff and consist primarily of grated inlets and piping. DSN 487 is the North Yard Drain where the discharge components consist of river water influx, precipitation runoff, building roof drains, heating, ventilating and air conditioning (HVAC) condensate drains, floor drains (from the fire pump and fresh water tank), sump pumps, No. 2 turbine building flood pump, and the emergency discharge from the No. 3 skim tank. The primary contributor to the effluent flow is the river water influx due to the low elevation of the Station. While the No. 3 skim tank (formerly DSN 487B) normally discharges to the influent of the NRLWDS, a discharge point has been retained for the No. 3 skim tank to discharge through DSN 487 in the event of an emergency. Although it is not anticipated that routine discharge through this emergency path will occur, the provision is necessary to ensure the oils on the top of the No. 3 skim tank are not released overland in the event of a pump failure. The No. 3 skim tank is a gravity separator designed to remove oils prior to discharge to the NRLWDS.

4. DSN 489

DSN 489 is the South Yard Drain where the discharge components consist of precipitation runoff, building roof drains, No. 1 and No. 2 skim tanks, power transformer sumps, auxiliary power transformer sumps, turbine building floor drains and turbine building sump pumps. These components are routed through one of the two 40,000 gallon Highland Oil Water Separators that are installed in parallel. Only one oil water separator is normally in service.

5. DSNs 488, 490, 491, 492, and 493

DSN 488 is the West Yard Drain which is located within the secure perimeter of the Station. Due to the low elevation of the Station, the primary contributor to flow through DSN 488 is the tidal river water influx with the service water strainer backwash being the next major contributor. Other discharge components include precipitation runoff, building roof drains, building floor drains, sump pumps, No. 1 turbine building floor pump, the service water sump pumps, residual chlorine analytical wastewater, and circulating water system vents.

DSNs 490, 491, 492, and 493 are external storm drainage systems that are located outside the secure perimeter of the Station. Discharges through these outfalls consist solely of precipitation runoff from areas of the property not associated with an industrial process area. DSN 490 discharges precipitation runoff from the area of the helicopter landing pad. DSN 491, the East Yard Drain, discharges precipitation runoff from the employee parking lot and an adjacent access road. DSNs 492 and 493 discharge precipitation runoff from undeveloped areas along the access road into the Station and from the vicinity of the access road security checkpoint, respectively.

6. FAC A, B and C

The term "FAC" is intended for the "facility." FAC A, B and C are not physical outfalls but instead enable regulation of specific parameters as a sum. Specifically, FAC A designates the discharge from Unit 1 (namely DSNs 481, 482, and 483) whereas FAC B designates the discharge from Unit 2 (namely DSNs 484, 485 and 486). FAC C designates the discharge from the facility namely the discharges from Units 1 and 2 (DSNs 481 – 486). These designators are used to enable regulation of intake, effluent and differential temperature for FAC A and FAC B and intake flow and heat for FAC C.

5 Clean Water Act Regulatory Overview:

A. Section 316(a) of the Clean Water Act and Regulatory Background

The New Jersey SWQS at N.J.A.C. 7:9B-1.5(c)8 states:

"Temperature criteria at N.J.A.C. 7:9B-1.14(d) apply unless an alternative effluent limitation is approved in accordance with Section 316(a) of the Clean Water Act, 33 U.S.C. 1326(a)."

The SWQS provide that "heat dissipation areas" will be developed on a case by case basis at N.J.A.C. 7:9B-1.5(h)2.i.

All discharges from the Station are to the main stem of the Delaware River; therefore, the thermal standards listed in the Delaware River Basin Commission's (DRBC) Water Quality Regulations apply. Section 3.30.5.C.2 of the DRBC Administrative Manual-Part III, Water Quality Regulations (December 4, 2013) lists the Stream Quality Objectives for temperature for Zone 5 of the Delaware River. These regulations require that the water temperature in the receiving water not be raised by more than $4^{o}F$ ($2.2^{o}C$) during the period from September through May and no more than $1.5^{o}F$ ($0.8^{o}C$) during the period from June through August, nor shall the maximum temperature exceed $86^{o}F$ ($30^{o}C$), except in designated heat dissipation areas (HDAs). Section 4.30.6.F.4 of DRBC's Administrative Manual-Part III, Water Quality Regulations (December 4, 2013) defines the dimensions of the HDA for Zone 5 (the regulatory HDA). It states that as a guideline, HDAs shall not be longer than 3,500 feet, measured from the point where the waste discharge enters the stream. In the event that these limits cannot be met at the discharge point or within the defined heat dissipation area, then the permittee can request a Section 316(a) variance which would allow an alternative effluent limit for temperature.

PSEG requires a Section 316(a) variance from the SWQS because temperature changes (ΔT's) due to the station's thermal discharge exceed the Stream Quality Objectives for temperature beyond the regulatory HAD for part or all of the year. Section 316(a) of the CWA applies to point sources with thermal discharges. It authorizes the National Pollutant Discharge Elimination System (NPDES) permitting authority to impose alternative effluent limitations for the control of the thermal component of a discharge in lieu of the effluent limits that would otherwise be required under sections 301 or 306 of the CWA. Specifically, Section 316(a) authorizes variances from thermal SWQS where it is shown that the alternative limit proposed will "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife" in the receiving water.

The implementation of CWA Section 316(a) Thermal Variances in NJPDES permits is outlined in a memorandum dated October 28, 2008 from Director James A. Hanlon of EPA's Office of Wastewater Management to Water Division Directors in Regions 1 to 10. This memorandum makes specific mention of the 1977 draft CWA section 316(a) guidance entitled "*Interagency 316(a) Technical Guidance Manual And Guide For Thermal Effects Sections Of Nuclear Facilities Environmental Impact Statements."* This guidance provides valuable technical information on conducting 316(a) demonstrations, useful to both facilities and permitting authorities.

EPA's regulations implementing Section 316(a) are at 40 CFR 125.70-73. EPA recognized the difficulty of evaluating the entire community and all the members of it and thus established Representative Important Species (RIS). The assumption is that if the RIS are doing well, then the entire community should also be doing well. Thus, a 316(a) demonstration can focus primarily or even entirely on RIS where RIS is defined at 40 CFR Part 125.71.

There are several methodologies a discharger may pursue in making a 316(a) demonstration. New dischargers must use predictive methods (e.g., laboratory studies, literature surveys, or modeling) to estimate an appropriate alternate thermal limit that will assure the protection and propagation of a balanced, indigenous community prior to commencing the thermal discharge. Existing dischargers can choose between submitting a predictive study or a demonstration of "absence of prior appreciable harm" to the balanced, indigenous community. Specifically, 40 CFR 125.73(c) states the following:

(1) Existing discharges may base their demonstration upon the absence of prior appreciable harm in lieu of predictive studies. Any such demonstrations shall 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.

(2) In determining whether or not prior appreciable harm has occurred, the Director shall consider the length of time in which the applicant has been discharging and the nature of the discharge.

This provision was adopted in 1979, 44 Fed. Reg. 38948, and has not been amended since then.

B. Section 316(b) of the Clean Water Act and Regulatory Background

Section 316(b) "require[s] that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact." The majority of environmental impacts associated with intake structures are caused by water withdrawals that ultimately result in aquatic organism losses. In that regard, cooling water intakes can have two types of effects, namely impingement and entrainment.

Impingement takes place when organisms are trapped against intake screens by the force of the water passing through the CWIS. Impingement can result in starvation and exhaustion (organisms are trapped against an intake screen or other barrier at the entrance to the CWIS), asphyxiation (organisms are pressed against an intake screen or other barrier at the entrance to the CWIS by velocity forces that prevent proper gill movement, or organisms are removed from the water for prolonged periods of time), and descaling (fish lose scales when removed from an intake screen by a wash system) as well as other physical harm.

Entrainment occurs when organisms are drawn through the CWIS into the cooling system. Organisms that become entrained are normally relatively small benthic, planktonic, and nektonic organisms, including early life stages of fish and shellfish. Many of these small organisms serve as prey for larger organisms that are found higher on the food chain. As entrained organisms pass through a plant's cooling system they are subject to mechanical, thermal, and/or toxic stress. Sources of such stress include physical impacts in the pumps and condenser tubing, pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers, shear stress, and chemical toxemia induced by antifouling agents such as chlorine.

EPA interprets the "best technology available" (BTA) standard to require use of the best technology available commercially at an economically practicable cost. CWIS technology is not BTA if its costs are "wholly disproportionate" to its environmental benefits. *In re Pub. Serv. Co. of New Hampshire*, 1 E.A.D. 332, 340 (EPA Final Decision, June 10, 1977). EPA issued final regulations under Section 316(b) for Phase II existing facilities (such as PSEG-Salem) which became effective September 7, 2004. The 2004 final Phase II regulation (2004 Phase II rule) established impingement requirements which required the number of organisms pinned against parts of the intake structure to be reduced by 80 to 95 percent from uncontrolled levels. Entrainment requirements called for the number of aquatic organisms drawn into the cooling system to be reduced by 60 to 90 percent from uncontrolled levels. The 2004 Phase II rule provided several compliance alternatives, such as using existing technologies, selecting additional fish protection technologies (such as screens with fish return systems), and using restoration measures. In its 2004 Phase II rule EPA expressly declined to mandate closed-cycle cooling systems in part due to the high costs of retrofitting existing facilities with cooling towers.

These rules were challenged by environmental plaintiffs and were overturned in part by the Second Circuit in *Riverkeeper, Inc. v. EPA*, 475 F.3d 83 (2d Cir. 2007). The Second Circuit held that EPA could not consider costs to establish BTA and directed EPA to reconsider key provisions of the rules, including EPA's determination of BTA, the performance standard ranges, the cost-cost and cost-benefit compliance alternatives, the Technology Installation and Operation Plan (TIOP) provision, and the restoration provisions. Following the Second Circuit's

ruling, EPA suspended the Phase II Section 316(b) regulations. *Suspension of Regulations for Cooling Water Intake Structures at Phase II Existing Facilities*, 72 Fed. Reg. 37,107 (July 9, 2007). Pursuant to this suspension, EPA directed states and permitting authorities to issue 316(b) permits on a case-by-case basis in accordance with their Best Professional Judgment (BPJ) pursuant to 40 CFR 125.90(b) and 40 CFR 401.14.

The Second Circuit decision was appealed to the Supreme Court, which agreed to consider "whether 316(b) of the Clean Water Act, 33 United States Code (U.S.C.) 1326(b), authorizes the EPA to compare costs with benefits when determining the 'best technology available for minimizing adverse environmental impacts' at cooling water intake structures?" *Entergy Corp. v. EPA*, 552 U.S. 1309 (2008).

In 2009 the Supreme Court reversed and remanded the case, holding that EPA may use cost-benefit analysis in determining BTA. *Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009) (finding the "wholly disproportionate" test consistent with EPA's discretion under Section 316(b) to "avoid extreme disparities between costs and benefits" when determining BTA). On remand the Second Circuit granted EPA's request to return the rules to the Agency for further consideration. *Riverkeeper, Inc. v. EPA*, No. 04-6692 (2d. Cir. Sept. 29, 2009) (order remanding to EPA).

In November 2010, EPA entered into a consent decree with the Riverkeeper, Inc. and other environmental plaintiffs to draft and issue new regulations over the next two years. EPA agreed to propose new Section 316(b) rules by March 28, 2011, with the goal of issuing final rules on July 27, 2012. EPA consequently published draft regulations in the Federal Register entitled *Cooling Water Intake Structures at Existing Facilities and Phase I Facilities*, 76 Fed. Reg. 22,174 (April 20, 2011). In the draft rules, EPA proposed that Ristroph screens and equivalent modified traveling screens may be BTA for Phase II facilities and relied upon this finding as the basis for EPA's compliance cost estimates in the rule proposal. *Id.* at 22,203, 22,214. Commenting on the proposed rules, the Department wrote that it "wholeheartedly agrees that the selected best technology available determination of modified Ristroph traveling screens with a fish return is an effective and available technology." NJDEP Comment 17, Docket No. EPA-HW-OW-2008-0667-2153 (August 17, 2011).

EPA sought and was granted four extensions by the environmental plaintiffs to complete revisions in its final rules. The extensions have allowed EPA to respond to the comments received on the proposal, which were numerous and complex in nature, and gave the Agency additional time to collect and review new data. On February 10, 2014 EPA announced a revised deadline of April 17, 2014 for release of the final rules.

On May 19, 2014 EPA released an unofficial pre-publication version of the final regulations to establish requirements under Section 316(b) of the Clean Water Act for all existing power generating facilities and existing manufacturing and industrial facilities that have surface water intakes. The final regulations became official when published in the Federal Register on August 15, 2014 (2014 Rule). See 79 Fed. Reg. 48300. Existing facilities that withdraw more than 2 MGD of water from waters of the United States and use at least 25 percent of that water exclusively for cooling purposes must comply with the new 316(b) regulations. The regulations establish national performance standards that represent a baseline level of protection required of all affected facilities, and the regulations allow NPDES administrators to require additional safeguards for aquatic life based on site-specific considerations.

There are three components to the final 2014 rule:

(1) Existing facilities that withdraw at least 25 percent of their water from an adjacent waterbody exclusively for cooling purposes and have a design intake flow of greater than 2 MGD are required to reduce fish impingement. To ensure flexibility, the owner or operator of the facility will be able to choose one of seven options for meeting BTA requirements for reducing impingement.

(2) Facilities that withdraw very large amounts of water – at least 125 MGD – are required to conduct studies to help the permitting authority determine what site-specific entrainment mortality controls, if any, will be required. This process will include public input. PSEG-Salem is in this category.

(3) New units at an existing facility that are built to increase the generating capacity of the facility are required to reduce the intake flow to a level similar to a closed cycle, recirculating system. This can be done by incorporating a closed-cycle system into the design of the new unit, or by making other design changes equivalent to the reductions associated with closed-cycle cooling.

These regulations became effective on October 14, 2014.

As part of the issuance of the final regulations, EPA distributed guidance regarding the implementation of federal regulations with respect to the timing of the regulations and applicable requirements. Specifically, EPA stated that if the Director (e.g. state permitting authority) began a permit renewal prior to October 14, 2014 (before the effective date of the final rule), the Director may issue a permit based on the information already supplied by the applicant without the need to supplement to meet additional reporting and study requirements of the new regulations, so long as the permit is issued before July 14, 2018. However, the NPDES permitting authority has discretion to require additional information from the applicant, where necessary, for determining appropriate permit conditions. Here, the Department may review PSEG-Salem's renewal permit based on already prepared studies, or it may request any technical studies or information required by the final regulations that have not previously been submitted as the Department deems necessary.

C. Endangered Species Act Consultation

The Clean Water Act does not address endangered species, nor does this permit authorize take, as defined by the Endangered Species Act (ESA), 16 U.S.C. 1532(19). The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) (collectively the Services) have determined that any impingement (including entrapment) or entrainment of Federally-listed species constitutes take. Such take may be authorized pursuant to the conditions of a permit issued under 16 U.S.C. 1539(a) or where consistent with an Incidental Take Statement contained in a Biological Opinion pursuant to 16 U.S.C. 1536(o). See 40 CFR 125.98(j).

EPA included a provision at 40 CFR 125.95(f) that requires a facility in its permit application to identify all Federally-listed threatened and endangered species and designated critical habitat that are or may be present in the action area. Further, the rule requires that the NPDES permitting authority transmit all permit applications to the Services to allow a 60 day review, which takes place prior to the public notice of the State's draft permit. The Services are expected to respond within 60 days and provide any corrections to the list of Federally-listed threatened and endangered species and critical habitat included in the permit application, and any measures that the Services recommend (including monitoring and reporting) for the protection of listed species. In addition, the State must copy the Services on the issuance of the draft permit, giving the Services an opportunity to review the draft permit and provide additional input or suggested control measures to address effects to listed species or critical habitat.

Among the recommendations that may be made by the Services to the facility and the Director are measures to minimize incidental take. EPA expects that any measures the Services recommend to minimize incidental take will be consistent with ESA regulations and guidance, which state at 50 CFR 402.14(i)(2), "Reasonable and prudent measures, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, or timing of the action and may involve only minor changes." EPA does not expect that installation of closed-cycle cooling would be specified as a measure solely for the purposes of minimizing incidental take.

The Department shared the 2006 PSEG NJPDES renewal application with USFWS as well as the NMFS. Specifically, the Department sent electronic copies of the application to Christine Vaccaro, Fisheries Biologist for NMFS on February 2, 2015 and to Eric Schrading of the USFWS on January 21, 2015. On April 3, 2015, Steve Mars of the USFWS completed this consultation with a finding of no federal threatened and endangered species in the project area that is under USFWS jurisdiction. As a result, USFWS did not provide any additional input or suggested control measures. No comments were received on the permit application from the NMFS at the time of the draft permit issuance.

The Department is also providing copies of this draft NJPDES permit to the USFWS as well as the NMFS in accordance with N.J.A.C. 7:14A-15.10(e)2.

When the Nuclear Regulatory Commission extended PSEG-Salem Unit 1 and Unit 2 licenses in 2014, the NMFS issued a biological opinion for the continued operation of the Station (see www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/salemhcnmfsfinalbiopjuly172014.pdf). This biological opinion was required by Section 7 of the ESA, which directs federal agencies to consult with the Services before approving an action that will affect an ESA-listed species. In its July 2014 biological opinion, NMFS concluded that license extension by NRC to permit the Station to continue operating with once-through cooling "may adversely affect but is not likely to jeopardize the continued existence of any [ESA] listed species." As a condition to exempting "incidental takes" of ESA listed species by the PSEG-Salem CWIS, particularly sea turtles and sturgeon, NMFS is requiring PSEG-Salem to undertake certain Reasonable and Prudent Measures (RPMs) to minimize and monitor incidental takes. These RPMs are described in NMFS's biological opinion and compliance will be ensured by USNRC.

6 NJPDES Permit History:

A. Legal History

The Federal Water Pollution Control Act (the Clean Water Act or CWA), 33 U.S.C. 1251 et seq., authorizes federal and state agencies to regulate discharges of pollutants to surface waters through the NPDES permit program. In 1972, Congress enacted the CWA requiring all point source dischargers of pollutants, including heat, to obtain a permit from EPA or from a state with delegated permitting authority. The EPA, which originally administered the NPDES program for New Jersey, delegated program authority to the Department in 1982. The Department implements the NPDES program through the NJPDES regulations (N.J.A.C. 7:14A-1 et seq.) which were promulgated pursuant to the authority of the New Jersey Water Pollution Control Act N.J.S.A. 58:10A-1 et seq.

B. 1994 NJPDES Permit

A NJPDES permit for this facility was issued to PSE&G-Salem Generating Station (the permittee at that time) on July 20, 1994 with an expiration date of August 31, 1999. In its July 20, 1994 NJPDES permit, the Department granted PSE&G's request for a variance pursuant to Section 316(a) and proposed thermal limits which would allow the continued operation of the existing once-through cooling system. With regard to Section 316(b), the Department determined that "best technology available" (BTA) consisted of the existing CWIS, modifications to the intake screens and an improved fish bucket design; a restriction on cooling water intake flow; and a sound deterrent study. The Department also required a variety of other "Special Conditions". To summarize the BTA requirements as well as the Special Conditions, these permit requirements can be grouped under three categories as follows:

- Special Conditions Requiring Actions at the Station's Circulating Water Intake Structure Considered to be Best Technology Available – an intake flow limitation, upgrading of the intake screens, and the conduct of a study to determine whether sound would be a feasible and effective technology at PSEG-Salem to deter fish from the plant's intake screens.

- Special Conditions Requiring Actions in the Estuary to Produce Fish – undertake a wetlands program to restore and/or preserve at least 8,000 acres of wetlands, plus 2,000 acres of additional wetlands or 6,000 acres of associated upland buffers, or a combination thereof based on a 1:3 wetlands/uplands buffer acreage ratio. The permit also required a Deed of Conservation Restriction to preserve up to 18,500 acres of lands, wetlands and uplands including the 4,500 acre Bayside Tract. The permit further required PSE&G to install five fish ladders to eliminate barriers to migration for anadromous fish.

- Special Conditions Requiring Actions to Develop and Implement a Comprehensive Biological Monitoring Program - requirement to perform baywide abundance monitoring, perform comprehensive monitoring of the thermal plume, impingement and entrainment monitoring, abundance monitoring in connection with the fish ladder sites, detrital production and pesticide release monitoring at marsh restoration sites. The permit also required PSE&G to establish a Monitoring Advisory Committee (MAC) to provide technical advice to PSE&G concerning the design and implementation of the Company's biological monitoring program and a Management Plan Advisory Committee (MPAC) to provide technical advice to PSE&G concerning the development and implementation of the wetlands restoration program. These two committees were to be composed of representatives of federal and state environmental and resource protection agencies, independent scientists and, in the case of MPAC, representatives from local governments.

The wetlands restoration program was intended to increase fish productivity in the Delaware Estuary. The amount of acreage selected for the program was determined and mandated in the July 20, 1994 permit by determining the amount of *Spartina* and other associated plants that would be produced each year and the resulting detrital plant biomass available in Delaware Bay by decomposition by fungi, bacteria and other micro-organisms. These in turn would be consumed by zooplankton and various small invertebrates which forms the food base for fish. These ecological concepts, along with specific quantities, formed the basis of the aggregated food chain model and was used to translate estimated fish losses at the Station to acres of wetlands required to adequately mitigate those losses. The Department calculated that a minimum of 7,487 acres should be restored to increase fish productivity to a level that equals the fish estimated to be lost at the cooling water intake structure. The permittee proposed to restore a minimum of 10,000 acres to provided added assurance that fish production will be increased to sufficient levels to mitigate the effect of PSEG-Salem related losses.

After the July 20, 1994 NJPDES permit was issued, the Delaware Natural Resource Environmental Commission (DNREC) and the Delaware Riverkeeper each requested an adjudicatory hearing before the New Jersey Office of Administrative Law to challenge the 1994 Permit. PSE&G thereafter entered into settlement agreements with DNREC and the Delaware Riverkeeper resolving their challenges. As a result, both entities withdrew their hearing requests. Under the DNREC Settlement, PSE&G agreed, among other matters, to restore a minimum of 3,000 acres of degraded wetlands and acquire up to 2,000 acres of upland buffers in addition to the acreage required in the permit, and to construct artificial reefs, all in Delaware. These measures were designed to benefit the aquatic populations of the estuary and provide an expanded wetlands habitat.

C. 2001 NJPDES Permit

The permittee submitted a NJPDES renewal application on March 4, 1999 prior to the expiration of the July 20, 1994 permit on August 31, 1999. The 1999 renewal application was reviewed by Department staff including extensive inspection and input regarding the progress of the wetland restoration sites as related to their progress. Various Department programs were part of the renewal process including representatives from the Division of Fish and Wildlife, Land Use Regulation Program, the Division of Water Quality, and the Southern Bureau of Water Compliance and Enforcement. To assist in its review of certain parts of the application, the Department hired an outside contractor, namely ESSA Technologies, Ltd. (ESSA) of Richmond Hill, Ontario, Canada, for those issues associated with Section 316(b) of the CWA. This included impingement and entrainment impacts, available intake protection technologies (including natural draft and mechanical draft cooling towers), cost/benefit analysis and the status of fish populations (e.g. predictive and retrospective assessments of power plant impacts to fisheries, biostatistics, fish population dynamics and fisheries economics) in the Delaware Estuary. Overall, the contractor evaluated the accuracy, completeness and appropriateness of the conclusions reached in the application given the methodologies and data used.

The Department issued a NJPDES permit renewal on June 29, 2001 which became effective August 1, 2001. The Department determined that closed-cycle cooling was not an available technology for Salem because the costs of retrofitting the Salem plant with this technology were wholly disproportionate to the additional environmental benefits as compared to the state-of-the-art modified Ristroph traveling screens already installed at the Station. Specifically, the Department accepted PSEG's estimates that retrofit of cooling towers would involve a complicated and wide-scale construction project involving substantial costs. Those costs in the March 4, 1999

application were estimated at $712,000,000 for a natural draft cooling tower and $849,200,000 for mechanical draft cooling towers. The Department also determined that the evidence of record indicated that retrofitting closed-cycle cooling would result in increased air pollution and other potential adverse environmental impacts. Based on these findings, the Department concluded that the costs of a closed-cycle cooling system were not wholly disproportionate to the expected environmental benefits.

In its June 29, 2001 final permit, the Department determined that a continued intake flow limitation, continued use of the modified Ristroph intake screens, further improvements to the fish return system, and study of a multi-sensory hybrid system constituted BTA under Section 316(b). Consistent with the 1994 NJPDES permit, the Department did not designate the wetlands restoration program and fish ladder requirements as best technology available under Section 316(b) nor were these actions required in lieu of cooling towers. The Department incorporated this plan, after it was proposed by PSEG outside of what was required under Section 316(b), as a special condition to the permit because of its environmental benefits and because it would continue to help minimize the potential for adverse impact from the CWIS. PSEG established the Estuary Enhancement Program (EEP), which is described in greater detail later in this document, to implement these requirements as well as other permit requirements.

The 2001 NJPDES permit also contained a wide spectrum of "Special Conditions" that were intended to minimize environmental impacts related to the Station's cooling water system. Specifically, the 2001 permit renewal carried over and/or revised many of the Special Conditions set forth in the July 20, 1994 NJPDES permit plus added new requirements based on the recommendations of ESSA. The 2001 permit also provides a thermal variance for the discharge from DSN's 481 – 486 based on Section 316(a) of the CWA.

D. DRBC Docket

Because the thermal discharges from the Station are to the main stem Delaware River, the thermal standards listed in DRBC's Water Quality Regulations apply. On June 30, 1995, PSEG submitted an application to DRBC which included an updated characterization and biothermal assessment of PSEG-Salem's thermal discharge. This application also requested a revision of the docket heat dissipation area to enable PSEG-Salem's thermal discharge to comply with DRBC's thermal water quality regulations as well as revisions that would incorporate the requirements of the 1994 permit into the docket. On September 27, 1995 DRBC issued Docket No. D-68-20 CP (Revised) and approved the requested revisions conditional on compliance with all USNRC and NJPDES conditions. DRBC amended PSEG's 1995 Docket by resolution on December 8, 1999 and determined that the docket would continue in effect contingent on renewal of the NJPDES permit.

DRBC issued Docket No. D-68-20 CP (Revision 2) on September 18, 2001 to PSEG for the Station consistent with the 2001 NJPDES Permit. The purpose of this docket was to revise the heat dissipation area specified in DRBC Docket No. D-68-20 CP (Revised) for the thermal discharge of the Station and to incorporate modifications reflecting requirements of the 2001 NJPDES permit. The docket remains in effect for a term of 25 years from the date of approval. Additional information regarding thermal issues is included in Section 9 of this Fact Sheet.

E. 2006 NJPDES Permit Application Renewal

PSEG-Salem submitted a NJPDES permit renewal application on February 1, 2006. The application is voluminous and consists of fourteen 4-inch binders. This application was timely filed; therefore, the existing permit remains in full force and effect until such time as a renewal is issued in accordance with N.J.A.C. 7:14A-2.8. The 2006 NJPDES application consists of the following components: Executive Summary; Estuary Enhancement Program Overview and Memorandum in Support of Renewal; NJPDES Application Forms; Section 316(b) Comprehensive Demonstration Study; Assessment of Station Impacts (Adverse Environmental Impact Assessment); Assessment of Alternative Intake Technologies; and Restoration Production Estimates. At the time that the 2006 NJPDES application was submitted, the September 7, 2004 Section 316(b) Phase II rule was in effect and was not repealed until July 9, 2007, therefore PSEG-Salem's renewal application addressed the standards of the 2004 Phase II rule.

The 2004 Phase II Rule established national performance standards to address impingement mortality and entrainment of fish and shellfish. These standards required that impingement mortality be reduced to between 80 and 95 percent of a calculation baseline mortality rate. Permittees could demonstrate compliance with these standards through various options including installing certain technologies or demonstrating compliance with the reductions based on existing or proposed design and construction technologies, operational measures, and/or restoration measures. Permittees were required to demonstrate compliance through submission of a report entitled the Comprehensive Demonstration Study (CDS). As described in the 2004 Phase II Rule, the CDS serves to characterize impingement mortality and entrainment; describes the operation of the CWIS; confirms that the technologies, operational measures, and/or restoration measures selected satisfy the performance standards; and identifies ongoing requirements to ensure continued satisfaction of the performance standards.

PSEG submitted a CDS in the February 1, 2006 renewal application. Some of the CDS components include an impingement mortality and entrainment characterization study; design and construction technology plan; TIOP; restoration plan; information in support of a site-specific determination of BTA based on the cost-cost test; information in support of a site-specific BTA based on cost-benefit analysis; site-specific technology plan required in conjunction with site-specific BTA determinations; and a verification monitoring plan.

Since the 2004 Phase II rule has been repealed, it is important to highlight the fact that the CDS portion of the 2006 application is written to comply with a different rule (i.e. 2004 Phase II rule) than the rule (i.e. 2014 rule) that is applicable today. While much of the technical information included in the 2006 application is still relevant, the ultimate compliance demonstration and the context of compliance has been significantly altered under the 2014 rule.

While not required by the 2004 Phase II rule, the 2006 renewal application also includes an assessment of station impacts. PSEG contends that numerous studies performed by PSEG as well as state and federal agencies have demonstrated that the health of the Delaware Estuary has been improving for over thirty years. This includes continuous impingement and entrainment sampling at the plant as performed since 1977 as well as baywide sampling. Baywide sampling includes juvenile abundance sampling as performed by PSEG since 1985 as well as long-term data on juvenile abundance in the Delaware Estuary as collected by NJDEP and DNREC for over thirty years. PSEG contends that the long term trend data shows no decline in juvenile abundance that can be attributable to PSEG-Salem; no change in the number of finfish species; and that finfish density has increased. Finally, PSEG contends that the fisheries analysis shows that reducing or eliminating impingement/entrainment would not measurably change the reproductive potential or spawning stock biomass of any of these species.

7 Specific Details on Certain Special Conditions in 2001 NJPDES Permit:

A. Overview

The following is a brief summary of some of the Section 316 Special Conditions from the 2001 NJPDES permit. Many of the below described special conditions are relevant to the 2014 Section 316(b) rule or have been retained in this renewal permit; therefore, additional detail and background is appropriate.

B. Intake Screens and Fish Return System

1. Traveling Screens

There have been three distinct traveling screen designs at PSEG-Salem. The original Linkbelt screen assembly was designed for intermittent operation and debris handling only, with no fish handling capabilities. All material removed from the water by the traveling screens was placed in a trash basket for off-site disposal. The original mesh was 3/8-inch-square opening. In the second design in the late 1970s, the screen assembly was modified to incorporate Ristroph vertical traveling screens with the capability for continuous operation and fish handling. Unit 1 was retrofitted in 1979, while Unit 2 which became operational in 1981, was constructed with Ristroph screens. The original mesh with a 3/8-inch-square opening was maintained and

mouthed in the screen frame at an "inclined to descent" attitude to the carrier chain centerline, attached to the backside of both the leading and trailing rails.

In 1995 and 1996, as required by the 1994 NJPDES permit, PSEG made additional alterations to the traveling screen system to improve performance and reliability and increase the survival rates of impinged fish. The new traveling water screens are a modified Ristroph design. The modified Ristroph screen unit is a vertical, chain-link, four-post type machine on which the screen rotates continuously to collect debris as water passes through the screen. Each traveling screen panel is 10 feet wide by 21 inches high with a composite, not metallic, material frame. Each traveling screen contains 62 panels. The wire mesh on each screen panel is 14-gauge stainless steel Smooth Tex® screening material with openings ¼ inch wide by ½ inch high. At the bottom of each screen panel is a composite material fish bucket. The type of mesh opening and weave were chosen because they were shown to reduce mortality. The smooth outer surface provides for easier removal of fish and debris, enhancing the survival of organisms impinged on the screens.

As the bucket travels over the head sprocket of the traveling screen, impinged organisms slide down the screen face and are washed into a trough by a low pressure spray system. One low pressure spray header is located outside the screen unit and two low pressure spray headers and nozzles are located inside the screen unit. The spray and organisms are washed into a fiberglass (18 x 30-inch) trough. As the panel rotates to the fish removal position, the spray wash water helps to slide the fish on the screen surface over a flap seal into the fish return trough. As the panels continue to travel, the remaining debris is removed into a debris trough using two inside high pressure spray headers with spray nozzles. The fish and debris troughs are joined after the troughs leave the intake structure building. The fish and debris troughs are emptied in the estuary north of the CWIS on flood tide, and south of the CWIS on ebb tides, to carry organisms away from the CWIS, thus minimizing the likelihood of re-impingement.

The rotational speed of the traveling screen automatically increases as debris accumulates and restricts flow through the screens. Due in parts to the lighter composite material, the screens are capable of operating nominally at 6, 12, 17.5, and 35 feet per minute (fpm).

2. Fish Return System

PSEG replaced the original rectangular trough assemblies for fish and debris with custom-formed troughs in 1990. The fish return trough is now approximately 30 inches wide and 18 inches deep with 6 inch radius rounded corners at the bottom. Smooth fiberglass material forms the trough, which minimizes any damage to the fish while traveling along the trough. Water depth in this bi-directional fish return system is maintained at approximately three inches with one unit operating and greater than three inches with both units in operation (normal configuration). The intersections of the fish and debris troughs were redesigned to enhance fish survival. The fish trough is aligned parallel to and above the debris trough. At the end of the fish trough the water from the fish trough drops into the debris trough and is cushioned by the water in the debris trough. The neoprene flap seals between the traveling screen frames and the troughs were also redesigned to improve sealing, facilitate the entry of fish into the troughs, and allow for installation and adjustment of the seals during operation.

3. Ranking of RIS Vulnerability

As per the 2001 permit, PSEG was required to submit a ranking of best to worst (i.e. most vulnerable or frail) RIS for which the Ristroph screens are most effective at minimizing mortality. PSEG uses an RIS approach for its Section 316(a) and Section 316(b) demonstrations. As described previously under Section 316(a), the RIS concept originated in EPA guidance documents where EPA recognized the difficulty of evaluating the members of the entire community and thus established RIS. The assumption is that if the RIS are doing well, then the entire community should also be doing well.

The permittee submitted a Ranking of RIS Vulnerability report dated October 30, 2001 as prepared by Lawler, Matusky and Skelly Engineers, LLP. The following table represents the mortality rate ranking (lowest to highest) for RIS Species based on 1996 through 2000 data.

Mortality Rate Ranking for RIS Species					
Rank	**Species**	**Annual Mortality**	**Minimum (%)**	**Maximum (%)**	**Total Number Sampled**
1	Striped Bass	4.66	2.10	6.87	1,505
2	White Perch	6.29	0.95	33.63	24,757
3	Spot	6.6	--	--	132
4	Atlantic Croaker	22.64	3.86	44.86	135,186
5	American Shad	23.95	--	--	40
6	Blueback Herring	27.39	14.11	43.38	4,150
7	Alewife	39.15	17.41	43.01	551
8	Weakfish	47.77	10.28	65.25	26,400
9	Bay Anchovy	58.02	27.48	83.97	10,235

The effectiveness of the modified Ristroph screens for reducing impingement mortality is generally high, but dependent on the species and months involved. As noted in the report, while a list ranking species solely on the basis of mortality can be useful, species with high impingement mortality but very low abundance may be of lesser immediate concern than a species with moderate mortality and high abundance.

To include the relative abundance in the ranking process, the report also contains a ranked list based on standardized impingement losses along with a description of the detailed methodology for developing such. Ranking results based on 1996-2000 data indicate that three species (Atlantic croaker, weakfish, and bay anchovy) account for nearly 88% of the RIS losses. Of these, Atlantic croaker and weakfish both have relatively low initial mortality and relatively low latent mortality for much of the year. It appears that total mortality increases for these two species during periods of extreme temperature (either high summer or low winter temperatures) or when the earliest, most fragile, life stages are susceptible to impingement. Bay anchovy shows a somewhat similar pattern of highest mortality during temperature extremes or early life stages. Bay anchovy, however, is much more fragile than either weakfish or Atlantic croaker where both initial and latent mortality rates are moderately high.

On a seasonal basis there is a reasonably clear segregation of dominant species. During the winter months, December through March, standardized losses of Atlantic croaker surpass all other species. During spring, April and May, adult bay anchovy become the predominant source of standardized impingement losses.

4. Further Study and Enhancements of Fish Return System

As per the 2001 permit, PSEG was required to submit a work plan for a study to determine ways to minimize the stresses and mortalities found associated with the fish return sluice and sampling pool that considered alternate flows, velocities, and depth profiles. The work plan submitted by PSEG outlined a Plan of Study to be completed in two phases. Phase 1 consisted of analyses and studies conducted to investigate the stresses associated with fish passage through components of the intake structures. Phase 2 focused on further testing of design and operational changes that could demonstrate reductions in mortality. The work plan was approved by the Department on April 30, 2002.

On December 31, 2002, this report was submitted to the Department to document laboratory and in situ studies conducted to address mortality associated with the fish return sluice (trough), sampling pool, and return pipe discharge. PSEG also performed additional investigations to evaluate any potential mortality caused by screen wash pressure. Results from the studies and evaluation concluded that the fish collection/sampling system and the fish return system are not resulting in any additional mortality to impinged fish beyond that inherent to the impingement process.

5. Geiger Screens

Subsequent to the issuance of the 2001 permit, PSEG expressed an interest in exploring alternate screen designs to improve debris handling through pilot testing on two alternate screen designs. The first design consisted of a front wash system on two of the twelve separate intake bays, at the northern end of the intake structure. The second design consisted of a new Geiger MultiDisc Rotary screen on one of the traveling screens at PSEG-Salem's intake structure. The Geiger MultiDisc Rotary screen consists of circulating sickle shaped mesh panels connected to a revolving chain. The screen is equipped with small buckets to hold the fish and other organisms. A front wash spray system helps transfer the organisms and any collected debris down the fish return trough back into the Delaware Estuary. PSEG selected the new wash system and screens based on positive results at other cooling water intake structures at other facilities particularly with debris removal. For the front wash screen design, PSEG proposed to conduct impingement monitoring three days a week which is consistent with the monitoring frequency on the other traveling screens. In addition to the three days a week sampling frequency, PSEG proposed to collect additional samples at the bays equipped with Geiger screens. Upon completion of the pilot study, PSEG learned that the Delaware Bay debris proved especially difficult. The debris tended to "staple" itself to the mesh, and could not be washed away with the spray system.

C. Multi-Sensory Hybrid Intake Protection Technology (MSHIPT)

1. Background

The 2001 permit required further study of a multisensory hybrid system as part of the BTA determination. This requirement built on the fact that the use of sound as an intake protection was a component of the 1999 application. The 1994 NJPDES permit required PSEG to submit a Plan of Study (POS) for assessing the feasibility of deterring fish from the area of the intake using underwater speakers or sound projectors; implement the POS in accordance with the schedule approved by the Department; and file a report of the results on or before March 4, 1999. The permit also required that the POS provide for an assessment of the potential for detrimental effects of sound deterrent systems on fish species in the Delaware Estuary.

The 1994 POS was submitted to and approved by the Department. Sound deterrent feasibility studies were conducted using the nine PSEG-Salem finfish RIS, namely, weakfish, bay anchovy, white perch, Atlantic croaker, spot, striped bass, alewife, American shad and blueback herring. Two series of cage tests were performed in 1994 to identify sounds that would potentially be effective in repelling fish from the intake during subsequent in-situ tests. The cage tests involved exposing fish to a wide range of sounds that varied in frequency, waveform, sound pressure level (SPL), pulse width and interval duration. The POS provided that cage tests would be followed by in situ tests at the intake. Because PSEG-Salem was not operating at full power in 1996 and 1997, the sound feasibility study, including the in situ testing, was not completed until 1998.

PSEG obtained the assistance of Dr. Arthur N. Popper, an expert on aquatic bioacoustics, in designing the tests conducted in 1998. PSEG implemented in 1998 a revised Plan of Study for additional cage testing. Following the conclusions of these 1998 cage tests, in situ testing was conducted at the PSEG-Salem intake in the summer and fall. PSEG also performed studies to assess whether the sounds used at the PSEG-Salem intake during in situ testing could have adverse effects on fish behavior.

The 2001 NJPDES permit acknowledged PSEG's comprehensive efforts in its study of sound deterrents, specifically the 1994 and 1998 Cage Tests; the literature review; the 1998 In-Situ Tests and the Sound Larval Data study. Specifically, the Department's consultant ESSA stated, "For the required study of the effects of sound as a fish deterrent, the investigators did a thorough job in data collection and analysis. It is indeed one of the most comprehensive data collections on sound and fish response to date." ESSA continues with "Considerable inconsistency in results occurred between 1994 and 1998. After examining all the data, we cannot recommend sound as a single deterrent system for excluding all RIS species at Salem GS. There was simply not enough impingement reduction demonstrated." However, on page 32 ESSA states "The 1994

results were positive on the issue of ultrasound for repelling alosids at Salem GS [Generating Station]. This is also consistent with the literature for alosid species in other locations - e.g. alewife, blueback herring and American shad (Dunning et al. 1992, Nesler et al. 1992, Ross et al 1993, Ross et al. 1996)." Based on the review of sound studies detailed above, the Department required further study of sound deterrents as part of a hybrid system including the study of far field attraction behavior or potential acclimation.

2. Summary of MSHIPT Phase 1 Studies

MSHIPT Phase 1 testing took place from 2002 to 2003 and included an extensive literature review and laboratory testing of selected technologies. Testing was conducted in a flume in which hydraulic and environmental conditions were controlled to reduce the potential for fish responses to be confounded by factors other than the behavioral stimuli that were tested. Behavior stimuli testing included strobe, air bubbles and sound. Based on identified vulnerability to impingement at CWIS during specific times of the year, weakfish, blueback herring, Atlantic croaker, and bay anchovy were selected in Phase 1 testing.

The general approach for evaluating the behavioral deterrents involved comparisons of the behavior and distribution of test fish during baseline (no stimulus) and treatment (stimulus) observation periods. Behavioral responses (i.e., shifts in fish distributions through time, startle responses, and schooling/dispersal activity) of each species during replicate trials were evaluated for response to the three stimuli, which were tested alone and in all possible combinations. Species responses were as follows:

- The analysis of **weakfish** data indicated that the air bubble curtain and sonic sound had some potential for repelling this species in the field. In contrast, the Phase 1 studies indicated that strobe lights may attract weakfish, particularly after a brief initial period of exposure (e.g., 1 minute).

- Ultrasound, alone and in combination with strobe light and air curtain (i.e., all three technologies combined), elicited strong avoidance reactions for **blueback herring**. However a lack of *directional* avoidance responses to strobe light and the air curtain when tested alone indicated that sound was the primary deterrent for blueback herring during the combined stimulus trials.

- The air bubble curtain, when tested alone, and in combination with sound and strobe light, produced strong avoidance reactions from **Atlantic croaker**. Strobe light and sound also appeared to repel Atlantic croaker, but avoidance was not as strong as it was for the air curtain. Responses to strobe light and sound were diminished over time. Consequently, the air curtain, alone or in combination with strobe light and/or sonic sound, exhibited the greatest potential for deterring Atlantic croaker in the field.

- Similar to Atlantic croaker, **bay anchovy** avoidance responses were strongest for treatments that included the air curtain. The air curtain combined with strobe light and/or sound appeared to have the greatest potential for repelling fish in the field. However, the incremental increase in deterrence created by the combined stimuli compared to the air curtain alone was minimal.

In addition to providing fish response data, supplemental Phase 1 studies demonstrated that the effectiveness of strobe light and air bubble technologies would be reduced considerably by the environmental conditions encountered at PSEG-Salem's CWIS. Strobe lights can only be effective where the light intensity is adequate to elicit the deterrent response. Measurements of light intensity in Phase 1 demonstrated that high levels of turbidity in the vicinity of the Salem CWIS would limit the effective range to only several feet from each flash head. Thus, the effect of high turbidity levels present at Salem on light propagation indicated that strobe lights would not be effective for deterring fish at the Salem CWIS.

Air bubble curtains may provide a synergistic deterrence effect when used in conjunction with a sound deterrent system. A computational fluid dynamics model was used to assess installation of an air bubble curtain around the PSEG-Salem CWIS. Due to natural daily tidal direction changes and high river current velocities, an air bubble curtain's integrity cannot be maintained at the PSEG-Salem CWIS. Thus, tidal conditions prevent an air bubble curtain from being used to deter fish from the CWIS.

Based on these results, PSEG Nuclear LLC submitted a Phase 2 plan of study to the Department on December 31, 2003 that proposed to evaluate the effects of sound to deter fish in the Delaware River near the PSEG-Salem CWIS. The Department approved this Phase 2 plan of study on May 19, 2004.

3. Summary of MSHIPT Phase 2 Studies

Phase 2 sound deterrent testing was conducted in 2004. The primary goal of Phase 2 testing was to determine if avoidance responses to sound observed in the laboratory could be replicated in the field under environmental conditions similar to those experienced at the intake. The Phase 2 evaluation consisted of collecting, identifying, enumerating, and measuring available wild fish from a specific test area during paired treatment (sound-on) and control (sound-off) periods over the course of an eight month study period. Data analyses were conducted to determine if a statistically significant difference in the number of fish collected occurred between treatment and control, indicating either an avoidance or attraction to sound deterrent stimuli. Eleven fish species were identified as RIS for the assessment of aquatic resource impacts associated with the operation of the PSEG-Salem CWIS.

Thirty- seven species of fish were collected during the eight month study period, eight of which were abundant enough to conduct meaningful statistical analyses of catch data from treatment and control samples. Blueback herring, American shad, Atlantic menhaden, bay anchovy, and Atlantic silverside demonstrated statistically significant avoidance to sound deterrent stimuli, whereas two *Morone* species (white perch and striped bass) and bluefish did not exhibit statistically significant responses. The analysis of white perch and striped bass data suggested that these species may have been attracted to the sound stimuli, but the data was not statistically significant and a definitive effect could not be determined. Weakfish and Atlantic croaker were not collected in sufficient numbers to allow statistical analysis.

Two underwater sound systems, sonic and ultra-sonic were used for Phase 2 testing. The sound signals that were evaluated during Phase 2 testing were selected based on the current knowledge of the hearing capabilities of species that were expected to be in the study area and the results of previous sound studies conducted at PSEG-Salem during Phase 1 of MSHIPT testing. Sonic signals were selected for repelling most species that occur in the vicinity of the PSEG- Salem CWIS that are capable of detecting frequencies less than 3,000 Hz, whereas ultrasonic signals were specifically targeted toward clupeids (alewife, blueback, herring, American shad, and Atlantic menhaden).

All ten of the RIS were collected during Phase 2 testing, but only bay anchovy, white perch, American shad, and blueback herring occurred in sufficient numbers to be statistically analyzed for avoidance to the sound system. Two other RIS, striped bass and alewife, were included in the fish collection data analysis for their respective families (i.e., collection data from all species within a family were combined for evaluation).

4. Summary of MSHIPT Phase 3 Studies

The Phase 3 MSHIPT intake assessment is intended to advance those technologies that have potential to be a viable behavioral deterrent to fish at the PSEG-Salem CWIS. As described previously, PSEG conducted a vulnerability ranking of RIS that was submitted to the Department in October 2001. The only vulnerable RIS that indicated statistically significant avoidance during the Phase 2 study was bay anchovy. In addition, the Phase 2 results indicated the possibility of attraction for striped bass and white perch. Though the results were not statistically significant, attraction of these commercially and recreationally important species may lead to increased impingement mortality. The Phase 2 studies did not demonstrate complete exclusion of any species.

Consistent with the Phase 2 findings, the Phase 3 Plan-of-Study includes:

- An engineering and design feasibility study to determine how such a sound system could be installed, constructed, operated, and maintained within the environmental and logistical conditions at PSEG-Salem. The system would be designed based on the results of the Phase 2 study relative to frequency, amplitude,

sound field intensity, and other applicable factors. The engineering evaluation will also include the required schedule for designing, permitting, obtaining materials, and installation.

- An evaluation of the projected biological efficacy of a system designed for PSEG-Salem which will draw from the analyses and data collected in Phase 1 and 2.

In the Phase 3 study for the evaluation of a sound deterrent system, PSEG determined the most effective frequencies for sound signals based on fish responses observed during the 1994 cage testing (0.476 kilohertz (kHz), 2.7 kHz, and a signal that mimics sounds produced by Atlantic croaker). Further technical considerations addressed the equipment that would be installed at the intake structure to emit sonic signals, specifically eight ultrasonic International Transducer Corporation Model 3406 transducers, and six G34 transducers to transmit a hybrid low frequency signal.

PSEG also considered the biological effectiveness of sound deterrents. Phase 3 evaluated the potential for application of sound deterrent at the PSEG-Salem CWIS, building on the analysis conducted in Phase 2 regarding fish responses to sound stimuli. The data compiled for species avoidance or attraction was further developed to calculate change in pounds of each RIS. In this evaluation, entrainment was assumed to be unchanged, while impingement losses would be affected based on the species and length.

5. Sound Deterrent Effectiveness

The fish collection data were statistically analyzed to determine if the sound deterrent system either repelled or attracted the fish collected during treatment control periods. Statistical comparisons were conducted for all species combined and for the eight species for which there were sufficient data. Avoidance probabilities with 95% confidence intervals were also calculated to assess the strength and variability of fish responses.

Five of the eight species for which collection data were analyzed had statistically significant avoidance probabilities indicating fish were repelled by the sound deterrent stimuli. Of the two family groups analyzed (Clupeidae and Moronidae), only the clupeid species showed statistically significant avoidance of the sound stimuli. This reflects the fact that all three clupeid species were repelled by the sound system, whereas the avoidance probabilities estimated for the combined moronid data were not statistically significant from a probably of zero (i.e., no response).

The species that exhibited statistically significant avoidance to the sound deterrent stimuli tended to have high catch rates. For species that were more rare, neither repulsion nor attraction could be conclusively determined (i.e., avoidance probabilities were not statistically significant). Other species, including several RIS, may have been repelled or attracted to the sound stimuli, but potential responses could not be detected due to very low catch rates across a small number of blocks.

Analysis of the effects of sound deterrent on the rate of impingement for each species is summarized below. The effect size in each table indicates the size of fish that were responsive to sound stimuli. Fish lengths below the effect size were not responsive to sound stimuli, exhibiting neither avoidance nor attraction.

Sound Deterrent Impingement Reduction (e.g. avoidance)		
Species	**Percentage Change**	**Effect Size (mm)**
Atlantic Menhaden	56.2%	> 47 mm
Alewife	58.7%	> 35 mm
Blueback Herring	58.7%	> 35 mm
American Shad	58.7%	> 35 mm
Bay Anchovy	30.0%	> 34 mm
Spot	0.0%	> 28 mm
Weakfish	0.0%	> 27 mm

Sound Deterrent Impingement Increase (e.g. attraction)		
Species	**Percentage Change**	**Effect Size (mm)**
Atlantic Croaker	12.0%	> 32 mm
Striped Bass	16.0%	> 31 mm
Blue Crab	25.0%	> 0 mm

6. Conclusions

In general, PSEG contends that the results of Phase 1 and 2 studies suggest the effectiveness of sound is reflected by a reduction in impingement only. This is due to the fact that fish do not develop the organs or structures required to hear until they are well into the juvenile stage and subject to impingement. Sound deterrents would not reduce the losses of fish eggs, larvae, and small juvenile fish or invertebrates.

The use of sonic sound stimuli could reduce some of the impingement losses of bay anchovy and Atlantic silversides at the PSEG-Salem CWIS. More definitive research would need to be conducted to further explore the potential for attraction of certain species before a sonic sound system is seriously considered for application. In addition, some RIS were not collected in sufficient enough numbers during Phase 2 testing to determine their response to the sound signals evaluated. In particular, more data would be required to determine if the three sciaenids that are PSEG-Salem RIS (namely weakfish, Atlantic croaker, and spot) will respond to sound stimuli under field conditions and, if so, benefit from an intake sound deterrent system.

The three RIS species that responded to sound stimuli with an increase in impingement (i.e. attraction) include Atlantic croaker, which is an important forage species, striped bass and blue crab, both of which have a high recreation value. The potential for increasing impingement among these three species outweighs the loss in impingement among the other species. As a result, further investigation of sound deterrent is not recommended at this time.

D. Estuary Enhancement Program

1. Overview

The 1994 and 2001 NJPDES permits contain extensive requirements with respect to wetland restoration, land preservation, fish ladders and biological monitoring. Most significantly, the permittee was required to restore an aggregate of no less than 10,000 acres of diked wetlands to normal tidal inundation to become functional salt marsh; restoration of wetlands dominated by common reed (*Phragmites australis or Phragmites*) to primarily *Spartina alterniflora (Spartina)* species and other desirable vegetation; and/or upland buffer. Upland buffer is creditable at a 3:1 ratio towards these requirements where 3 acres of upland buffer counts as one acre towards the restoration total.

To implement these requirements PSEG created the Estuary Enhancement Program (EEP) in 1994. To date, PSEG's EEP has preserved and/or restored more than 20,000 acres or approximately 32 square miles of Delaware Bay tidal wetlands and adjoining upland buffer areas. The restored marshes comprise approximately one half of the total that PSEG has preserved as part of EEP. PSEG has also preserved more than 10,000 acres of adjoining uplands and transition areas including forested uplands and wetlands, agriculture fields, and properties and landscapes. The preservation of the restoration sites and other properties in combination with other publically owned lands serves to provide a greenway of uninterrupted areas of open space and habitat along the Delaware River Bayshore region. The preservation of these lands plays an important ecosystem role in primary and secondary productivity, habitat type and diversity, water quality, and water management.

Healthy salt marshes are among the most productive natural systems as they provide favorable habitat and abundant food to support fish and shellfish populations. Marsh creeks and mud flats are used for feeding, breeding, shelter and nursery by a variety of fish and invertebrates. Salt marsh productivity flows through an integrated, complex food chain that leads to production of fish, crabs, and shellfish important to commercial and recreational fishing. Large fish, such as weakfish and striped bass, use the estuary on a seasonal basis and

derive substantial food resources from forage fish and shellfish produced and nurtured in marshes. PSEG's restoration program is designed to increase the number of fish through production of algae and higher plants thereby widening the base of the food chain.

The marshes chosen for restoration were carefully selected since marshes need the appropriate elevations, tidal regimes, salinity, and sediment characteristics for restoration success. The environment adjacent to the restoration sites needed to be able to contribute important components of the ecosystem including seeds, algae, fish larvae and adults, and animals integral to the function of the marsh ecosystem. Further, the sites needed surrounding upland areas to provide protection and buffering to prevent off-site impacts such as flooding and groundwater intrusion. The restoration design approach was based upon the principles of ecological engineering that result in naturally-designed ecosystems. PSEG "jump-started" the restoration process by providing the basic elements of restoration such as the dredging of major tidal channels, but allowed nature to finalize the design of the restored wetlands. Restoration to the natural and productive structure and function has been completed at many of the restored sites as demonstrated by a variety of findings. Normal tidal inundation is present at all of the restored sites; sites have been colonized by expanding stands of desirable vegetation; and productivity in the restored sites is comparable to productivity in nearby reference marshes. The sites are utilized by a diverse and abundant fish population as feeding, reproduction, and nursery areas and by a diverse bird and wildlife community typical of natural, undisturbed wetlands.

The EEP provides opportunities for environmental education; promotes environmental stewardship; and supports ecotourism through southern New Jersey and the Delaware Estuary region. Environmental and student groups visit the sites to learn more about ecosystems through tours and participation in hands-on activities. Public access improvements incorporated into the restoration designs provide the public with access to thousands of acres. PSEG has incorporated a broad range of public access improvements, including handicap accessible facilities and self-guided interpretations, and have promoted a variety of public recreational activities in this region. The improvements constructed at a cost exceeding a million dollars include: miles of nature trails and boardwalks; seven wildlife observation platforms; and 21 parking areas that provide for over 100 cars/buses throughout the estuary region.

PSEG established scientific advisory committees, community involvement committees and public outreach programs. The project's stakeholder review process has continued with semi-annual meetings of its Estuary Enhancement Program Advisory Committee (EEPAC) as well as on-going periodic meetings with several community involvement committees. The EEPAC is comprised of local, state, regional, and federal regulators as well as nationally recognized scientific experts in a variety of estuary related disciplines. The committee has reviewed annual monitoring data and offers technical insights on the continued management of the restoration sites.

PSEG was also required to install fish ladders. When dams or earthen embankments are installed across rivers or streams to create lakes or ponds, they block routes for fish migration and impede fish access to and from suitable spawning habitat. Fish ladders help river herring (alewife and blueback herring) and other fish species migrate over these barriers thus restoring access to historic spawning and nursery areas.

Biological monitoring programs are sponsored by the EEP to gather information on habitat structure, species distribution, species abundance, biological productivity, and other ecological indicators. These programs provide scientific data to the EEP and various state and federal resource management programs for the Delaware Estuary.

The EEP has funded, as well as conducted, numerous studies on the estuary and the plants, fish, and shellfish that live within the ecosystem. Numerous papers have been published about the wetlands restoration process, the use of adaptive management as a tool for ensuring restoration success, and the overall success of EEP's restoration efforts. The October 2006 edition of the Journal of Ecological Engineering is dedicated entirely to EEP's wetlands program. More than 160 papers have been published in peer-reviewed journals documenting various elements of the EEP.

2. Diked Salt Hay Farm Wetland Restoration Sites

There are three restored diked salt hay farms within the EEP:

- The Dennis Township Salt Hay Farm: 578 acres of wetland and adjacent uplands in Cape May County, New Jersey. The site is comprised of 369 restoration acres and 15 acres of protected upland buffer.
- The Commercial Township Salt Hay Farm: 4,171 acres along the Maurice River in Cumberland County, New Jersey. The site is comprised of 2,894 restoration acres and 339 acres of protected upland buffer.
- The Maurice River Township Salt Hay Farm: 1,396 acres along the Maurice River in Cumberland County, New Jersey. The site is comprised of 1,135 restoration acres and 108 acres of protected upland buffer.

The former diked salt hay farms had been cut off from the Delaware Estuary to create farmland for the production of salt hay so habitat and food supply. The objective of the restoration was to create inlets and tidal channels to promote access to the marsh plain for fish; provide the proper hydrology to promote revegetation by *Spartina* species and other naturally occurring marsh vegetation; and provide for the exchange of detritus between the restored marsh and the estuary. Following restoration of tidal flow, sediments and *Spartina* seeds were brought in with the tides and were deposited on the marsh plain. The *Spartina* seedlings rapidly colonized the marsh surface.

The restoration of these sites was described in Department approved Management Plans where success is determined through established "success criteria". The estimates for restoration of the salt hay farm projected a twelve-year process for complete development of vegetation and hydrology. The final success criteria were met at the Dennis Township and Maurice River Township sites in four growing seasons (2000 and 2001, respectively). The hydrologic criterion at the Commercial Township site has been met and re-vegetation is approaching the higher criterion originally established for this site.

Animal response was significant. Upon completion of construction activities, invertebrates appeared on the marsh and mummichogs and other forage fish are plentiful on the marsh surface. Weakfish, striped bass, and other fish that live in the estuary migrate into the marsh creeks to feed during ebb tides because of this new food source. Scientific studies by academic and university staff using tagging methodologies indicate that the fish present in the restored salt hay farms represent new production to the estuary. The studies further demonstrate that the restored marshes are performing as designed by producing forage fish, on which larger fishes of recreation and economic importance depend. PSEG's biological monitoring indicates that fish species richness and abundance increased dramatically immediately after restoration on all three sites, and that the response of the fauna to the salt hay farm restorations was successful as measured by structural and functional responses.

3. *Phragmites*-Dominated Sites

Portions of the Delaware Estuary have experienced infestation of a non-native strain of the invasive species known as *Phragmites* or common reed. A monoculture of *Phragmites* contributes significantly less to fish production as compared to marshes that are dominated by *Spartina* and other more desirable marsh species. *Phragmites* reduces contributions to fish production by:

- Filling in small rivulets on the marsh plain that provide fish access to the marsh;
- Increasing the bank slope of tidal creeks and channels, reducing fish access to the marsh plain and reducing beneficial intertidal habitat for algae, benthic organisms, fish and other aquatic organisms; and
- Significantly reducing the amount of sunlight reaching the marsh plain (and consequently reducing the amount of algae production) because of the height and density of *Phragmites* and the persistence of the previous year's leaf litter among the dense stands.

PSEG undertook restoration measures aimed at significantly reducing *Phragmites* and increasing desirable plant species such as *Spartina* on selected marshes in New Jersey and Delaware. The restoration of these

sites was described in Department approved Management Plans with established "success criteria". These sites include:

- Alloway Creek Watershed *Phragmites*-Dominated Wetland Restoration Site: Located in Lower Alloways Creek and Elsinboro Township, Salem County, New Jersey. The site totals 3,096 acres including 1,601 acres of restoration area.
- Cohansey River Watershed *Phragmites*-Dominated Wetland Restoration Site: Located in Hopewell and Fairfield Townships in Cumberland County, New Jersey. The site totals 1,055 acres including 910 acres of restoration area.
- Cedar Swamp *Phragmites*-Dominated Wetland Restoration Site: Located in New Castle, Delaware. The site totals 1,870 acres including 1,863 acres of restoration area.
- The Rocks *Phragmites*-Dominated Wetland Restoration Site: Located in New Castle County Delaware, the site totals 736 acres all of which are considered restoration area.

To control *Phragmites,* EEP scientists, in consultation with the EEPAC committee and various state and federal regulators, investigated various management strategies, including marsh plain alteration, mowing, animal grazing, herbicide application and various combinations of each. The program has also implemented test plots throughout the Delaware Estuary to statistically analyze the results of more than five years' worth of data collection for the various management strategies.

The Management Plans for the formerly *Phragmites*-dominated restoration sites established the same vegetative and hydrologic success criteria as applied to the salt hay farm restoration sites. Re-vegetation with desirable marsh vegetation and the reduction of *Phragmites* on the Cohansey River Watershed Restoration Site occurred ahead of schedule and this site met all final success criteria by 2004.

Mapping of vegetative cover on the Cedar Swamp, The Rocks, and the Alloway Creek Watershed Restoration Sites after the 2013 growing season indicates that 85-95 percent of the vegetated marsh plain on these sites is colonized by *Spartina* with other desirable species. The percent desirable cover on these sites has been fluctuating around the final success criteria for several years as PSEG continues to treat persistent regrowth of *Phragmites*. *Phragmites* cover on these sites has been reduced to 5-15 percent of the vegetated marsh plain. Re-vegetation by desirable species continues on these formerly *Phragmites*-dominated restoration sites, and the small marsh creeks and rivulets that are important to the fisheries are reforming as a result of the restoration activities. Biological monitoring indicates that the marsh habitat quality and aquatic production on these sites have been greatly improved.

The 2001 permit also described criteria for "replacement acreage" for lands deemed failed by the Department. PSEG agreed to replace some acreage at the Alloway Creek site since *Phragmites* control proved to be especially difficult. PSEG advised the Department that PSEG had facilitated the transfer of 1,156 acres to serve as replacement acreage for approximately 1,000 acres at the Alloway Creek site. PSEG agreed to replace some acreage for the Alloway Creek site since *Phragmites* control provided to be especially difficult in some areas. The replacement lands are as follows:

- Dennis Wildlife Management Area: Located in Dennis Township where the site totals 114 acres;
- Heislerville Wildlife Management Area: Located in Maurice River Township where the site totals 200 acres;
- Millville Wildlife Management Area: Located in Commercial Township where the site totals 521 acres; and
- New Sweden Wildlife Management Area: Located in Lawrence Township where the site totals 309 acres.

4. Other Restoration or Conservation Projects

PSEG has secured and preserved, via Deeds of Conservation Restriction in favor of the State of New Jersey, the property known as the Bayside Tract. The property contains 1,822 acres of upland forests and agricultural

areas and 2,585 acres of wetlands and other sensitive lands. EEP has funded and facilitated the transfer of more than 1,000 acres of environmentally sensitive areas along the Maurice River and Delaware Bay to the State of New Jersey to be protected from development in perpetuity.

EEP has provided initial restoration actions and funding for restoration for three additional *Phragmites*-dominated areas in Delaware. While these areas are not included within the top 10,000 acres of restoration credited to the EEP, they nonetheless provide ecological benefits to the Delaware Estuary ecosystem. DNREC continues to manage the three sites through EEP supported fundings. These sites include:

- The Lang Tract: 253 acre *Phragmites* restoration area that is part of Augustine Wildlife Area located in New Castle County, Delaware;
- Silver Run: 309 acre *Phragmites* restoration area located in New Castle County, Delaware; and,
- Woodland Beach: 1,177 acre *Phragmites* restoration area located in Kent County, Delaware.

DNREC used EEP funding to restore 964 acres of degraded wetlands at the Augustine Creek Impoundment. This wetland has historically been impounded by dikes that restrict flow to and from the Delaware River resulting in increased upland flooding, *Phragmites* invasion, mosquito breeding, sedimentation, and shoreline erosion. The restoration of the Augustine Creek Impoundment has been completed and functional tidal flow reestablished.

5. Fish Ladders

PSEG has installed twelve fish ladders on tidal tributaries along the Delaware Estuary in New Jersey and Delaware. The type of fish ladders installed are the Alaska steeppass, which were recommended by the USFWS. The Alaska steeppass fish ladder resembles an aluminum chute and is installed at a gentle slope to allow fish to swim up and over the dam to spawning grounds. The fish ladders are equipped with interior baffles along their sides and bottom which slow the water flowing through them. This reduced flow allows fish to swim upstream with minimal effort. The bubbling of water at the base of the ladders attracts fish to the ladder entrance.

PSEG also stocked selected impoundments to supplement herring runs and monitors the use of the ladders. On average it takes at least five years for herring runs to re-establish after the installation of the ladders. Those river herrings that survive to maturity will return to their native impoundments and streams and spawn using the EEP-installed fish ladders, continuing a cycle of production facilitated by the re-introduction of new spawning and nursery grounds. The fish ladders have resulted in an increase of 1,001 acres of habitat and 133 miles of upstream habitat previously made inaccessible by man-made obstacles.

E. Biological Monitoring Program

The NJPDES permit requires PSEG to conduct biological monitoring and prepare Biological Monitoring Program Annual Reports. As described in Part IV, Special Condition G.5, details concerning the required biological monitoring are defined in the original and modified versions of the Improved Biological Monitoring Work Plan (IBMWP). The most recent version of the IBMWP, dated March 6, 2006 was approved by the Department on March 30, 2006. Biological data and results from PSEG's monitoring programs as conducted by the EEP are reported annually through Biological Monitoring Program Annual Reports (Annual Reports). The Annual Reports contain a separate section for each of the IBMWP programs that are performed. Annual reports are available from 1995 through 2013 where an annual report for 2014 will be submitted on or before June 30, 2015. The types of sampling conducted and the monitoring study areas have varied since the biological monitoring program was initiated in 1995.

A brief summary of each of the sections as included in the Annual Reports is provided below with specific details from the most recent 2013 Annual Report. Impingement and entrainment results are described in further detail in Section 10.

1. Impingement Abundance Monitoring

Impingement abundance and initial survival sampling at the CWIS is conducted by diverting timed subsamples of flow from combined fish and debris troughs into the north fish counting pool. As described in the IBMWP, impingement sampling occurs through three 24-hour collection events per week from January through December. Ten samples are collected per 24 hour period, conditions permitting. A total of 1,580 samples were collected during 2013. Sampling durations resulted in 96% of the collections being one minute and 4.0% of the collections being two minute in duration. See Section 10 for a detailed summary of 2013 impingement data.

All individual finfish and blue crabs are collected from the pool by dip net and categorized as "live," "dead," or "damaged." Debris (vegetative matter) was examined for fish and any found were included in the collection. Specimens are sorted by condition category and species, and were counted, weighed, and measured. Ancillary parameters, including weight of detritus in the sub-sampled water volume, pump and screen conditions, tide, weather, water temperature and salinity, are measured during every sampling event. Due to the installation of the Detrital Discharge Pipe in 2012, the north fish counting pool is now the primary location for all impingement sampling.

2. Entrainment Abundance Monitoring

Entrainment abundance sampling is conducted in the CWIS by pumping river water out of the intake bay of Circulating Water Pumps 12B or 22A into a plankton net having a 0.5-mm mesh. A typical sample filters 50 m^3 of intake water. As described in the IBMWP, during the months of January through March and August through December, routine entrainment sampling was scheduled during three 24-hour events per week with seven collections at approximately equal intervals during each event. During the months of April through July, intensive entrainment sampling occurred during four events scheduled each week with 14 samples scheduled at equal intervals during each event. Each event monitored a complete diel period encompassing two tidal cycles.

A total of 1,616 out of 1,729 scheduled entrainment abundance samples were collected during 2013. Each concentrated sample was preserved, and the ichthyoplankton identified. For each species collected, the life stage was determined, the total number counted, and the lengths of a subsample were measured. See Section 10 for a detailed summary of 2013 entrainment data.

3. Baywide Biological Monitoring

The focus of the abundance monitoring studies described below is on the following four priority RIS: weakfish *(Cynoscion regalis),* bay anchovy *(Anchoa mitchilli),* white perch *(Morone americana),* and striped bass *(M. saxatilis)*, as well as continued monitoring of other species as specified in the historical Biological Monitoring Work Plan. These additional species are spot *(Leiostomus xanthurus)*, Atlantic croaker *(Micropogonias undulatus),* American shad *(Alosa sapidissima)*, blueback herring, alewife, Atlantic silverside *(Menidia menidia)*, Atlantic menhaden *(Brevoortia tyrannus),* and bluefish *(Pomatomis saltatrix).*

The abundance data collected by the below described surveys is used in conjunction with historical studies to characterize, or update prior information on, the biological conditions in the vicinity of the Station. PSEG's abundance data is also used in conjunction with survey data collected by the Delaware Department of Natural Resources and Environmental Control (DNREC) and the Department's New Jersey Division of Fish and Wildlife (NJFW) to characterize long-terms trends in the abundance of juvenile fish species in the estuary during the historical period of Salem operations. Long-term trends in juvenile abundance can reflect the cumulative effects of all potential stressors in the estuary (e.g. fishing, pollution, environmental conditions, multiple cooling water intakes) on the fishery resources.

- PSEG Baywide Beach Seine Survey

PSEG samples finfish and blue crabs by deploying a beach seine in the near shore waters of the Delaware Estuary. Forty samples are collected once per month in June and November; and twice per month in July through October, conditions permitting, at fixed stations between the mouth of the Delaware River to the Chesapeake and Delaware Canal. These 40 fixed stations have been annually sampled since 1995.

Finfish and blue crabs collected are identified to the lowest practicable taxon and counted. Length measurements for a representative subsample, and carapace width for blue crab, of the above-mentioned species are taken. PSEG obtains beach seine data for the region between the Chesapeake and Delaware Canal and near the Fall Line in Trenton, New Jersey, from the Department's Division of Fish and Wildlife (NJFW).

The gear is a 100 x 6-ft (30.5 x 1.8-m) bagged haul seine with a 1/4-inch (6.25 mm) nylon mesh. This is identical to the gear employed by the Department in their beach seine program conducted upstream of the present study. The seine is set at high tide by boat from the shore and pulled in the direction of the prevailing tidal current, wind or surf as conditions required, resulting in the most effective deployment of the gear. Water quality parameters, including water temperature, salinity, dissolved oxygen and water clarity are measured with each collection.

The PSEG Baywide Beach Seine Survey was conducted on a monthly basis in June and November 2013, and twice monthly from July through October 2013. In 2013 the PSEG Baywide Beach Seine Survey yielded 30,270 individuals of 44 finfish species from 400 samples. Bay anchovy (*Anchoa mitchilli*) was predominant and represented 40.3% of the catch; Atlantic silverside (*Menidia menidia*) ranked second, comprising 38.4%. More than a third (17 of 44) of the species taken was represented by 10 or fewer specimens. Of the target species, only bay anchovy, Atlantic silverside, and striped bass (*Morone saxatillis)* were taken during all sampling events, in all regions, and at all beach types.

- PSEG Baywide Bottom Trawl Survey

  PSEG conducts the bottom trawl survey within the Delaware River Estuary from the mouth of the Delaware Bay to the Pennsylvania/Delaware state line (rkm 0-127) at 40 randomly selected stations allocated from sampling Zones 1-8. Each year, forty samples are collected once per month from April through November, conditions permitting, at random stations allocated among eight sampling strata between the mouth of the Delaware Bay and the Delaware Memorial Bridge. Target species are bay anchovy, alewife, American shad, Atlantic menhaden, blueback herring, Atlantic silverside, striped bass, white perch, bluefish, Atlantic croaker, spot, weakfish, and blue crab.

  The relative abundance of finfish and blue crabs is determined by employing ten minute tows of a 4.9-m otter trawl in the estuary. One daytime bottom trawl collection is taken at each station each month from April through November 2013. Eight monthly surveys were completed, resulting in the collection of 320 bottom trawls. All finfish and blue crabs are identified to the lowest practicable taxonomic level, enumerated, and recorded on field data sheets. Length measurements for all target species are recorded to the nearest millimeter. Surface, mid-depth and bottom water quality data are recorded for each sample as well as pertinent field observations such as water clarity, weather, and tidal stage.

  In the 2013 Bottom Trawl Survey, 39,713 finfish (representing 54 species) and 1,896 blue crabs were collected in 320 different trawl samples. Almost 64% of the total finfish catch was comprised of target fish species. All target species were collected, and bay anchovy was the most abundant target finfish species taken, comprising 24.8% of the total finfish catch. Of the total trawl samples in 2013, there were 8 blueback herring, 2 Alewife, 27 American shad, 5 Atlantic menhaden, 9,848 Bay anchovy, 9 Atlantic silverside, 1,375 White perch, 45 Striped bass, 7 Bluefish, 5,365 Weakfish, 770 Spot, and 7,816 Atlantic croaker caught.

PSEG also conducted an ichthyoplankton survey, pelagic trawl survey and expanded the bottom trawl study areas during three intensive sampling years (2002, 2003, and 2004). These additional monitoring components

were necessary to support the impact assessment modeling as contained in the 2006 application, particularly the calculation of conditional mortality rates as required by Part IV.G.8.b of the 2001 permit. Impact assessment modeling is not required under the 2014 rule. A summary of the River Ichthyoplankton Survey and River Pelagic Trawl Survey is as follows:

- PSEG River Ichthyoplankton Survey

  The relative abundance of ichthyoplankton is determined by employing five minute stepwise oblique tows (surface to bottom) of a 1-meter plankton net (500 micron mesh) in the estuary. Ninety samples are collected twice per month from April through July, conditions permitting, at random stations allocated among fourteen sampling strata between the mouth of the Delaware Bay and near the fall line at Trenton, New Jersey. Specimens collected are identified to the lowest practical taxon and life stage, and counted. Target species for this project are alewife, American shad, Atlantic menhaden, blueback herring, bay anchovy, Atlantic silverside, striped bass, white perch, bluefish, Atlantic croaker, spot, weakfish, *Neomysis americana* and *Gammarus* spp.

- PSEG River Pelagic Trawl Survey

  The relative abundance of juvenile fish and blue crabs was determined by employing ten-minute tows of a 4 x 6-foot frame pelagic trawl at randomly selected depths within the Delaware Estuary. Eighty samples are collected once per month from April through November, conditions permitting, at random stations allocated among fourteen sampling strata between the mouth of the Delaware River and near the Fall Line at Trenton, New Jersey. Specimens collected are identified to the lowest practical taxon and counted. Length measurements and carapace width for blue crab, for a representative subsample of the above-mentioned species are taken.

Subsequent to the release of the 2001 NJPDES permit, PSEG committed to conditions via an April 4, 2002 letter to expand the Department's Delaware River Striped Bass Recruitment Survey to collect length-frequency data on additional species. A summary of the Delaware River Striped Bass Recruitment Survey and subsequent sampling modifications is as follows:

- Delaware River Striped Bass Recruitment Survey

  The Department's New Jersey Fish and Wildlife (NJFW) program conducts the Delaware River Striped Bass Recruitment Survey (see www.state.nj.us/dep/fgw/artdelstudy15.htm). This program is intended to provide an annual index of abundance for striped bass young-of-year whereas the PSEG Baywide Beach Seine Survey (described above) is intended to provide information on the bay-wide distribution, relative abundance, and absolute population size of striped bass and other species that use the shore zone habitat. In order to satisfy the objectives of both programs without duplication of sampling effort, it was agreed that NJFW would modify its striped bass recruitment beach seine sampling as follows:

  - Continue twice per month sampling (August – October) at the 32 fixed stations as sampled during the 2001 beach seine survey. The NJFW will also conduct additional sampling at the 32 fixed stations during June, July and November. Sampling will be performed once per month in June and November and twice per month during July. A total of ten beach seine survey events will be conducted during the June-November period and the beach seine survey will be continued during the duration of the existing NJPDES permit for PSEG-Salem.

  - Include measurement of individual length (nearest millimeter) for up to 30 specimens per haul of the following species: American shad, blueback herring, alewife, Atlantic menhaden, bay anchovy, Atlantic silverside, striped bass, white perch, bluefish, Atlantic croaker, spot, weakfish, and blue crab.

  Additionally, both parties agreed to the following:

- PSEG will provide its seine data to NJFW by March 1 of each year so that NJFW can use it to support development of the annual striped bass young-of-year abundance indices. Conversely, NJFW will provide its seine data to PSEG by March 1 of each year so that PSEG can use this data in assessing distribution and developing trends in abundance.

- Both PSEG and NJFW will jointly develop an estimate of the average area swept by the seines. This will include observations and measurements associated with each group's sampling efforts.

4. Vegetative Cover and Geomorphology Monitoring

The results of all vegetative cover and geomorphology monitoring are used to evaluate the success of the wetlands restoration measures including wetlands productivity. Vegetative cover at the wetlands restoration sites is monitored using a combination of aerial photography and field sampling methodologies. Aerial photography is conducted annually to map changes in the vegetative communities and the geomorphology associated with the restoration process. Annual field sampling is also conducted on representative wetland restoration sites to assess changes in community abundance and composition for vascular plants.

Annual mapping of the vegetative communities and geomorphology occurs on all wetland restoration sites that have not met the vegetative success criteria defined in the applicable Management Plans. As of 2013, vegetative cover monitoring is performed annually during the peak growing season at the following reference marshes and restoration sites:

- Commercial Township Salt Hay Farm Wetland Restoration Site
- Moores Beach West Reference Marsh
- Alloways Creek *Phragmites*-dominate Wetland Restoration Site
- The Rocks *Phragmites*-dominate Wetland Restoration Site
- Cedar Swamp *Phragmites*-dominate Wetland Restoration Site
- Mad Horse Creek Reference Marsh

During 2013, geomorphological monitoring was conducted at all four restoration sites to assess changes associated with the restoration process. Analyses of the 2013 vegetative cover type mapping indicates that *Spartina* and other desirable marsh species is the dominant cover type at all four restoration sites and the two reference marshes. *Spartina* comprised 69.1% and 78.5% of the Mad Horse Creek and Moores Beach West reference marshes, respectively. At the three *Phragmites*-dominated restoration sites, *Spartina* and other desirable vegetation ranged between 73.1 to 75.5% of the total marsh. At the Commercial Township site, 69.8% of the total marsh was mapped as *Spartina* during 2013. Other cover type categories evaluated at the restoration sites and reference marshes include *Phragmites*-dominated vegetation, non-vegetated marsh plain, internal water areas and open water. Non-vegetated marsh plain comprised approximately 16.9% of the Commercial Township site.

5. Fish Assemblage Monitoring

To evaluate the faunal response to salt marsh restoration in the Delaware Bay, fish assemblages are compared for small and large creek habitats at the reference and restored marshes in the upper and lower regions of the Bay. Sampling is conducted monthly from May to November with semi-balloon otter trawls in the large marsh creeks and with weirs in the small intertidal marsh creeks draining the marsh surface. A subset of fish species, blue crabs, diamond back terrapins, horseshoe crabs and snapping turtles is identified, enumerated and measured for each trawl and weir sample. Data on water temperature, dissolved oxygen, salinity, and turbidity is recorded at each sampling location

Regarding Lower Bay Region sampling in 2013, sampling was conducted at both the Moores Beach reference site and the Commercial Township restoration site. In the large marsh creek habitats, fish species richness was slightly higher at Commercial Township than at Moores Beach; however, 85% of the species collected were common to both sites. In the small marsh creek habitats, total fish abundance was very similar at Moores

Beach and at the Commercial Township Restoration Site. Fish species richness was slightly higher at Moores Beach, with eight species taken common to both sites.

Regarding Upper Bay Region sampling in 2013, sampling was conducted at the Mad Horse Creek reference site as well as at two locations in the Alloway Creek restoration site, namely the Mill Creek sampling area and the Alloway Creek sampling area. In the large marsh creek habitats in 2013, fish species richness was higher at Mad Horse Creek than at the Mill Creek Area with 65% of the species in common. In the small marsh creek habitats of the Upper Bay Region, total fish abundance was substantially higher at the Mill Creek restoration sampling area than at the Mad Horse Creek Reference site. While at the Alloway Creek Restoration site, fish abundance was only somewhat higher than at the Mad Horse Creek Reference site. Regarding species rank order, mummichog had the highest percent frequency of occurrence at all three sites. There were six species collected that were common to all three sites. All species taken at Mad Horse Creek, except bay anchovy, were common to both Mill Creek and Alloway Creek; bay anchovy was collected at Mill Creek, but not at Alloway Creek.

6. Detrital Production Monitoring

The objective of the detrital production monitoring is to determine the vegetation structure, productivity, and detrital production of restored marshes as compared to the reference marshes. The data have also been used to determine the contribution of the restored marsh to estuarine food webs and the capacity to support fish production. Detrital production at the wetland restoration sites has been monitored using a combination of aerial photography and field sampling methodologies. Aerial photography has been conducted annually at all restoration sites to map changes in the vegetative communities associated with the restoration process. Quantitative field sampling has also been conducted on four representative restored wetland sites (two formerly diked salt hay farm sites and two *Phragmites*-dominated sites) and two reference sites to assess changes in community abundance and composition for vascular plants as well as benthic and epiphytic algae. This sampling consists of percent cover, vegetation height, and calculation of aboveground biomass for the vascular plants; and biomass and productivity of the benthic and epiphytic algae.

Cover mapping in 2013 indicates that the completion of the restoration of normal tidal inundation and drainage of the marsh at the Commercial Township site has promoted the spread of the *Spartina* communities at that site. Herbicide with surfactant applications at the ACW Site in New Jersey and Cedar Swamp and the Rocks in Delaware have maintained progress in controlling *Phragmites* at these sites and resulted in the expansion of *Spartina* and other desirable marsh species as dominant species at these sites in 2013.

Geomorphological mapping of the Commercial Township site in 2013 indicates progress in both drainage density and channel frequency, both of which are higher than that found in the reference marsh. Drainage density for the Alloway Creek site, the Rocks and Cedar Swamp sites are all above the reference marsh. In addition, the channel frequency for the Alloway Creek site, the Rocks and Cedar Swamp sites all exceed the channel frequency in the reference marsh.

Detrital production data were collected in August 2013 along transects located in New Jersey at the Mad Horse Creek reference marsh and Moores Beach reference marsh; the Commercial Township site; the Alloway Creek site; and the Rocks and Cedar Swamp sites in Delaware. Random quadrats were established and macrophyte production data were collected within these quadrats.

Aerial photography from August 2013 indicates that macrophyte production for the reference marshes was 69.1% and 78.5%, with production values ranging from 828 $\pm$77 grams dry weight per meters squared (gdw/m^2) to 1,043 $\pm$98 gdw/m^2 at one reference marsh, and 548 $\pm$48 gdw/m^2 to 550 $\pm$126 gdw/m^2 at another reference marsh. The Commercial Township site was 69.8% vegetated by *Spartina* spp. with production estimated between 918 $\pm$164 gdw/m^2 and 1,414 $\pm$114 gdw/m^2. The Alloway Creek site was 73.1% vegetated by *Spartina* with production ranging from 572 $\pm$72 gdw/m^2 to 985 $\pm$181 gdw/m^2. The Rocks site was 75.5% vegetated by *Spartina* with production ranging from 798 $\pm$113 gdw/m^2 to 1,002 $\pm$377 gdw/m^2. The Cedar

Swamp site was 74.4% vegetated by *Spartina* spp. with production ranging from 526 $\pm$71 gdw/m^2 to 1,032 $\pm$194 gdw/m^2.

In sum, results of the detrital production monitoring from 2013 indicate that the restored marsh sites are either comparable to or exceeding the reference marshes in terms of drainage density, channel frequency, percent vegetation by desirable *Spartina* spp., and detrital production by transect.

F. Artificial Reefs and Oyster Restoration

Artificial reefs are manmade structures that increase habitat surface area and colonization by aquatic organisms and fish. The colonization in-turn produces a more diverse and productive forage base for predator fish. Artificial reefs improve water quality by enhancing the habitat for animals that filter algae, organic matter, and bacteria from the water column. Artificial reefs can be utilized by some of the PSEG-Salem RIS. Specifically, Atlantic croaker and spot will congregate near the reef to get out of the current for refuge as well as to feed on macroinvertebrates. Weakfish and striped bass will also use the reef for refuge and to feed upon spot and Atlantic croaker.

The 2001 NJPDES permit required the permittee to fund an escrow account in the amount of $500,000 to be made available to the Department for the construction and installation of artificial reefs. PSEG satisfied this requirement on December 19, 2001. In early 2006, the Department used some of the PSEG funding to revitalize more than 150 acres of oyster habitat within the Delaware Bay. This project was an extension of the 2003 pilot project which enhanced an oyster seedbed in the bay by planting approximately 30 million oysters. Additionally, the EEP provided funds to the Department and DNREC for their State-managed artificial reef programs which have successfully installed artificial reefs in Delaware Bay and the adjoining coastal areas.

8 Available Intake Protection Technologies:

A. Technologies Evaluated as part of the 1999 Application

The Section 316(b) Demonstration of the 1999 NJPDES renewal application included an extensive analysis of intake protection technologies. Each of the 29 identified options was considered by PSEG in a preliminary screening to identify those appropriate for further consideration. The factors applied in the preliminary screening were: (1) whether the option has a known effectiveness for reducing fish losses generally; (2) whether further engineering development would be required for the option to be considered "available"; and (3) the relative engineering and/or biological advantages of one option over another. The potential application of the options to the specific conditions of the Station was not considered.

On the basis of the preliminary screening, four fish protection alternatives and three flow modification schemes were selected for detailed evaluation including:

- Wedge-wire screens
- Fine mesh screens
- Modular inclined screens
- Hybrid strobe light/air bubble curtain barriers
- Seasonal flow reductions
- Revised refueling outage schedules
- Closed cycle cooling

PSEG developed an analysis of five factors related to evaluating the impacts of implementing each alternative including: (1) relevant background knowledge derived from previous assessments of the feasibility of implementing the alternative at PSEG-Salem; (2) engineering and technical considerations affecting implementation at PSEG-Salem; (3) potential biological effectiveness in reducing intake losses at PSEG-Salem; (4) other potential environmental impacts that could result from implementation at PSEG-Salem; and (5) costs and

operational impacts of implementing the alternative at PSEG-Salem. For those options considered to be feasible for implementation at PSEG-Salem, their costs and benefits were assessed.

The Department utilized a contractor, namely ESSA Technologies of Ontario, Canada, to assist in the review of certain components of the 1999 NJPDES renewal application. ESSA reviewed each of the seven technologies and concluded an improved "fish defense system" using multi-sensory or hybrid technologies should be further studied. This recommendation was based on the observation that sound alone has shown limited success as a deterrent at PSEG-Salem where other systems should be integrated with sound to evaluate a better reduction in fish impingement. Based on ESSA's review, the Department required further study of a hybrid system included as Part IV Section G.5 of the 2001 NJPDES permit. A summary of this study is provided at length in Section 7.C above.

B. Technologies Evaluated as part of the 2006 Application

1. Evaluation of Fish Protection Alternatives

The Section 316(b) Demonstration of the 2006 NJPDES renewal application included an extensive analysis of intake protection technologies. As described in the application, fish protection alternatives can be classified into two groups: (1) modifications to the existing CWIS (i.e., fish protection systems and devices); and (2) modifications to reduce cooling water flow rates. This portion of the application was prepared by Alden Research Laboratory, Inc. (Alden, or Alden study). After a comprehensive review of the currently available literature and contacts with regulatory, water-user, and utility personnel, over 30 such alternatives were considered.

The available fish protection alternatives that modify an existing CWIS fall into the following four categories:

- Behavioral barriers- these alternatives alter or take advantage of natural behavioral patterns to attract or repel fish. Some alternatives include strobe lights, air bubble curtains, sound barriers and chemicals.

- Physical barriers- these alternatives physically block fish passage (usually in combination with methods to reduce the velocity of the water upon impact). Examples include infiltration intakes, porous dikes, wedge wire screens, and barrier nets.

- Collection systems- these alternatives actively collect fish for their return to a safe release location. Modified traveling screen and the Geiger MultiDisc screens are examples of collection system alternatives.

- Diversion systems- these alternatives divert fish to bypasses for return to a safe release location. Some alternatives include fish pumps, modular inclined screens, and submerged traveling screens.

Fish protection alternatives that reduce cooling water flow rates include those that reduce flow rates whether on a seasonal basis or year-round basis. Reducing flow on a seasonal basis and shifting refueling outages to reduce flows during periods of peak organism abundance can reduce the number of organisms entrained or impinged at the CWIS. Installation of closed-cycle cooling towers provides year-round reductions in flow.

2. Methodology and Results of the Screening Evaluation

After identifying the potential alternatives, Alden conducted a screening process. The initial evaluation process was based on an assessment of each alternative relative to various generic criteria for applicability. Those criteria include biological effectiveness and the degree of engineering development of each alternative. In addition, site-specific factors include detailed evaluations how each alternative would relate to the location, design, and operation of the CWIS at PSEG-Salem. Finally, the hydrodynamics of the Delaware Estuary in the near-field area of PSEG-Salem and the existing CWIS strongly influence whether a fish protection alternative would be practical to install at PSEG-Salem and would have the potential to reduce organism losses.

An alternative was considered to have potential for application at PSEG-Salem if the following four criteria were met:

- Biological effectiveness (not necessarily with the species involved at PSEG-Salem) was demonstrated through test data (preferably from full-scale in-situ application) at other sites was shown.
- The alternative would not require further engineering development to be considered an available option.
- Engineering and/or biological advantages are relative to the other options.
- The potential for reducing entrainment and impingement mortality was possible.

A total of five alternatives were selected for detailed evaluation at Salem where cost-benefit and/or cost-cost analysis in the 2006 application was provided. This includes two types of fish protection alternatives that involve modifications to the existing CWIS and three types of flow modifications. These alternatives are as follows:

- Sound Deterrent System

  This alternative uses a fish behavioral barrier that emits sound to deter select fish species from becoming impinged at Salem. The system components would include sound generators that would be designed to operate at all water levels and cover the width of the intake. This alternative passed the preliminary screening process because a sound barrier was found to be effective for some species as a result of the PSEG-Salem-specific studies (an MSHIPT study that included a sound barrier) conducted as required by Custom Requirement G.5. of the 2001 Salem NJPDES permit. This study is detailed above in Section 7.C. This alternative would have otherwise been eliminated from the list of options because it reduces only impingement mortality. Since fish do not develop the organs/structures required to hear until they are well into their juvenile stage, sound deterrents cannot reduce entrainment. Additionally, some species are actually attracted to the CWIS by the sound.

- Dual-Flow Fine-Mesh (0.5 mm) Screens

  Dual-flow fine-mesh screens are designed with a dual flow entry/single-flow exit configuration. The screens are also equipped with fish lifting buckets, a low and high pressure spray wash system for fish and debris removal, and a fish and debris return trough. This alternative would be designed to achieve an approach velocity of 0.24 feet per second (ft/sec) with a through screen velocity of 0.5 ft/sec and would have met the national impingement standard of 0.5 ft/sec or less as specified in the 2004 and 2014 EPA regulations.

  Use of fine-mesh would reduce entrainment losses by preventing early life stages from being entrained through the Station cooling water system. Additionally, the design of the dual-flow screen system reduces the potential for carryover of fish and debris into the circulating water system. The alternative would result, however, in some shift in the relative number of organisms entrained versus impinged. Specifically, some smaller organisms currently entrained would become impinged. The net effect of the alternative depends in part on the organisms' impingement survival rate relative to its entrainment survival rate.

- Revised Refueling Outages

  This alternative involves changing the timing of the planned refueling outages to coincide with more biologically active periods in the estuary. Nuclear plants, including PSEG-Salem, require periodic outages for refueling. Planned refueling outages are periods during which one of the two Salem units is shut down to undergo refueling. However, one circulator is kept in operation in the shutdown unit during a refueling outage and the net effect of each refueling outage is to reduce flow by approximately 42% (7 versus 12 pumps operating).

Currently, each of the Salem units undergoes refueling every 18 months in either the spring or fall. The revised refueling outage alternative involves changing the timing of the planned refueling outages to occur during the summer (the period of peak biological productivity) and winter while meeting several constraints. Adjusting the refueling outage schedule would result in a potential reduction in fish entrainment and impingement mortality if the outages were timed to coincide with periods of biological productivity.

Reducing flow on a seasonal basis or shifting refueling outages, such that flows are reduced during periods of peak organism abundance, would reduce the number of organisms entrained or impinged at the CWIS. It should be noted that although shifting refueling outages will result in reduced effects during that period, there would be an increase in the effects during the old refueling outage period.

- Seasonal Flow Reductions with Variable Speed Drives

The seasonal flow reduction alternative involves installing variable speed drive controllers to the existing pump motors to control circulating water flow. Since the variable speed drives allow control of the circulating water pump speed, the water intake velocity and volume is reduced in response to seasonal fluctuations in aquatic life to allow reduced flow during periods of high fish activity. The specific alternatives considered in the assessment involve flow reductions of 10%, 20%, and 45% during the summer months (early June through early September).

The associated costs and benefits of the flow reductions modifications differ considerably depending on whether the change in cooling water temperature is allowed to vary freely or is held constant. The change in temperature is defined as the difference in temperatures of the water entering the circulating water system and the water discharged from the system. Thus, a total of six seasonal flow reduction scenarios are considered. They are described as follows:

  - Seasonal flow reduction of 10% with constant change in temperature: cooling water flow would be reduced by 10% during a 13-week period where the number of organisms are typically highest and the resultant reductions in loss greatest. The temperature differential would be held constant at 15°F.
  - Seasonal flow reduction of 20% with constant change in temperature: same as above except seasonal flow reduction would be 20%.
  - Seasonal flow reduction of 45% with constant change in temperature: same as above except that the seasonal flow reduction would be 45%.
  - Seasonal flow reduction of 10% with variable change in temperature: cooling water flow would be reduced by 10% during a 13-week period where the numbers of organisms are typically highest and the resultant reductions in loss greatest. The temperature differential would be allowed to vary with flow up to a 27.5°F limit.
  - Seasonal flow reductions of 20% with variable change in temperature: same as above except that the seasonal flow reduction would be 20%.
  - Seasonal flow reduction of 45% with variable change in temperature: same as above except that the seasonal flow reduction would be 45%.

- Retrofit with Closed- Cycle Cooling System

A closed-cycle cooling system would substantially reduce intake flow and thus entrainment and impingement. Closed-cycle cooling systems reject most of the generated waste heat from the operating units to the atmosphere rather than to the receiving waterbody. Retrofitting a closed-cycle cooling system to an existing power plant is a difficult engineering, design, scheduling, and construction effort because the installation was not planned in the original Station design. The conversion of the PSEG-Salem units to a closed-cycle cooling system would present a substantial technical challenge where a detailed discussion can be found in the 2006 NJPDES renewal application.

One option for converting PSEG-Salem's once-through cooling system to a closed-cycle cooling system would require installation of two 24-cell mechanical draft cooling towers. The conversion would also involve the installation of various equipment including new pumps and significant modifications to the existing station's piping and structures. Compared to natural draft cooling towers, mechanical towers are somewhat less expensive to build but have other disadvantages, such as significant air emissions and larger operating costs. Another option would involve installing two new counter-flow type natural draft towers, one for each PSEG-Salem unit. As with the mechanical draft tower alternative, retrofitting PSEG-Salem with natural draft cooling towers would require significant modifications to the existing piping and structures, including installation of various pumps and new electrical power distribution systems. Compared to mechanical draft cooling towers, natural draft cooling towers produce less noise and have smaller air emission impacts but are somewhat more expensive to build and aesthetically more imposing.

As indicated in the 2006 renewal application, the capital cost for retrofitting natural draft cooling towers is estimated at $852,440,200 whereas the capital cost for retrofitting mechanical draft cooling towers is estimated at $814,844,200.

9 Section 316(a) Determination and Information:

A. Overview

The thermal plume is formed as the Station's cooling water is discharged to the estuary. After the water is withdrawn from the estuary, it passes through the cooling water system to the condensers where its temperature is raised as the steam is condensed from the turbines. The thermal plume consists of a near-field region, a transition region, and the far-field. The near-field, which is also referred to as the "zone of initial mixing" (ZIM), is a small region within the thermal plume where the mixing of the Salem thermal discharge with the waters of the estuary is dominated by the momentum of the thermal discharge. The length of the near-field is measured along the centerline of the ZIM, which may have a curved shape depending on the magnitude and direction of the local currents in the vicinity of the Station. The transition regions extend from the end of the near-field to the beginning of the far-field. The far-field comprises the remainder of the thermal plume and is the region where mixing is controlled by the ambient currents. The boundary of the far-field, which is also the boundary of the thermal plume, is often delineated using a line of constant ΔT (or ΔT isopleth). Except for slack tides, the velocity at the end of the transition region is assumed to have a magnitude equal to the ambient current. The far-field comprises the remainder of the thermal plume and is the region where mixing is controlled by the ambient currents. In summary, the plume is characterized by a small area of more elevated temperatures in the immediate vicinity of the discharge that cools as the discharge surfaces and spreads, and a larger area of mildly elevated temperatures.

Because the thermal discharges from the Station are to the main stem Delaware River, the thermal standards listed in DRBC's Water Quality Regulations apply. Section 3.30.5.C.2 of the DRBC's Administrative Manual-Part III, Water Quality Regulations (December 4, 2013) lists the Stream Quality Objectives for temperature for Zone 5 of the Delaware River. These regulations require that the water temperature in the receiving water not be raised by more than 4^oF (2.2^oC) during the period from September through May and no more than 1.5^oF (0.8^oC) during the period from June through August, nor shall the maximum temperature exceed 86^oF (30^oC), except in designated heat dissipation areas. Section 4.30.6.F.4 of DRBC's Administrative Manual-Part III, Water Quality Regulations (December 4, 2013) define the dimensions of the HDA for Zone 5 (the regulatory HDA). It states that as a guideline, HDAs shall not be longer than 3,500 feet, measured from the point where the waste discharge enters the stream. In the event that these limits cannot be met at end of pipe or within the defined heat dissipation area, then the permittee can request a Section 316(a) variance would allow an alternative effluent limit for temperature.

To assess compliance with Section 316(a) and relevant regulations, facilities often use a Representative Important Species approach in conducting a biothermal assessment. The concept of RIS originated with the CWA and specifically with Section 316(a) regulations at 40 CFR Part 125.71. RIS means species which are representative, in terms of their biological needs, of a balanced, indigenous community of shellfish, fish, and wildlife in the body of water into which the discharge of heat is made. 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. Species selected for the analyses using EPA Draft §316(a) Guidance indicates that 5 to 15 RIS should be selected and include species that are:

- Commercially and recreationally valuable;
- Threatened and endangered;
- Critical to the structure and function of the ecosystem (e.g. habitat formers);
- Potentially capable of becoming localized nuisance species; and
- Necessary in the food chain for the well-being of species determined above.

B. Historical Section 316(a) Studies

As described in the 1999 application, a variety of physical and mathematical modeling and field data collection programs have been implemented to characterize the Station thermal plume in the thirty-year period between 1968 and 1998. The complexity of these studies has increased over the years as science and technology have advanced.

In the 1999 application, at the 30-day average flow rate of 175,000 gpm per pump, the increase in water temperature across the condensers ($\Delta T_{condenser}$) is 14.8°F. The expected maximum $\Delta T_{condenser}$ is 18.6°F, at the expected minimum flow rate of 140,000 gpm per pump. The maximum $\Delta T_{condenser}$ can occur when fouling reduces pump flow rates or when some circulating pumps are not operating. The length of the near-field is approximately 300 feet during running tides (flood and ebb), and approximately 1000 feet during the times of slack water for two unit operations. In the 1999 application, the length of the transition region is taken to be approximately 700 feet for the four principal phases of a tide (namely, ebb, end-of ebb, flood, and end-of-flood).

PSEG utilized an RIS approach in both the 1994 Section 316(a) Demonstration and in the 1999 §316(a) Demonstration. Species selected by PSEG for the Section 316(a) Demonstration include alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidissima*), Atlantic croaker (*Micropogonias undulatus*), bay anchovy (*Anchoa mitchilli*), blueback herring (*Alosa aestivalis*), spot (*Leiostomus xanthurus*), striped bass (*Morone saxatilis*), weakfish (*Cynoscion regalis*), and white perch (*Morone americana*). The macroinvertebrate RIS chosen were blue crab (*Callinectes sapidus*), opossum shrimp (*Neomysis americana*), and scud (*Gammarus daiberi, G. fasciatus, G. tigrinus*). These 12 selected RIS are among the most abundant species entrained and impinged at the CWIS and/or reside or migrate through the area occupied by the thermal plume.

The Biothermal Assessment included in the 1999 application is an assessment of the effects of the thermal plume on the biological community. This assessment relies directly on the results of the thermal plume modeling. The purpose of the biothermal assessment is to identify the likelihood and magnitude of biothermal responses elicited by the Station's thermal discharge and to assess their significance to the key species and the biological community. In PSEG's 1999 316(a) Demonstration, there were five sequential steps to the biothermal assessment: (1) Review of regulatory standards and decision criteria; (2) Evaluation of biological vulnerability (critical functions, biotic categories); (3) Selection of RIS; (4) Detailed evaluation (Predictive, Retrospective - No Prior Appreciable Harm); and (5) Overall evaluation of "balanced indigenous community" (BIC).

The 1999 application contains two biothermal assessments of the PSEG-Salem plume, a predictive assessment and a retrospective assessment, as set forth in EPA guidance. The predictive assessment uses reasonable worst case assumptions to project the maximum likely extent and duration of exposure by the RIS to the elevated temperatures of the PSEG-Salem plume, and then evaluates the potential adverse effects of such exposures based on the results of laboratory tests on the effects of heat on those species. PSEG's evaluation, which also takes into account the effects on the RIS of nearby thermal discharges other than PSEG-Salem, the interaction of the heat in the plume with other pollutants, and fish losses at the Station intake, concluded that the discharge would not have an adverse effect on any RIS populations. The essential basis for this conclusion is that the area of more elevated plume temperatures in the immediate vicinity of the discharge is small and larger fish avoid it, while the less elevated temperatures in the remainder of the plume are too low to have adverse effects.

The retrospective assessment examined abundance trends for RIS and was conducted in two parts. First, specific biotic components potentially vulnerable to the Station's thermal discharge were evaluated to determine if there were changes in species composition or abundance attributable to PSEG-Salem's thermal discharge. Second, the evaluation focused on trends in the abundance of RIS populations. The results of these evaluations revealed that the changes in species composition or overall abundance were within the range of natural variation and that juveniles of most species showed statistically significant increases in abundance. Other data was examined to identify any adverse effects of the plume, in conjunction with other influences including the PSEG-Salem intake, on fish populations. PSEG contends that no such effect was found.

C. Section 316(a) Determination in June 29, 2001 Permit

In the June 29, 2001 decision, the Department acknowledged that Station operations and the resulting physical thermal plume had not significantly changed since the onset of Station operations, with the exception of extended outages. The Department also agreed that the velocities associated with the ZIM are high and available data shows that RIS species could not reside in this area of biological significance for very long. Therefore, based on a review of the current data and modeling pertaining to the thermal plume as well as the biothermal assessment, the Department determined that a variance under Section 316(a) is warranted. A thermal discharge at the Station, which does not exceed a maximum of 115^{o} F (46.1^{o}C), is expected to assure the protection and propagation of the balanced indigenous population. In summary, the Department granted PSEG's request for a variance pursuant to Section 316(a) and proposed thermal limits which would allow the continued operation of the existing once-through cooling water system with an intake flow limit of 3024 MGD.

The DRBC issued Docket No. D-68-20 CP (Revision 2) on September 18, 2001 to PSEG for the Station consistent with the NJPDES permit. The docket specified that the project discharge shall not cause a temperature rise in excess of 1.5°F (24-hour average during June through August) above ambient temperature. Such limitations may be exceeded within a heat dissipation area which shall not exceed a length of 25,300 feet upstream and 21,100 feet downstream from the end of the Station's discharge pipes nor extend closer than 1320 feet to the present eastern boundary of the shipping channel of the Delaware River. The docket also states that the project shall not cause a temperature rise in excess of 4°F (24-hour average during September through May) above ambient temperatures. Such limitations may be exceeded within a heat dissipation area which shall not exceed a length of 3,300 feet upstream and 6,000 feet downstream from the end of the Station's discharge pipes nor extend closer than 3,200 feet to the present eastern boundary of the shipping channel of the Delaware River.

D. 2006 NJPDES Renewal Application Regarding Section 316(a)

The 2006 NJPDES renewal application contains extensive technical information regarding Section 316(a) and focuses on a comparison of current operating conditions versus operating conditions under which the 1999 Section 316(a) demonstration was evaluated.

1. Characterization of the Thermal Plume

The thermal exposure of the biotic community resulting from waste heat discharged at the Station depends, in part, on the resulting spatial and temporal distribution of water temperatures in the Station's thermal plume. Temperature distributions in the thermal plume depend on six factors involving Station configuration and operation and the waterbody (i.e., the Delaware Estuary) characteristics. Station configuration and operating factors affecting the thermal plume are: 1) the outfall configuration, 2) the circulating water flow rate, and 3) the heat rejection rate. Waterbody factors affecting the plume temperature distributions are: 4) the geometry of the receiving water, 5) meteorological conditions affecting evaporative cooling, and 6) the ambient temperature of the receiving water. As discussed below, PSEG contends that none of these factors have changed significantly since the 1999 application. The heat rejection rate has decreased slightly, along with a slight decrease in the water temperature across the condensers. Hence, there has been very little change in the PSEG-Salem plume, and the change that has occurred produces slightly lower plume temperatures.

Regarding Station configuration and operation, the thermal discharge outfall location, outfall configuration, and the circulating water pumps are unchanged since the 1999 application. There have been no changes in the circulating water pumping system, and dye studies measuring pump flow rates confirm that the circulating water flow rates have not changed. Nominal, minimum, and maximum pump flow rates (normalized to six pumps per unit) during the term of the current permit at the Station (166,000, 140,000, and 175,000 gpm, respectively) are identical to the flow rates considered representative of Station operation at the time of the 1999 application. The cooling water is still discharged through the same outfall system, so the discharge velocities (flow rated divided by cross-sectional areas) are also identical. The 1999 Section 316(a) Demonstration was protectively conservative, in part because it assessed the effects of a reasonable worst case plume at the low pump flow (140,000 gpm) condition.

Regarding the heat rejection rate, two significant modifications have been made since the 1999 application. First, PSEG-Salem Unit 1 and Unit 2 both increased their licensed thermal power limit by about 1.4%. The Unit 2 high pressure and low pressures turbines were replaced in 1999. The Unit 1 high pressure and low pressure turbines were replaced several years later in 2004. These modifications used optimized flow paths and blade efficiencies to improve the performance of the PSEG-Salem units, resulting in increased electrical generation for each unit and reduction of heat rejected to the river

Additionally, the station heat rejection rate changes slightly because of the 1.4 percent uprating (tending to increase the heat rejection rate) and new, more efficient turbines (tending to decrease the heat rejection rate). The net effect calculated is a small (about 0.5% to 1 %) decrease in the heat rejection rate, and a proportional decrease in the discharge "Delta T" (ΔT), which is proportional to the rate of heat rejection divided by the (unchanged) circulating water flow rate. The revised heat rejection rate is 15.3×10^9 British Thermal Units (BTUs)/hr, as presented in the Condenser Performance Evaluation, prepared by True North Consulting, LLC, and submitted with the 2006 application. This evaluation utilized the PEPSE model to simulate various river water temperatures in order to determine the heat rejection rate from the Station. PEPSE is a steady-state energy balance software program that calculates the performance of electric generating plants. In addition, given the 30-day average flow rate of 175,000 gpm per pump, the increase in water temperature across the condensers ($\Delta T_{condenser}$) has dropped from 14.8°F to 14.6°F. The expected maximum $\Delta T_{condenser}$ has also decreased slightly from 18.6°F to 18.3°F, at the expected minimum flow rate of 140,000 gpm per pump. As stated above, the maximum $\Delta T_{condenser}$ can occur when fouling reduces pump flow rates or when some circulating pumps are not operating.

Waterbody factors affecting the distribution of plume temperature include the geometry of the receiving water; meteorological conditions affecting evaporative cooling; and the ambient temperature of the receiving water. There have been no significant changes to the morphology of the Delaware Estuary in the vicinity of the Station's thermal discharge, so the ambient and plant-induced velocities that affect mixing and dilution of the waste heat are unchanged since the assessments were conducted for the 1999 application.

Meteorological conditions that primarily affect water temperatures include air temperature, relative humidity, wind speed, and cloud cover. The 1999 application relied on 50 years of weather observations made by the National Oceanic and Atmospheric Administration (NOAA) Weather Service and its predecessors at the Wilmington, Delaware airport from 1948 through 1997 as input for the thermal plume characterization. Air temperature, dew point temperature, wind speed, and cloud cover observations from the NOAA database for1998 through 2004 were compared with the meteorological conditions used as inputs for the 1999 application. No trend in annual average air temperature or dew point temperature is observable. Annual average wind speeds since 1987 have tended to be less than the long-term mean; however, there is no indication of a long term trend in the data. Values for percent cloud cover are consistently lower after 1994 because instrumentation installed that year for automatically measuring cloud cover does not detect clouds higher than 12,000 feet in elevation. Yet comparing the annual average cloud cover values with the appropriate mean does not disclose any clear trend in cloud cover at the Wilmington meteorological monitoring station.

As an integral component of the thermal plume characterization, the 1999 permit application computed ambient water temperatures based, in part, on historical meteorological data for the 10-year period from 1988 to 1998. Water temperatures measured at Reedy Island from 2000 to 2004 were compared with water temperatures measured there during the 1988 to 1998 period to evaluate whether recent ambient water temperatures are similar to those used in the prior 1999 316(a) Demonstration. Results of the comparison demonstrate that, within the bound of normal variation, daily mean ambient water temperatures during the most recent five-year period do not differ from those of the preceding 10-year period and that, as in the past, short-term high temperature excursions in water temperature in the estuary are concurrent with extreme drought conditions. Therefore, ambient water temperatures are similar to those considered in the 1999 application and within the range of warm and cool years addressed in the biothermal analysis submitted with that application.

Three models were used in the 1999 hydrothermal assessment: an ambient temperature model (ATM), a far-field model (FFM), and a near-field model (NFM). The ATM computes ambient temperatures, and their statistics, as a function of time based on historical meteorological data, water depth, and site-specific parameters. This model was necessary because it is not possible to measure ambient temperature when the station is in operation. However, as discussed above, an examination of historical water temperatures shows no significant warming or cooling trends. Hence it is reasonable to conclude that there is no change, statistically, in ambient water temperatures and therefore no effect of such change on the total temperature to which the estuarine community is exposed. The far-field plume temperatures were calculated using RMA-10/11, which computes water temperatures as a function of time and up to three spatial dimensions, with and without station operation. The near-field plume temperatures were computed using CORMIX, which computes near-field temperature increases above the far-field (background) temperature. CORMIX also computes near-field velocities for use in estimating time and temperature exposures of planktonic life stages during plume entrainment and evaluating (by comparison to sustainable fish swimming speeds) the maximum near-field temperatures to which juvenile and older fish will be exposed. The hydrothermal models were used to generate several types of output used in the regulatory and biothermal analyses and which PSEG contends are still relevant.

The size of the HDA is specified in the DRBC docket. The size of the thermal plume is primarily governed by the heat rejection rate (which has decreased slightly) and by hydrodynamics (e.g., the pipe induced flow and the ambient tidal regime, both of which remain the same). Hence, conservatively, the size of the thermal plume has remained unchanged, and the size of the HDA will not need to be changed.

2. Balanced Indigenous Community (BIC)

In the 1999 application, PSEG studied the nature of the aquatic community to determine the maintenance of a BIC. PSEG explored the community structure, including trophic relationships, utilization of habitat types, and species composition of the community. PSEG maintains that the RIS and the basic structure of the community have not changed since the 1999 application, and a balanced community has been maintained in the estuary. The structure of the aquatic community in the estuary is largely determined by the hydrographic and climatological conditions in the estuary and in the Mid-Atlantic Bight which is the biogeographic region to which the estuary belongs. The community and ecosystem characteristics that minimize the potential for thermal impacts to aquatic life have not changed since the 1999 application. The only major changes in the estuary have been the installation of fish ladders in tributaries and the marsh restoration program conducted by PSEG which have improved habitat quality and productivity in the estuary. Further, PSEG contends that PSEG-Salem's thermal discharge was found to meet the EPA 316(a) draft "*Interagency 316(a) Technical Guidance Manual And Guide For Thermal Effects Sections Of Nuclear Facilities Environmental Impact Statements"* for a low potential impact site for phytoplankton, zooplankton, habitat forming communities, epibenthic macroinvertebrates and vertebrate wildlife other than fish.

PSEG contends that the thermal discharge has a low potential to threaten the BIC through its effects on phytoplankton because the contribution of phytoplankton to photosynthesis in the vicinity of the Station, and to food production in the estuary, is small. In the area of the estuary where PSEG-Salem is located, high

sediment loads and associated turbidity limit light penetration, thereby supporting very low levels of phytoplanktonic photosynthesis. Low light penetration is limiting to planktonic growth; therefore, temperature does not impact planktonic growth in the area of the discharge.

The primary habitat formers in the Delaware Estuary are rooted vascular plants in the tidal wetlands, which also serve as the major food producers in the estuary. Other habitat formers in the estuary include submerged aquatic vegetation (SAV) and oyster beds. PSEG-Salem's thermal discharge was determined to have low potential to threaten the BIC through its effects on habitat forming communities because tidal scouring, sedimentation and low light penetration limit the development of SAV beds in the transition zone of the estuary. There are not SAV beds in the vicinity of the Station's offshore discharge; however, the closest oyster bed is the Hope Creek bed which is located 0.56 miles from the Station. Additional information on oysters is included later.

PSEG-Salem's thermal discharge was determined to have low potential to threaten the BIC through its effects on vertebrate wildlife other than fish. This is based on the fact that the offshore vicinity of the discharge is not preferred habitat for any species and is only used incidentally by wildlife (e.g., waterfowl, raccoons, muskrats) in the shore zone and its wetlands. Similarly, the 1999 Demonstration concluded that the region of the Station is not the preferred habitat for sea turtles, and is at the margin of the geographical distribution range of Kemp's Ridley, green, and loggerhead sea turtles that occasionally occur near PSEG-Salem. Further, sea turtles occasionally occurring near the Station are strong swimmers, capable of avoiding plume temperatures warmer than they prefer.

The Station's thermal discharge in the transition zone of the estuary is at the outer margin of the distribution of most marine and freshwater fish species that inhabit the Delaware Estuary. A critical function of the habitat in the region of the estuary near PSEG-Salem is as a pathway for seasonal fish migrations. Although the abundance of individual fish species in the estuary varies from year to year, the species composition today remains typical of that historically present in the estuary. The 1999 Section 316 (a) Demonstration concluded that the potential for the thermal discharge to threaten the reproduction and development of fish populations in the estuary is small since the primary spawning and nursery areas for most fish species in the Delaware Estuary are remote from the Station's discharge. Primary spawning and nursery areas are generally located either downstream in the more saline water of the lower bay and the Atlantic Ocean, or upstream in freshwater reaches of the Delaware River. The 1999 Section 316 (a) Demonstration also found that PSEG-Salem's discharge minimizes the potential for blocking fish migration or causing cold shock. Predictive evaluations on the finfish RIS confirmed that fish migration would be unaffected in over 95 percent of the estuary cross-section in the vicinity of PSEG-Salem. Cold shock is highly unlikely due to the unconfined location of the thermal discharge, high discharge velocity, low ΔTs beyond the ZIM, and because a tidally dynamic plume would not attract fish or allow them to acclimate to elevated plume temperatures.

In PSEG's 2006 application, the thermal discharge from the Station was found to have low potential to threaten the BIC through its effects on the shellfish/macroinvertebrate biotic category. The location of the Station's discharge in the Transition Zone of the estuary is not the primary habitat of most marine and freshwater benthic macroinvertebrates and macrozooplankton, which are located downstream in the Bay and coastal marine environment or upstream in the freshwater reaches of the Delaware Estuary. Additionally, no threatened or endangered shellfish/macroinvertebrate species occur in the vicinity of the thermal discharge. In the 2006 application, PSEG stated that the physical characteristics that control the distribution of shellfish relative to PSEG-Salem's location in the estuary have not changed since the 1999 application; therefore no increase in the vulnerability of the shellfish/macroinvertebrate community is expected.

3. Summary

An evaluation of the factors influencing the Station's thermal plume and the characterization of that plume provided in the 1999 Section 316(a) Demonstration indicates that the nature of PSEG-Salem's thermal discharge has not changed fundamentally from the 1999 application. This conclusion is conservative in that detailed analysis of the Station's thermal performance indicates that the current heat rejection rate at PSEG-

Salem is slightly lower than it was in 1999, and all other Station factors affecting the resulting thermal plume are unchanged. Waterbody geometry is unchanged since the 1999 application and other environmental factors affecting the rate of mixing and cooling of the thermal plume resulting from the Station's discharge have varied naturally, showing no increasing or decreasing trends. Therefore no change in the spatial and temporal temperature distributions of PSEG-Salem's thermal plume are expected.

Most importantly, the characteristics of PSEG-Salem's thermal discharge that are critical in protecting the BIC are driven by its location and design and, therefore, remain the same now as they have been from initial licensing through the 1999 application. PSEG contends that the 1999 Section 316(a) Demonstration and all prior biothermal assessments have shown that the location of the discharge and its general design characteristics minimize the potential for PSEG-Salem's thermal discharge to threaten the maintenance of a BIC because of the following:

- The high exit velocity of the Station's thermal discharge produces very rapid dilution, resulting in rapidly declining temperatures and short exposure times for organisms that may drift through the plume.
- Rapid mixing also confines higher plume temperatures to relatively small areas in the ZIM in the immediate vicinity of the discharge. Fish and other nektonic organisms are not exposed to higher plume temperatures in the ZIM because the velocities and turbulence in this portion of the plume exceed their swimming capabilities.
- Rapid dilution by the high exit velocities and high tidal energies cause the vast majority of PSEG-Salem's thermal plume to consist of low ΔT fields which have little effect on the aquatic community and are comparable to natural temperature variations experienced by aquatic life in the estuary.
- The offshore open-water location, rapid temperature reduction and high exit velocity minimize the potential for cold shock by reducing thermal attraction to the warmest temperatures of the plume and preventing fish from residing there long enough to acclimate to those temperatures.
- The offshore location and rapid dilution of the thermal discharge prevent contact of the higher plume temperatures with shoreline communities.
- The discharge is located in a region of the estuary where high tidal energy, salinity variations, sediment scouring and redeposition, and turbidity prevent the establishment of an ecologically important bottom community and does not provide suitable year-round habitat for any but relatively few species that can tolerate the large salinity range.
- Strong tidal currents and the relatively large width of the estuary (i.e. 2.5 miles wide), in combination with the rapid dilution of discharge temperatures provide a low potential for impact on migratory pathways, the only critical ecological function served by the zone of the estuary in which PSEG-Salem is located.

The levels of conservatism used in the 1999 predictive assessment and the use of updated retrospective analyses to confirm the maintenance of a BIC in the Delaware Estuary provide additional assurance that the conclusions of the 1999 Section 316(a) Demonstration continue to apply.

E. Section 316(a) Determination in this Renewal Permit

Section 316(a) allows for a variance from temperature criteria as long as a balanced indigenous community can be maintained. Specifically, the permittee must demonstrate that the otherwise applicable thermal discharge effluent limit is more stringent than necessary to assure the protection and propagation of the waterbody's balanced, indigenous population (BIP) of shellfish, fish and wildlife. As part of the request for a continued Section 316(a) variance, PSEG has conducted predictive studies as well as retrospective studies to demonstrate the absence of prior appreciable harm.

As described previously, PSEG conducts biological monitoring including the PSEG Baywide Beach Seine and the PSEG Baywide Bottom Trawl Survey. PSEG also funds the Department's striped bass recruitment survey on an

annual basis to ensure that there is no duplication of sampling effort between this survey and the PSEG Baywide Beach Seine. PSEG contends that numerous studies performed by PSEG Salem as well as State and Federal Governmental agencies have demonstrated that the health of the Delaware Estuary has been improving for over thirty years. Baywide sampling includes juvenile abundance sampling as performed by PSEG since 1985 as well as long-term data on juvenile abundance in the Delaware Estuary as collected by NJDEP and DNREC for over thirty years. PSEG contends that the long term trend data shows no decline in juvenile abundance that can be attributable to PSEG-Salem; no change in the number of finfish species; and that finfish density has increased.

In order to evaluate trends of finfish with respect to the status of the population, the Department also examined data from the Department's Delaware Bay finfish trawl survey of juvenile finfish species, conducted by the Department's NJFW Program (see http://www.njfishandwildlife.com/artdelbaystudy14.htm). This survey began in 1991 and is used to develop indices for comparing the relative annual abundance of selected stocks. Sampling stations are located within the shallow, near shore waters on the New Jersey side of the bay. Data collected allows biologists to develop relative abundance estimates and length frequencies of estuarine dependent finfish necessary for predicting future fishery trends and harvest potential. The species of focus in the Delaware Bay finfish trawl survey include bay anchovy, Atlantic croaker, weakfish, blue crab, and striped bass. In reviewing data from 1991 through 2011, there is great inter-annual variation. Species abundance has fluctuated from 1991 through 2011 with no apparent long-term trends. It is reasonable to conclude that the 20 year data set from this survey supports that there is evidence of no prior appreciable harm.

PSEG's retrospective evaluation has asserted no prior appreciable harm to the balanced indigenous population. The Department recognizes that the large data set from baywide sampling programs, as conducted by resource agencies (including the Department) and PSEG, supports this conclusion as most trends are stable or increasing. The Department acknowledges that there have been no substantial changes in the thermal characteristics of the discharge, the hydrology of the waterbody, or the species composition in the area of the discharge. Specifically, the fundamental characteristics of the thermal plume have not changed in the decades that both units have been in operation. The large volume of the estuary at the discharge location as well as the positioning of the site near the edge of both the freshwater and saltwater habitats helps to minimize extended biotic exposure to the thermal discharge.

The Department has determined that the data and studies presented support a continued 316(a) variance as the operation of the Station continues to support a balanced, indigenous community. **The Department proposes to renew the variance pursuant to Section 316(a).** Nonetheless, the Department maintains that additional measures described above would offset any impacts of the Station and would serve to enhance the balanced indigenous population.

This variance expires along with the permit. If upon permit renewal the permittee wants the variance to be continued, the request for the variance along with a basis for its continuance must be submitted at the time of application for the renewal permit. The Department's Section 316(a) determination will include, but not be limited to, a review of whether the nature of the thermal discharge or the aquatic populations associated with the Station have changed; whether the measures required under the proposed existing permit have, in fact, assured the protection and propagation of the balanced indigenous population; whether the best scientific methods to assess the effect of the permittee's cooling water system have changed; and whether the technical knowledge of stresses caused by the cooling system has changed. This requirement is included in Part IV.

In accordance with N.J.A.C. 7:14A-16.4, the permittee is required to notify the Department of any changes to its discharges, including any additional heat or temperature loadings, that may occur as a result of changes to the Station's operations. This notification shall be made in writing so that the Department can make a determination as to whether any Section 316(a) variance granted by the Department is still appropriate. The Department reserves the right to request additional thermal modeling data and/or a modified biothermal assessment. This condition is included in Part IV.

10 Section 316(b) Determination and Information:

A. Impingement Data

1. Overview

Ongoing impingement monitoring is a requirement of the NJPDES permit where the sampling materials and methods are specified in the IBMWP. The objective of the Impingement Monitoring Program is to estimate the numbers of species impinged at the CWIS; to estimate their densities; and to estimate their survival rates. Impingement samples are collected at the fish counting pools located adjacent to the CWIS. Timed samples are diverted from the fish/debris return trough into the north fish counting pool, where the water exits the pool through screen panels with mesh that matches the mesh of the CWS traveling screens. After draining the pool, specimens are classified as live, dead, or damaged. Specimens are then sorted by species, measured and weighed.

Since 1998, sampling has been scheduled throughout the year (January through December), 3 days per week, with up to 10 samples collected per 24-hr period (1,560 samples annually). Samples are taken at 2 ½-hr intervals during each 24-hr period. Collection efficiency studies were conducted from 1979 to 1982, in 1998, from 1999 to 2000, and in 2002. The most recent study conducted in 2002 estimated the mortality of fish solely attributable to the pool and collection process. This study also provided an estimate of true impingement collection efficiency, since known numbers of fish were introduced and subsequently collected.

2. Summary of Impingement Data Biological Monitoring Program Annual Reports

Impingement data is summarized in the Biological Monitoring Program Annual Reports where the number of individual specimens is totaled. While all numbers for individual species are included, the findings focus on the RIS or target species. Note that these values are not representative of the total impingement losses at the Station since these are timed subsamples and are not scaled up for full intake flow.

To illustrate the presentation of this data, a summary of 2013 data from the 2013 annual report is included below. A total of 60,004 finfish and 4,988 blue crabs were taken in 1,580 samples (total sample time of 1,647 minutes) during 2013. Findings specific to target species include:

- Alewife. A total of 103 individuals were taken from 77 of 1,580 samples. Abundance was highest in July; individuals were collected in all months of 2013 except April. The proportion of live individuals on an annual basis was 94%.

- American shad. A total of 1,165 individuals were taken from 395 of 1,580 samples. Abundance was highest in November; individuals were collected from January through April, and again from July through December. The proportion of live individuals on an annual basis was 93%.

- Atlantic croaker. A total of 14,412 individuals were taken from 644 of 1,580 samples. Abundance was highest in December; individuals were collected in all months of 2013 except September. The proportion of live individuals on an annual basis was 96%.

- Atlantic menhaden. A total of 2,245 individuals were taken from 271 of 1,580 samples. Abundance was highest in May; individuals were collected in all months of 2013 except February and October. The proportion of live individuals on an annual basis was 95%.

- Atlantic silverside. A total of 1,511 individuals were taken from 502 of 1,580 samples. Abundance was highest in December; individuals were collected in all months of 2013. The proportion of live individuals on an annual basis was 96%.

- Bay anchovy. A total of 4,478 individuals were taken from 866 of 1,580 samples. Abundance was highest in May, and similarly high in November; individuals were collected in all months of 2013. The proportion of live individuals on an annual basis was 87%.

- Blueback herring. A total of 224 individuals were taken from 114 of 1,580 samples. Abundance was highest in April; individuals were collected in March through May and again in July through December. The proportion of live individuals on an annual basis was 92%.

- Bluefish. A total of 522 individuals were taken from 214 of 1,580 samples. Abundance was highest in June; individuals were collected in May through November. The proportion of live individuals on an annual basis was 92%.

- Spot. A total of 132 individuals were taken from 93 of 1,580 samples. Individuals were collected in January and again in May through November, with highest abundance recorded during the month of May. The proportion of live individuals on an annual basis was 93%.

- Striped bass. A total of 1,237 individuals were taken from 477 of 1,580 samples. Abundance was highest in November, and similarly high in December; individuals were collected in January through April, and again in June through December of 2013. The proportion of live individuals on an annual basis was 96%.

- Weakfish. A total of 10,151 individuals were taken from 501 of 1,580 samples. Individuals were collected in June through November; abundance was highest in July. The proportion of live individuals on an annual basis was 95%.

- White perch. A total of 8,108 individuals were taken from 937 of 1,580 samples. Individuals were collected in all months of 2013; abundance was highest in November and similarly high in December. The proportion of live individuals on an annual basis was 97%.

3. Impingement Analysis in the 2006 Renewal Application

For the 2006 application PSEG utilized data from 2002 to 2004 with enhanced statistical analysis to minimize uncertainty in Station loss estimates. The improvements to the monitoring program and analytical methods which began in 2002 provide a more complete and precise set of data than previous years.

The following table presents a summary of the 2002 through 2004 impingement data, showing only those species which accounted for ≥1% of the total collection. The Department has ranked this data to indicate the species most commonly impinged based on the estimated total number values. **Note that this is data that has not been adjusted to represent full intake flow.**

Impingement at the CWIS									
	Year One - 2002			**Year Two - 2003**			**Year Three - 2004**		
Taxon	**Estimated Total Number**	**%**	**Rank**	**Estimated Total Number**	**%**	**Rank**	**Estimated Total Number**	**%**	**Rank**
Atlantic croaker	67,300	62.97%	1	1,779	3.42%	4	8,972	14.23%	3
Spotted hake	12,062	11.29%	2	1,040	2.00%	7	2,290	3.63%	5
Blue crab	8,845	8.28%	3	1,343	2.59%	6	2,452	3.89%	4
White perch	7,534	7.05%	4	31,131	59.92 %	1	30,251	47.99%	1

Weakfish	3,047	2.85%	5	9,328	17.95 %	2	10,389	16.48%	2
Atlantic menhaden	1,566	1.47%	6	110	0.21%	15	69	0.11%	21
Atlantic silverside	1,382	1.29%	7	627	1.21%	8	368	0.58%	12
Bay anchovy	1,305	1.22%	8	1,573	3.03%	5	1,344	2.13%	8
Gizzard shad	1,153	1.08%	9	370	0.71%	10	381	0.60%	10
Blueback herring	547	0.51%	10	409	0.79%	9	2,241	3.56%	6
Black drum	411	0.38%	11	15	0.03%	29	1	0.00%	37
Striped bass	353	0.33%	12	2,811	5.41%	3	1,587	2.52%	7

The impingement losses and numbers entrained were totaled for each species by life stage/age in each of the three years. In summary, the dominant finfish collected in 2002 were Atlantic croaker and spotted hake. In 2003, the dominant finfish collected included white perch and weakfish. The dominant finfish collected in 2004 included white perch, weakfish, and Atlantic croaker.

A review of this data shows inter-annual variability in the number of organisms present in the vicinity of Salem's CWIS, as expected in a part of the estuary with high inter-annual variability in salinity levels. An analysis of monthly data indicates seasonal variability in the vicinity of the CWIS which shows strong seasonal patterns of abundance that are species specific and that are consistent with spawning seasons, spawning locations, and migration patterns of the species. In order to examine diel variation, impingement and entrainment values were allocated to four different time periods: 12:00 midnight to 5:59 am; 6:00 am through 11:59 am; 12:00 noon through 5:59 pm; and 6:00 pm through 11:59 pm. The diel analysis indicated the presence of diel patterns of abundance in the vicinity of the CWIS for many species and ages.

As described previously, PSEG recorded both initial impingement mortality and latent impingement mortality. Initial mortality is measured immediately upon collection, whereas latent mortality requires a holding time of up to 48 hours. The table below shows initial and latent impingement mortality (from 2002 to 2003) with the data presented as annual averages by taxon. Only those species were included for which a sample size was greater than or equal to 20 individuals. As the table demonstrates, the average impingement mortality for all species (including both initial and latent mortality) is 27.39%.

Initial and Latent Impingement Mortality		
	Initial Mortality (annual average)	**Latent Mortality (annual average)**
Atlantic croaker	15.88%	19.76%
Atlantic menhaden	4.01%	--
Atlantic silverside	3.86%	--
Bay anchovy	8.19%	47.13%
Blue crab	7.36%	--
Blueback herring	10.53%	--
Bluefish	6.42%	--
Mummichog	3.39%	--
Naked goby	2.77%	--
Sheepshead goby	15.00%	--
Striped bass	--	5.92%

Weakfish	4.11%	36.09%
White perch	4.33%	10.61%
Alosids	--	42.11%
Spot	--	30.13%
Average of all species	**7.15%**	**27.39%**

The table below summarizes annual impingement losses with mortality by taxon averaged from 2002 to 2004. The "Impingement Losses" column is the sum of the fish initially classified as dead due to impingement plus the estimated loss due to latent mortality. **This data accounts for full intake flow.**

Total Annual Impingement Numbers by Species for Current Conditions

	Total Impinged			**Impingement Losses (after adjusting for latent impingement mortality)**			**Average Mortality**
	2002	**2003**	**2004**	**2002**	**2003**	**2004**	**2002-2004**
Alewife	87,001	31,275	134,149	10,996	16,360	63,492	37.43%
American Shad	5,879	31,584	227,103	1,672	15,354	72,486	36.32%
Atlantic Croaker	21,313,809	620,754	3,260,494	6,332,522	143,298	332,644	21.00%
Bay Anchovy	424,168	475,799	544,177	197,496	326,839	341,135	59.31%
Blueback Herring	184,095	133,328	1,110,952	28,113	50,790	265,866	25.77%
Spot	1,131	2,714	366	253	721	133	28.42%
Striped Bass	101,208	776,934	505,340	5,351	167,332	66,007	13.30%
Weakfish	722,090	3,129,152	3,531,713	428,300	1,953,299	2,118,736	60.58%
White Perch	2,044,207	9,424,768	11,181,299	163,505	773,818	970,462	8.30%
Atlantic Silverside	509,142	220,114	156,495	138,270	44,951	48,609	26.21%
Atlantic Menhaden	534,646	31,211	20,420	360,931	21,769	15,724	71.42%
Blue Crab	2,739,118	356,983	831,320	172,725	27,483	57,931	6.99%
Bluefish	45,292	31,311	44,533	3,884	7,592	17,433	23.99%
TOTAL							**32.23%**

B. Entrainment Data

1. Overview

Ongoing entrainment monitoring is a requirement of the NJPDES permit where the sampling materials and methods are specified in the IBMWP. The objective of this monitoring program is to provide accurate density estimates of fish entrained through the CWIS at PSEG-Salem Units 1 and 2. Samples are timed while being diverted by pumping river water out of the intake bay of Circulating Water Pumps 12B or 22A into a plankton net having a 0.5-mm mesh. A typical sample filters 50 m^3 of intake water. Each concentrated sample is preserved, and the ichthyoplankton identified. For each species collected, the life stage is determined, the total number counted, and the lengths of a subsample were measured.

During the months of January through March and August through December, routine entrainment sampling is scheduled during three 24-hour events per week with seven collections at approximately equal intervals during each event. During the months of April through July, intensive entrainment sampling occurs during four events scheduled each week with 14 samples scheduled at equal intervals during each event. Each event monitors a complete diel period encompassing two tidal cycles.

2. Summary of Entrainment Data Biological Monitoring Program Annual Reports

Entrainment data is summarized in the Biological Monitoring Program Annual Reports where the number of individual identifiable specimens is totaled. While all numbers for individual species are included, the findings focus on the RIS or target species. Note that these values are not representative of the total entrainment losses at the Station since these are timed subsamples and are not scaled up for full intake flow.

A total of 1,616 out of 1,729 scheduled entrainment abundance samples were collected during 2013. During the 2013 Salem Entrainment Abundance Monitoring program, totals of 45,018 fish eggs, 33,546 larvae, 7,999 juveniles, and 82 adults representing at least 28 species were collected in 1,616 entrainment abundance samples, with 82,375 meters cubed (m^3) of sample water filtered. Results specific to the target species are discussed in phylogenic order:

- *Alosa* spp. - A total of eight *Alosa* spp., including seven larvae and one juvenile, was taken during May and June.

- American shad - A total of one larval American shad was collected in May.

- Atlantic croaker - A total of 1,903 Atlantic croaker, including 19 larvae and 1,884 juveniles, was collected during January through April and September through December. Atlantic croaker was most abundant in January, with juveniles being the predominant life stage.

- Atlantic menhaden - A total of 5,297 Atlantic menhaden, including 2,654 larvae and 2,643 juveniles, was taken during January through June and October through December. The abundance of Atlantic menhaden was highest in March, with juveniles being the predominant life stage.

- Bay anchovy - A total of 59,893 bay anchovy, including 44,807 eggs, 12,715 larvae, 2,322 juveniles and 49 adults, was collected during all months. Bay anchovy was most abundant in June, with eggs being the predominant life stage.

- Blueback herring - A total of one juvenile blueback herring was collected during April.

- Bluefish - A total of one juvenile bluefish was taken during June.

- *Menidia* spp. - A total of 511 *Menidia* spp., including 195 eggs, 282 larvae, 17 juveniles and 17 adults, was collected during January and May through September, November, and December. *Menidia* spp. was most abundant in July, with larvae being the predominant life stage.

- *Morone* spp. - A total of four larval *Morone* spp. was taken during May and June.

- Spot - A total of four juvenile spot was collected during the months of April and May.

- Striped bass - A total of 4,252 striped bass, including three eggs, 4,137 larvae and 112 juveniles, was collected during the months of May, June and July. Striped bass was most abundant in June, with larvae being the predominant life stage.

- Weakfish - A total of 1,031 weakfish, including four eggs, 321 larvae and 706 juveniles, was collected during the months of May through September. Weakfish was most abundant in June, with juveniles being the predominant life stage.

- White perch - A total of 19 white perch, including 11 larvae and eight juveniles was taken during the months of January, February, and May through July. White perch was most abundant in May, with larvae being the predominant life stage.

3. Entrainment Analysis in the 2006 Renewal Application

The following table presents a summary of total annual entrainment numbers by species for current conditions as included in the Comprehensive Demonstration Study in the 2006 application. Note that while the application provides numbers broken down by egg, yolk sac larvae, post yolk sac larvae and juvenile, this table shows a summary of those numbers. **Note that this data represents full intake flow.**

Total Annual Entrainment Numbers by Species			
Species	**2002**	**2003**	**2004**
Alewife	9,784,893	5,237,082	2,524,777
American Shad	0	0	0
Atlantic croaker	448,073,184	211,546,736	213,160,748
Atlantic menhaden	190,335,922	4,904,474	6,811,742
Atlantic silverside	44,784,147	3,618,760	10,101,573
Bay anchovy	946,394,581	366,360,420	2,343,169,023
Blueback herring	1,093,842	1,707,471	1,122,568
Spot	2,260,343	47,587	0
Striped bass	403,581,536	120,270,260	35,673,301
Weakfish	29,188,389	11,922,881	46,780,773
White perch	18,693,515	19,461,447	25,818,403

C. Summary of 2014 Section 316(b) Rule and Application Requirements

Section 316(b) regulations became effective October 14, 2014 and are intended to address impingement and entrainment effects at a national level. Under the Executive Summary of the 2014 rule on pages 48302-48303 of the rule publication in the federal register, EPA provides the following summary:

> "This rule includes a national performance standard as the BTA to address impingement mortality (IM) at existing CWIS. This national standard for impingement reflects EPA's assessment that impingement reduction technology is available, feasible and demonstrated, and thus BTA for existing facilities. The impingement mortality standard is based on modified traveling screens with fish returns and includes a performance standard as one compliance alternative, but also offers six other compliance alternatives that are equivalent or better in performance. With regard to entrainment, this rule contains a national BTA standard that is a process for a site-specific determination of entrainment mitigation requirements at existing CWIS. The entrainment provision reflects EPA's assessment that there is no single technology basis that is BTA for entrainment at existing facilities, but instead a number of factors that are best accounted for on a site-specific basis."

Because EPA has established a national performance standard to address impingement mortality, prescriptive alternatives are described. As per 40 CFR 125.94(c), existing facilities can select one of the following seven alternatives for meeting the BTA impingement standard:

1. Operate a closed-cycle recirculating system;
2. Operate a cooling water intake structure that has a maximum design through-screen velocity of 0.5 fps;
3. Operate a cooling water intake structure that has a maximum actual through-screen velocity of 0.5 fps;

4. Operate an existing offshore velocity cap that is a minimum of 800 feet offshore and has bar screens or otherwise excludes marine mammals, sea turtles, and other large aquatic organisms;
5. Operate a modified traveling screen system such as modified Ristroph screens with a fish handling and return system, dual flow screens with smooth mesh, or rotary screens with fish returns or vacuum returns that the Director determines is the BTA for impingement reduction;
6. Operate any combination of technologies management practices and operational measures that the Director determines is the BTA for reducing impingement; or
7. Achieve a 12-month performance standard of no more than 24% mortality including latent mortality for all non-fragile species

Compliance options 1, 2 and 4 are essentially preapproved technologies requiring at most only a minimal demonstration that the flow reduction and control measures are functioning as EPA envisions. Options 3, 5 and 6 require more detailed information be submitted to the permitting authority before they can be specified as the BTA to reduce impingement mortality.

In contrast, EPA has determined that there is no single technology that is BTA for entrainment at existing facilities. Rather, BTA for entrainment is comprised of a process for a site-specific determination of entrainment mitigation requirements at existing CWIS.

As stated on page 48330:

> "While site-specific permit requirements are not new, what is different about this approach from the current requirement for permits to include 316(b) conditions is that for the first time, EPA is establishing a detailed specific framework for determining BTA entrainment control requirements. Thus, the rule identifies what information must be submitted in the permit application, prescribes procedures that the Director must follow in decision making and factors that must be considered in determining what entrainment controls and associated requirements are BTA on a site-specific basis."

Installation of cooling towers was not adopted as BTA for impingement or entrainment. As explained, on page 48343:

> "After fully considering all comments and data, EPA still finds closed-cycle cooling is not the ''best technology available for minimizing adverse environmental impact'' required by section 316(b). Because of a combination of concerns over feasibility/availability, air emissions, and remaining useful life of the facility, EPA has rejected closed cycle recirculating systems as the basis for national impingement and/or entrainment controls. Nor is EPA able to identify a subcategory for which these concerns no longer apply…EPA decided not to establish any presumptive BTA entrainment outcome"

For existing facilities, the permit administrator is directed to establish BTA standards for entrainment for each intake on a site-specific basis. These standards will reflect the permit administrator's determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in 125.98(f). These are:

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

The application components at 40 CFR 122.21(r)(2) through (r)(13) provide the permitting authority with the necessary information to render a decision on impingement and entrainment. The biological data and study requirements for both impingement mortality and entrainment are presented primarily in 40 CFR 122.21(r)(4), (6), (7) and (9) of the 2014 rule. The permit administrator has discretion to determine what types of data are required or recommended to be collected depending on a facility's particular location, configuration, and operation. For impingement, depending on which of the seven compliance options is selected, studies can include simple flow monitoring or more complex latent mortality studies associated with technology optimization and evaluations of compliance with impingement mortality standards. For entrainment, a facility may choose to conduct studies to quantify entrainment or through-plant survival, or a facility can use existing data (after demonstrating that the data is representative of current conditions) to meet the rule requirements (presumably at lower cost).

EPA suggests the following process to evaluate BTA for entrainment:

1. Facility conducts 2 year source water characterization, entrainment characterization, and performance studies.
2. Entrainment studies including peer review submitted to Director.
3. Permit authority makes entrainment determination.
4. Permit authority may establish schedule of requirements.
5. Impingement mortality compliance must occur as soon as practicable after entrainment determination is made.
6. Permit authority may require interim measures and milestones.
7. Permit authority may proceed with ongoing permit proceedings.

As described previously, the NJPDES permit for PSEG-Salem expired in 2006 and has been administratively continued pending the Department's consideration of PSEG's timely renewal application and publication of federal 316(b) regulations. In such cases where an existing 316 permit expired before July 14, 2018, EPA explains at page 48358 of the new rule publication that permit administrators should follow this process to make entrainment BTA determinations:

> The EPA realizes that, in some cases, a facility may already be in the middle of a permit proceeding at the time of promulgation of this rule, or the Director may have already required much of the same information be submitted by the facility prior to promulgation of today's final rule. Therefore the rule includes several provisions that provide flexibility for the permit application requirements. In the case of any permit expiring prior to July 14, 2018, under § 125.95 a facility may request that the Director waive the submission date of the permit application requirements of § 122.21(r) based on a showing by the owner or operator of the facility that it could not develop the information for which such a waiver is requested by the time required for submission of the permit renewal application. If the Director then chose to allow a delay for the submittal of any of the information requirements of § 122.21(r), the Director would then determine the schedule for submission of any delayed requirements to be as soon as practicable.

The application requirements for facilities with cooling water intake structures at 40 CFR 122.21(r) provide the Director with the information to render a decision on the 2014 rule requirements. The requirements listed at 40 CFR 122.21(r)(2) through (r)(8) apply to all facilities with cooling water intake structures while 40 CFR 122.21(r)(9) through (r)(13) apply to facilities that withdraw an actual intake flow (AIF) greater than 125 MGD. These application requirements are to be provided to the permitting authority to support the evaluation of BTA at each facility.

As an existing facility with greater than 125 MGD AIF, items (r)(2) through (r)(13) apply to PSEG-Salem as follows:

(r)(2) Source water physical data – includes a water body description, hydrology and chemistry of the receiving water, and the area of influence of the intake structure.

(r)(3) Cooling water intake structure data – includes the configuration of the intake, design flows, water balance diagram, and description of typical operations.

(r)(4) Source water baseline biological characterization data – includes a list of the species present, their susceptibility to impingement and entrainment, spawning periods, and seasonal patterns. All threatened and endangered species must be identified.

(r)(5) Cooling water system data – includes the configuration of the cooling water system and any reductions in impingement and entrainment based on water reuse.

(r)(6) Chosen method(s) of compliance with impingement mortality standard – includes the selection of an impingement mortality compliance path with option-specific information, such as a monitoring plan or documentation of velocity. This requirement also includes the Performance Optimization Study.

(r)(7) Entrainment Performance Studies – includes previous studies on technology efficacy, studies from other facilities, and other entrainment studies.

(r)(8) Operation Status – includes the age of the units, the capacity utilization rates, and any past upgrades.

(r)(9) Entrainment Characterization Study – includes a plan for entrainment data collection.

(r)(10) Comprehensive Technical Feasibility and Cost Evaluation Study – includes an evaluation of the feasibility of all technologies, including engineering aspects and social cost estimates.

(r)(11) Benefits Valuation Study – includes monetized losses from impingement and entrainment along with assessment of other benefits.

(r)(12) Non-water Quality and Other Environmental Impacts Study - includes estimates of changes in energy consumption, noise, safety, facility reliability, and water consumption.

(r)(13) Peer Review – requires external peer review of Feasibility, Costs, Benefits, and Environmental Impacts Studies. The applicant must notify the Director of the reviewers, and the Director may choose to disapprove and/or require additional reviewers.

D. Relevance of 2006 Application and Previous Studies to Current Application Requirements

PSEG has submitted comprehensive and extensive technical information in its 2006 renewal application as well as in its annual biological monitoring program reports. In fact, PSEG has one of the most comprehensive data sets in the nation. For example, PSEG-Salem is unique in that there has been continuous impingement and entrainment sampling since 1977. Nonetheless, the 2014 rule includes new requirements that PSEG-Salem did not address in the 2006 application (e.g. peer review) because the application was submitted before the release of the draft and final Section 316(b) rule. As such, the Department must determine whether to proceed with review and renewal of PSEG-Salem's permit in reliance on the information already provided, or whether to require additional information from PSEG-Salem to ensure the renewal application satisfies all of the new regulation's requirements before a permit decision is rendered. Following EPA's guidance for renewing permits before July 2018 (described above), the Department will review the renewal application based on the 2006 submissions to make an interim BTA determination and will require additional new information to be developed for the following permit cycle.

The Department is hereby requiring submission of various application components to enable rendering of an entrainment determination during the next permit cycle. This is consistent with the final rule as indicated at 40 CFR 125.98(b)(6):

"(6) In the case of any permit issued after October 14, 2014, and applied for before October 14, 2014, the Director may include permit conditions to ensure that the Director will have all the information under 40

CFR 122.21(r) necessary to establish impingement mortality and entrainment BTA requirements under §125.94(c) and (d) for the subsequent permit. The Director must establish interim BTA requirements in the permit on a site-specific basis based on the Director's best professional judgment in accordance with § 125.90(b) and 40 CFR 401.14."

The following is a listing of the necessary application components and the appropriate schedule.

1. 40 CFR 122.21(r)(2), 40 CFR 122.21(r)(3), and 40 CFR 122.21(r)(5)

Application requirements pertaining to source water physical data (40 CFR 122.21(r)(2)); cooling water intake structure data (40 CFR 122.21(r)(3)); cooling water system data (40 CFR 122.21(r)(5)) have been fully satisfied based on information provided in the 2006 NJPDES renewal application at Sections 4-II and 5-II. Any updated operational information pertaining to these requirements that is relevant to the period of study represented with the application components at 40 CFR 122.21(r) can be submitted with those submissions as they become due under the timeframes described below.

2. 40 CFR 122.21(r)(4)

Source water baseline biological characterization data requirements at 40 CFR 122.21(r)(4)(i) through (viii) have been satisfied based on previous application submissions. However, the 2014 rule contains the following new requirements at 40 CFR 122.21(r)(4):

"(x) For the owner or operator of an existing facility, identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

(xi) For the owner or operator of an existing facility, a list of fragile species, as defined at 40 CFR 125.92(m), at the facility. The applicant need only identify those species not already identified as fragile at 40 CFR 125.92(m). New units at an existing facility are not required to resubmit this information if the cooling water withdrawals for the operation of the new unit are from an existing intake.

(xii) For the owner or operator of an existing facility that has obtained incidental take exemption or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, any information submitted in order to obtain that exemption or authorization may be used to satisfy the permit application information requirement of paragraph 40 CFR 125.95(f) if included in the application."

40 CFR 122.21(r)(4)(i) through (ix) are fully addressed in the Proposal for Information Collection section of the 2006 renewal application at Section 4-III, 4-IV, 5-III, and 5-IV. Regarding 40 CFR 122.21(r)(4)(x), the Department anticipates that protective measures and stabilization activities have not occurred that affect the baseline water condition in the vicinity of the intake. Nonetheless, the permittee shall submit this information to ensure compliance with the 2014 rule.

While information is already available regarding these conditions, the Department is requiring the permittee to submit further information to fully address 40 CFR 122.21(r)(4)(xi). Both historical and ongoing data collection efforts and NJPDES permitting decisions at PSEG-Salem have been focused on the RIS approach. In contrast, the 2014 rule focuses on fragile and non-fragile species. Pursuant to 40 CFR 122.92(m), EPA defines "fragile species" as a species of fish or shellfish that has an impingement survival rate of less than 30 percent. EPA also identifies fragile species in Chapter 11 of the Technical Development Document for the final rule. The Department is requiring that the permittee submit either an update of current information or new information relevant to 40 CFR 122.21(r)(4)(x) – (xi) **within EDP + 6 months.**

Regarding 40 CFR 122.21(r)(4)(xii), the Department acknowledges that Section 4-IV and Attachment 4-3 of the 2006 NJPDES application concerns information regarding the 1999 amendments to the biological opinion and Incidental Take statement that are currently in effect for the Station.

3. 40 CFR 122.21(r)(6)

40 CFR 122.21(r)(6) concerns the Chosen Method(s) of Compliance with Impingement Mortality Standard. Note that 40 CFR 122.21(r)(6)(i) below refers to 40 CFR 125.94(c)(5) which is the modified traveling screen option. PSEG already operates with this technology. As specified at 40 CFR 122.21(r)(6)(i):

"(6) *Chosen Method(s) of Compliance with Impingement Mortality Standard.* The owner or operator of the facility must identify the chosen compliance method for the entire facility; alternatively, the applicant must identify the chosen compliance method for each cooling water intake structure at its facility. The applicant must identify any intake structure for which a BTA determination for Impingement Mortality under 40 CFR 125.94 (c)(11) or (12) is requested. In addition, the owner or operator that chooses to comply via 40 CFR 125.94 (c)(5) or (6) must also submit an *impingement technology performance optimization study* as described below:

(i) If the applicant chooses to comply with 40 CFR 125.94(c)(5), subject to the flexibility for timing provided in 40 CFR 125.95(a)(2), the *impingement technology performance optimization study* must include two years of biological data collection measuring the reduction in impingement mortality achieved by the modified traveling screens as defined at 40 CFR 125.92(s) and demonstrating that the operation has been optimized to minimize impingement mortality. A complete description of the modified traveling screens and associated equipment must be included, including, for example, type of mesh, mesh slot size, pressure sprays and fish return mechanisms. A description of any biological data collection and data collection approach used in measuring impingement mortality must be included:

(A) Collecting data no less frequently than monthly. The Director may establish more frequent data collection;
(B) Biological data collection representative of the impingement and the impingement mortality at the intakes subject to this provision;
(C) A taxonomic identification to the lowest taxon possible of all organisms collected;
(D) The method in which naturally moribund organisms are identified and taken into account;
(E) The method in which mortality due to holding times is taken into account;
(F) If the facility entraps fish or shellfish, a count of entrapment, as defined at 40 CFR 125.92(j), as impingement mortality; and
(G) The percent impingement mortality reflecting optimized operation of the modified traveling screen and all supporting calculations."

With respect to the timing of the selection of the intended method of impingement compliance, EPA states at page 48358 of the final rule publication:

> While EPA expects that many facilities will already comply with § 125.94(c), in some cases the facility will need to choose one of the compliance alternatives for IM in their subsequent permit cycle. In particular, EPA expects the facility would submit the information required in § 122.21(r), and the Director would make a determination of BTA for entrainment for that facility. Only after the Director has established site-specific BTA requirements for entrainment reduction will the facility have to select the compliance alternative on which it will rely to meet the IM requirements of today's rule. The Director may either amend the permit to include the IM requirements or include them in a subsequent permit if the Director determines the proposed controls are consistent with § 125.94(c). The Director would establish a schedule incorporating each of these sequential actions. In addition, the rule allows the Director the flexibility to grant a request for a waiver of permit application

requirements in § 122.21(r)(6) in order to accommodate the circumstances described here. See § 122.21(r)(1)(i) and 125.95(a) ."

In other words impingement mortality compliance must occur as soon as practicable after an entrainment determination is made. Prior to that determination, an interim BTA determination for impingement must be established by the Department in accordance with BPJ.

For the **circulating water system**, the permittee has been operating a modified traveling screen system with Ristroph screens and a fish handling and return system. The Department has determined that this system meets the criteria at 40 CFR 125.94(c)(5) which is one of the compliance options allowable under the 2014 rule. Nonetheless, the rule does offer seven options where the permittee is required to choose an option as the intended method of compliance with the impingement mortality standard. In the event that the permittee chooses to comply with the modified Ristroph traveling screen option at 40 CFR 125.94(c)(5) for the circulating water system, which requires collection of data specified at 40 CFR 122.21(r)(6)(i) above, sampling and data analysis would need to be adjusted to reflect all species as opposed to RIS species. This determination shall be made within **EDP + 3 years** which will allow time for the necessary data collection and submission of the required study for the circulating water system in accordance with 40 CFR 125.94(c)(5).

For the **service water system**, the permittee operates traveling screens that do not have a Ristroph traveling screen design and there is no fish handling system or return. Because the service water system is a non-contact cooling water system that uses 60.48 MGD, it is well above the eligibility threshold of 2 MGD. Therefore, the permittee is required to comply with one of the 40 CFR 122.21(r)(6) impingement compliance options for the service water system. The permittee shall submit a determination for the service water system within **EDP + 3 years** along with any study components that are required based on the chosen option. Regarding the collection of impingement data under option 40 CFR 122.21(r)(6)(i), the Department is willing to consider a proposal for collecting data at the circulating water system that would be adjusted accordingly for flows at the service water system as well as for 100 % mortality given the lack of a fish return.

Please refer to the interim BTA determination for the service water system under subsection F below for additional requirements for the service water system including the installation of control measures in accordance with 40 CFR 125.94(c).

4. <u>40 CFR 122.21(r)(7)</u>

As specified at 40 CFR 122.21(b)(7):

"(7) *Entrainment Performance Studies*. The owner or operator of an existing facility must submit any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from their locations are relevant and representative of conditions at your facility. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definition of entrainment at 40 CFR 125.92(h)."

The permittee has already included information relevant to this requirement, namely, site-specific estimates of entrainment mortality based on studies at PSEG-Salem or at comparable facilities. This information is included in the 2006 application at Section 4-IV and Attachment 4-4. However, because this information is more than 10 years old, the permittee must update this information or submit a justification why the data is relevant and representative of current facility conditions. The permittee shall submit the necessary information **within EDP+3 years**.

5. <u>40 CFR 122.21(r)(8)</u>

Sections of 40 CFR 122.21(r)(8) that are relevant to power producing facilities are as follows:

"(8) *Operational Status*. The owner or operator of an existing facility must submit a description of the operational status of each generating, production, or process unit that uses cooling water, including but not limited to:

(i) For power production or steam generation, descriptions of individual unit operating status including age of each unit, capacity utilization rate (or equivalent) for the previous 5 years, including any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors, including identification of any operating unit with a capacity utilization rate of less than 8 percent averaged over a 24-month block contiguous period, and any major upgrades completed within the last 15 years, including but not limited to boiler preplacement, condenser replacement, turbine replacement or changes to fuel type;

(ii) Descriptions of completed, approached, or scheduled upgrades and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities;

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(v) Descriptions of plans or schedules for any new units planned within the next 5 years."

While much of this information is included in the 2006 application at Section 4-V, the permittee shall update and amend any available information **within EDP+3 years** so that the information corresponds with the impingement and entrainment study components. Additionally, the operational status information must address both the circulating water system and the service water system.

6. 40 CFR 122.21(r)(9)

As specified at 40 CFR 122.21(r)(9):

"(9) *Entrainment Characterization Study*. The owner or operator of an existing facility that withdraws greater than 125 MGD actual intake flow, where the withdrawal of cooling water is measured at a location within the cooling water intake structure that the Director deems appropriate, must develop for submission to the Director an Entrainment Characterization Study that includes a minimum of two years of entrainment data collection. The Entrainment Characterization Study must include the following components:

(i) *Entrainment Data Collection Method*. The study should identify and document the data collection period and frequency. The study should identify and document organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by the Director, and any species protected under Federal, State, or Tribal law, including threatened or endangered species with a habitat range that includes waters in the vicinity of the cooling after intake structure. Biological data collection must be representative of the entrainment at the intake subject to this provision. The owner or operator of the facility must identify and document how the location of the cooling water intake structure in the waterbody and the water column are accounted for by the data collection locations;

(ii) *Biological Entrainment Characterization*. Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species), including a description of their abundance and their temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in entrainment, including but not limited to variations related to climate

and weather differences, spawning, feeding and water column migration. This characterization may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Identification of all life stages of fish and shellfish must include identification of any surrogate species used, and identification of data representing both motile and non-motile life-stages of organisms;

(iii) *Analysis and Supporting Documentation*. Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Entrainment data to support the facility's calculations must be collected during periods of representative operational flows for the cooling water intake structure, and the flows associated with the data collection must be documented. The method used to determine latent mortality along with data for specific organisms mortality or survival that is applied to other life-stages of species must be identified. The owner or operator of the facility must identify and document all assumptions and calculations used to determine the total entrainment for that facility together with all methods and quality assurance/quality control procedures for data collection and data analysis. The proposed data collection and data analysis methods must be appropriate for a quantitative survey."

The permittee shall submit the Entrainment Characterization Study for a period of data collection spanning a minimum of 2 years. This shall include entrainment at both the circulating water system AND the service water system. The Department is willing to consider a proposal for collecting data at the circulating water system that would be adjusted accordingly for flows at the service water system. This two-year data collection period shall correspond with the benefits valuation study period at 40 CFR 122.21(r)(11). Again, species included in the Entrainment Characterization Study shall not be limited to RIS but shall include characterization of all life stages of fish, shellfish, and any species protected under federal and state law (including threatened or endangered species). The Entrainment Characterization Study shall be submitted by **EDP + 3 years**.

7. 40 CFR 122.21(r)(10)

As specified at 40 CFR 122.21(r)(10):

"(10) *Comprehensive Technical Feasibility and Cost Evaluation Study*. The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director an engineering study of the technical feasibility and incremental costs of candidate entrainment control technologies. In addition, the study must include the following:

(i) *Technical feasibility*. An evaluation of the technical feasibility of closed-cycle recirculating systems as defined at 40 CFR 125.92(c), fine mesh screens with a mesh size of 2 millimeters or smaller, and water reuse or alternate sources of cooling water In addition, this study must include:

(A) A description of all technologies and operational measures considered (including alternate designs of closed-cycle recirculating systems such as natural draft cooling towers, mechanical draft cooling towers, hybrid designs, and compact or multi-cell arrangements);

(B) A discussion of land availability, including an evaluation of adjacent land and acres potentially available due to generating unit retirements, production unit retirements, other buildings and equipment retirements, and potential for repurposing of areas developed to ponds, coal piles, rail yards, transmission yards, and parking lots;

(C) A discussion of available sources of process water, grey water, waste water, reclaimed water, or other waters of appropriate quantity and quality for use as some or all of the cooling water needs of the facility; and

(D) Documentation of factors other than costs that may make a candidate technology impractical or infeasible for further evaluation.

(ii) *Other entrainment control technologies.* An evaluation of additional technologies for reducing entrainment may be required by the Director.

(iii) *Cost evaluations.* The study must include engineering cost estimates of all technologies considered in paragraphs (r)(10)(i) and (ii) of this section. Facility costs must also be adjusted to estimate social costs. All costs must be presented as the net present value (NPV) and the corresponding annual value. Costs must be clearly labeled as compliance costs or social costs. The applicant must separately discuss facility level compliance costs and social costs, and provide documentation as follows:

(A) Compliance costs are calculated as after-tax, while social costs are calculated as pre-tax. Compliance costs include the facility's administrative costs, including costs of permit application, while the social cost adjustment includes the Director's administrative costs. Any outages, downtime, or other impacts to facility net revenue, are included in compliance costs, while only that portion of lost net revenue that does not accrue to other producers can be included in social costs. Social costs must also be discounted using social discount rates of 3 percent and 7 percent. Assumptions regarding depreciation schedules, tax rates, interest rates, discount rates and related assumptions must be identified;

(B) Costs and explanation of any additional facility modifications necessary to support construction and operation of technologies considered in paragraphs (r)(10)(i) and (ii) of this section, including but not limited to relocation of existing buildings or equipment, reinforcement or upgrading of existing equipment, and additional construction and operating permits. Assumptions regarding depreciation schedules, interest rates, discount rates, useful life of the technology considered, and any related assumptions must be identified; and

(C) Costs and explanation for addressing any non-water quality environmental and other impacts identified in paragraph (r)(12) of this section. The cost evaluation must include a discussion of all reasonable attempts to mitigate each of these impacts."

The permittee has provided an extensive analysis of alternate intake protection technologies in its 1999 and 2006 NJPDES applications as described in Section 8 above. While the permittee provided an analysis of natural draft and mechanical draft cooling towers, all required alternatives at 40 CFR 122.21(r)(10) must be addressed. In addition, cost information shall be provided to address all relevant factors at 40 CFR 122.21(r)(10). Again, because the 2006 application predates both the 2014 rule and the applicable guidance documents, the 2006 application does not include all the necessary components and must be revised and updated accordingly.

For example, past Section 316(b) demonstrations have traditionally focused on the facility's compliance costs. Yet the 2014 rule extends this analysis to social costs and describes very prescriptive elements along with detailed guidance documents. As stated on page 48367:

"The final rule requires that the cost information be presented as both the facility's compliance costs and the social costs, and in net present value (NPV) terms and the corresponding annual value. Social costs are the 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. See Chapter 8 of EPA's 2010 Guidelines for Preparing Economic Analyses (DCN 10– 3258)."

The permittee shall complete the Comprehensive Technical Feasibility and Cost Evaluation Study by **EDP + 3 years**. The study shall then be sent to the selected peer reviewers to be evaluated, revised as necessary, and submitted to the Department by **EDP + 4 years**.

8. 40 CFR 122.21(r)(11)

As specified at 40 CFR 122.21(r)(11):

"(11) *Benefits Valuation Study*. The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director an evaluation of the benefits of the candidate entrainment reduction technologies and operational measures evaluated in paragraph (r)(l0) including using the Entrainment Characterization Study completed in § 122.21(r)(9) of this section. Each category of benefits must be described narratively, and when possible, benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods. The benefits valuation study must include, but is not limited to, the following elements:

(i) Incremental changes in the numbers of individual fish and shellfish lost due to impingement mortality and entrainment as defined in 40 CFR 125.92, for all life stages of each exposed species;

(ii) Description of basis for any estimates of changes in the stock sizes or harvest levels of commercial and recreational fish or shellfish species or forage fish species;

(iii) Description of basis for any monetized values assigned to changes in the stock size or harvest levels of commercial and recreational fish or shellfish species, forage fish, and to any other ecosystem or non-use benefits;

(iv) A discussion of mitigation efforts completed prior to October 14, 2014 including how long they have been in effect and how effective they have been;

(v) Discussion, with quantification and monetization, where possible, of any other benefits expected to accrue to the environment and local communities, including but not limited to improvements for mammals, birds, and other organisms and aquatic habitats;

(vi) Discussion, with quantification and monetization, where possible, of any benefits expected to result from any reductions in thermal discharges from entrainment technologies."

The 2006 application predates the 2014 rule and the applicable guidance documents. Therefore, the 2006 application focuses benefit information on the cost-benefit test as included in the 2004 Phase II rule (now repealed). As a result, the 2006 application does not contain the necessary components pursuant to the 2014 rule and must be revised and updated accordingly. For example, the Benefits Valuation Study is expected to include an analysis of social benefits. As noted on page 48367:

"The dollar values in the social benefits analysis should be 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. While the Director must consider benefit and cost information, the Director will also determine if this information is of sufficient rigor to make a decision on entrainment controls on the basis of this information. For instance, the Director may decide not to rely on benefit-cost information in establishing the entrainment controls when the benefits analysis includes only a qualitative discussion of nonuse benefits. Willingness-to-pay for nonuse benefits can be measured using benefits transfer or a stated preference survey. However, the rule does not require the Director to require a facility owner or operator to conduct or submit a stated preference survey to assess benefits."

The benefits valuation study is one of the study components that must undergo peer review as per 40 CFR 122.21(r)(13). As described on page 48368:

> "The owner or operator of the facility must obtain peer review of the benefits evaluation study, as described in Section 12. EPA expects peer reviewers to have appropriate qualifications (*e.g.,* fisheries biologist, economist) for the subject matter. The Director may consult with EPA and Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure(s) to determine which peer review comments must be addressed by the final study."

The permittee shall complete the Benefits Valuation Study by **EDP + 3 years**. The study shall then be sent to the selected peer reviewers to be evaluated, revised as necessary, and submitted to the Department by **EDP + 4 years**.

9. 40 CFR 122.21(r)(12)

As specified at 40 CFR 122.21(r)(12):

"(12) Non-water Quality Environmental and Other Impacts Study. The owner or operator of an existing facility that withdraws greater than 125 MGD AIF must develop for submission to the Director a detailed facility-specific discussion of the changes in non-water quality environmental and other impacts attributed to each technology and operational measure considered in paragraph (r)(10) of this section, including both impacts increased and impacts decreased. The study must include the following:

(i) Estimates of changes to energy consumption, including but not limited to auxiliary power consumption and turbine backpressure energy penalty;

(ii) Estimates of air pollutant emissions and of the human health and environmental impacts associated with such emissions;

(iii) Estimates of changes in noise;

(iv) A discussion of impacts to safety, including documentation of the potential for plumes, icing, and availability of emergency cooling water;

(v) A discussion of facility reliability, including but not limited to facility availability, production of steam, impacts to production based on process unit heating or cooling, and reliability due to cooling water availability;

(vi) Significant changes in consumption of water, including a facility-specific comparison of the evaporative losses of both once-through cooling and closed-cycle recirculating systems, and documentation of impacts attributable to changes in water consumption; and

(vii) A discussion of all reasonable attempts to mitigate each of these factors."

Some of the required information under 40 CFR 122.21(r)(12) is included in the 2006 application. However, this information must be updated and evaluated by a peer reviewer as required by 40 CFR 122.21(r)(13). The permittee shall complete the Non-water Quality Environmental and Other Impacts Study by **EDP + 3 years**. The study shall then be sent to the selected peer reviewers to be evaluated, revised as necessary, and submitted to the Department by **EDP + 4 years**.

10. 40 CFR 122.21(r)(13)

As specified at 40 CFR 122.21(r)(13):

"(13) *Peer Review.* If the applicant is required to submit studies under § 122.2l(r)(10) to (r)(12), the applicant must conduct an external peer review of each report to be submitted with the permit application. The applicant must select peer reviewers and notify the Director in advance of the peer review. The Director may disapprove of a peer reviewer or require additional peer reviewers. The Director may confer with EPA, Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure, independent system operators, and state public utility regulatory agencies, to determine which peer review comments must be addressed. The applicant must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications and their names and credentials must be included in the peer review report."

The peer review component is a new requirement to the 2014 rule which was not included in the 2004 Phase II rule.

The permittee shall submit the names, curricula vitae, and other relevant qualifications of the proposed peer reviewers by **EDP + 2 years** to the Department for approval. If the Department does not object to any such submission of peer reviewers in writing within 90 days, the selection shall be considered acceptable.

11. Summary of Submittal Requirements as per 2014 Rule

- Impingement and entrainment characterization for ALL species (including oyster entrainment) for a minimum of 2 years for both circulating water system and service water system. A report including this data shall be submitted by **EDP + 3 years**.
- Chosen method of impingement technology for the Circulating Water Intake shall be completed by **EDP + 3 years**.
- Chosen method of impingement technology for the Service Water Intake shall be completed by **EDP + 3 years** with a requirement to install the chosen technology by **EDP + 4 years**.
- Technology Evaluation including costs to be completed by **EDP + 3 years** then subject to peer review.
- Benefits Valuation Study for impingement and entrainment to be completed by **EDP + 3 years** then subject to peer review. Benefits shall include assessment of "social benefits."
- Non-Water Quality and Other Environmental Impacts to be completed by **EDP + 3 years** then subject to peer review.
- Peer Review of required items above to be completed by **EDP + 4 years**.

E. Section 316(b) Best Technology Available Determination for Impingement Mortality

Seven impingement mortality compliance options are established in the 2014 Section 316(b) rules at 40 CFR 125.94(c). Two options are likely applicable to PSEG-Salem, namely Options 5 and 7. Option 5 specifies that a facility can achieve BTA by operating a modified traveling screen that the Director determines meets the definition at 40 CFR 125.92(s) and that the Director determines is the best technology available for impingement reduction. Option 7 specifies that a facility can satisfy BTA by achieving the specified impingement mortality performance standard of no more than 24% mortality. Specifically, the 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

and kept for a holding period of 18 to 96 hours. EPA defines "fragile species" at 40 CFR 125.92(m), as a species of fish or shellfish that has an impingement survival rate of less than 30 percent.

For the **circulating water system**, the permittee has been operating a modified traveling screen system with Ristroph screens and a fish handling and return system since 1995. The Department acknowledges that PSEG has included several design and operational improvements over the years to this system to enhance efficacy. The 2014 rule offers seven options where the permittee is required to choose an option as the intended method of compliance with the impingement mortality standard. The Department acknowledges that 40 CFR 125.94(c)(6) describes a "system of technologies, management practices, and operational measures that, after review of the impingement technology performance optimization study at 40 CFR 122.21(r)(6)(ii), the Director determines the best technology available for impingement reduction" at the cooling water intake structures. The Department does not interpret this provision as being allowable to average impingement mortality for both intakes.

In the event that the permittee chooses to comply with the modified Ristroph traveling screen option at 40 CFR 125.94(c)(5) for the circulating water system, which requires collection of data specified at 40 CFR 122.21(r)(6)(i) above, sampling and data analysis would need to be adjusted to reflect all species as opposed to RIS species. This determination shall be made within **EDP + 3 years** which will allow time for the necessary data collection and submission of the required study in accordance with 40 CFR 125.94(c)(5).

In consideration of the available information, the Department is hereby designating the use of the existing modified Ristroph traveling screens with a fish handling system as **interim BTA for impingement mortality for the circulating water system** until such time as a final impingement and entrainment determination is made based on submission and review of the required study components at 40 CFR 122.21(r)(2) through (r)(13). Selection of this technology as interim BTA is consistent with the Department's BPJ and is conditional on the proper operation and maintenance of such screens and fish return system.

For the **service water system**, the permittee operates traveling screens that do not have a modified traveling screen design and there is no fish handling system or return. Because the service water system is a non-contact cooling water system that uses 60.48 MGD, it is well above the eligibility threshold of 2 MGD. As a result, the permittee shall comply with 40 CFR 122.21(r)(6) for the service water system. In addition, the Department has repeatedly gone on record through its comments on EPA's rule making effort as well as through individual permit actions that modified traveling screens are a proven and effective technology to minimize impingement mortality. Constant rotation and screen washes serve to reduce impingement mortality by assisting organisms into the fish return system, which should discharge below the tide level. Modified traveling screens are particularly effective in reducing impingement mortality for blue crab, a species which has one of the highest impingement rates. Given the fact that modified traveling screens are a readily available technology and in consideration of the size of the service water flow, the Department is requiring that installation of modified traveling screens be expedited. As a result, installation of one of the alternatives at 40 CFR 125.94(c) shall be completed by **EDP + 4 years**.

The Department is hereby designating compliance with 40 CFR 122.21(r)(6) and the installation of control measures as specified at 40 CFR 125.94(c) as **interim BTA for impingement mortality for the service water system**. Most notably, modified traveling screens and a fish return or other allowable control measures under 40 CFR 125.95(c) shall be installed within **EDP + 4 years**.

F. Section 316(b) Best Technology Available Determination for Entrainment Mortality

In order to render an entrainment BTA Determination under the 2014 rule, the permittee is required to comply with 40 CFR 122.21 (r)(2) through (r)(13). Again, the 2014 rule specifies a process for a site-specific determination of entrainment mitigation requirements at existing CWIS. The Department has therefore determined that inclusion of a continued intake flow limit in combination with the conduct of the required studies at the circulating water system and the service water system is **BTA for entrainment** in accordance with best professional judgment in accordance with 40 CFR 125.90(b) and 40 CFR 401.14. This decision will be revisited once the required studies are submitted.

11 Renewal of Special Conditions

A. Summary of Special Conditions

The Department has determined it appropriate to retain many of the special conditions from the 2001 permit. Other requirements have been deemed appropriate to retain in accordance with the Department's BPJ. Other requirements are considered no longer necessary and have been deleted accordingly.

The following is an overview of the Special Conditions from the 2001 NJPDES permit, the Department's determination as to whether or not the conditions are being retained or eliminated and the location of the condition in the renewal permit. A detailed justification for certain special conditions that have been retained is included in subsection B below.

Intake Flow Limit		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee is required to limit the circulating water intake flow to a monthly average not to exceed 3024 MGD.	Requirement retained as the intake flow limit is a component of the BTA determination.	Part III, Part IV.G.1
The flow rate for each individual circulating water pump shall be determined at least every other year using Rhodamine WT dye tracer evaluation.	Requirement retained as measuring intake flow is integral to the BTA determination. Use of Uranine dye is also authorized.	Part IV.G.1.b
Flow is reported on monthly Discharge Monitoring Reports (DMRs).	Intake flow data must be tracked on DMRs for compliance.	Part III

Intake Screens and Fish Return System		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall ensure proper operation and maintenance of its Ristroph traveling screens.	Requirement retained as part of BTA determination for the circulating water system.	Part IV.G.2.a.i
The permittee shall conduct semi-annual training of employees operating the traveling water screens to ensure awareness of the function of the screens.	Requirement modified to allow posting of a sign to describe screen function in lieu of training.	Part IV.G.2.a.ii
The permittee shall submit a Work Plan for a study to determine ways to minimize the stresses and mortalities found associated with the fish return sluice and sampling pool which shall consider alternate flows, velocities, and depth profiles.	Requirement completed to the Department's satisfaction and therefore not retained in renewal permit.	N/A
The permittee shall submit a ranking of best to worst (i.e. most vulnerable or frail) RIS for which the Ristroph screens are most effective at minimizing mortality.	Requirement completed. However, the permittee shall submit a list of fragile and non-fragile species which is relevant to 40 CFR 125.94(c)(7).	Part IV.G.2.a.iii

Wetlands Restoration and Enhancement		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall continue to implement the Estuary Enhancement Program in restoring, enhancing and/or preserving wetlands including title ownership or deed restriction. Lands shall include the restoration of no less than 10,000 acres of diked wetlands to normal	While the requirement pertaining to the implementation of EEP is still retained, it has been modified to reflect that land acquisition, title ownership and deed restriction is complete.	Part IV.G.3.a

tidal inundation to become functional salt marsh; restoration of wetlands dominated by common reed (*Phragmites*) to primarily *Spartina* species and other desirable vegetation; and/or upland buffer.		
The permittee shall implement Management Plans for Dennis, Commercial, Maurice River Township, the Bayside Tract, Cohansey, and Alloway Creek, as well as the Rocks and Cedar Swamp sites in Delaware.	Requirement retained where permittee shall continue to implement management plans for these sites as well as replacement acreage sites, namely Dennis, New Sweden, Heislerville and Millville WMAs. Success criteria must be attained for these sites where not yet attained.	Part IV.G.3.b
The Department may require the permittee to acquire additional lands to serve as "replacement acreage" for any acreage deemed "failed" by the Department. The permittee shall impose a Conservation Restriction and file a management plan for any replacement acreage.	The permittee has acquired replacement acreage and it is expected that all lands will meet success criteria with proper management. The permittee shall continue to implement management plans for these sites to attain success criteria.	N/A
The permittee shall establish an Estuary Enhancement Program Advisory Committee (EEPAC) which shall consist of representatives from state and federal resource agencies, scientists and local representatives. The EEPAC shall meet at least twice per year and the permittee shall designate a representative to serve as the EEPAC's chair.	The permittee shall continue to manage the EEPAC; however, the make-up and meeting frequency of the EEPAC has been modified since much of the restoration is complete or nearly complete.	Part IV.G.3.c

Fish Ladders		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall operate and maintain the installed fish ladders in accordance with the developed operations and maintenance manuals.	Requirement retained to assure the propagation of *Alosid* species. Requirement extended to all 12 fish ladder sites.	Part IV.G.4.a
The permittee shall conduct routine inspections during the upstream adult migration period to ensure that the ladders are operating as designed.	Requirement retained to assure that fish ladders are effective.	Part IV.G.4.b
The permittee shall install two additional fish ladders in New Jersey.	Requirement no longer needed since requirement has been fulfilled.	N/A

Artificial Reefs		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall fund an escrow account to be made available to the Department for the construction and installation of artificial reefs.	Requirement fulfilled.	N/A

Biological Monitoring Program		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall develop and implement an	The Biological Monitoring Program	Part IV.G.5

improved biological monitoring program which shall be subject to review by EEPAC and approval by the Department. The program shall include: o Improved bay-wide abundance monitoring; o Continued detrital production monitoring (including vegetative cover mapping, quantitative field sampling and geomorphology); o Improved impingement and entrainment monitoring; o Abundance monitoring for adult and juvenile passage of river herring as well as stocking; o Review and discussion of the appropriateness of Atlantic Silverside as an RIS; o Continued study of the fish utilization of restored wetlands; and o Other special monitoring studies as may be recommended by EEPAC.	provides valuable information. The Department's determination on each of these components is as follows: o Requirement retained where improvements are discussed below. o Some detrital production monitoring requirements retained as described below. o Requirement retained but slightly modified. o Requirement not retained since some runs have been established. o Requirement not retained since Atlantic silverside was added as an RIS. o Requirement not retained since fish utilization has been documented. o Requirement retained although no special studies are recommended at this time.	

Entrainment and Impingement Abundance Monitoring		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall continue to conduct entrainment sampling during normal Station operations at a minimum frequency of three days per week, from April to September, and once per week from October through March, weather and operational conditions permitting. Nighttime sampling shall be included and a minimum of six samples shall be collected per sampling day.	Entrainment sampling is continued in the renewal permit where frequency, materials and methods are established in the IBMWP. Data shall continue to be reported in Biological Monitoring Program Annual Reports. Additional study requirements are included (as per 40 CFR 122.21(r)(9)) for the circulating water system and the service water system.	Part IV.G.6
The permittee shall continue to conduct impingement sampling during normal Station operations at a minimum frequency of three days per week, from April to September and once per week from October through March, weather and operational conditions permitting. Nighttime sampling shall be included and a minimum of six samples shall be collected per sampling day.	Impingement sampling is continued in the renewal permit where frequency, materials and methods shall be established in the IBMWP. Data shall continue to be reported in Biological Monitoring Program Annual Reports. Additional study requirements are included (as per 40 CFR 122.21(r)(6)) for the circulating water system and the service water system.	Part IV.G.6

Further Study of Intake Protection Technologies		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall study the feasibility of strobe light technology; air bubble technology; and sound deterrent technology. Each technology shall be studied individually and in various combinations as a hybrid system.	Requirement fulfilled and not retained in renewal permit.	N/A

Expansion of Analyses		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The analysis of losses at the Station shall be supplemented with: o A further assessment of the biomass lost to the ecosystem for all RIS; o The contribution of RIS other than Bay Anchovy to the forage available for commercial and recreationally important species; o A more detailed analysis of the levels of uncertainty in the production and catch foregone estimates; and o Projected increases in RIS abundance in the estimates of catch and production foregone.	Requirement fulfilled and not retained in renewal permit. Related application requirements are included under benefits valuation as per 40 CFR 122.21(r)(11).k	N/A
Analyses shall be expanded with regard to entrainment sampling as follows: o A further assessment of the biomass lost to the ecosystem for all RIS; o The uncertainty of the estimated historic annual entrainment loss estimates should be characterized and presented as ranges with maximum and minimum levels. o Any error in the estimation of natural mortality rate and the effect on Conditional Mortality Rate (CMR) estimates with the Extended Empirical Impingement model shall be investigated.	Requirement fulfilled and not retained in renewal permit. Related application requirements are included under benefits valuation as per 40 CFR 122.21(r)(11).	N/A

Special Studies		
Summary of 2001 Special Condition	**Rationale for Retention**	**Location in Renewal**
The permittee shall further study the hydrodynamics at the intake including: o The flow field in front of the intake and the existence of vortices shall be observed and photographed during an extreme low tide and strong current; o The pumping records of each pump should be examined to determine if the flow distribution is asymmetrical among the intake bays; and; o The bathymetric chart of the area and other relevant hydrodynamic data should be examined to determine the potential for a back eddy during the ebb in Ship Wreck Bay to the south of the intake.	Requirement fulfilled and not retained in renewal permit.	N/A
The permittee shall study enhancements to entrainment and impingement sampling including: o An analysis of the optimum sampling frequency for entrainment and impingement in consideration of the episodic nature of the entrainment process; and o Alternative entrainment sampling methods with less process error.	Requirement fulfilled and not retained in renewal permit.	N/A

B. Justification for Special Conditions Retained in the Renewal Permit

1. Intake Flow and Dye Tracer Evaluation

Intake flow continues to be part of the Section 316(b) BTA determination for impingement and entrainment for the circulating water system. A flow limit, monitoring, and periodic verification of flow values are appropriate and therefore have been retained. The permittee reports intake flow for the circulating water system at "FAC C" as indicated in Part III as well as in Part IV.G.1.a.

PSEG has requested that the flow limit be eliminated as a NJPDES permit condition. This is included in Section 2 of the 2006 application where PSEG contends that future limitations on circulation water intake flows are not necessary or appropriate. The Department has evaluated the permittee's request and maintains that retention of the existing flow limit is integral to the current and historical Section 316(a) and Section 316(b) determination. This flow limit was incorporated in the 1994 NJPDES permit and was retained in the 2001 NJPDES permit. The flow limit is also in accordance with the regulations at N.J.A.C. 7:14A-13.19 which states:

"(a) Except as provided for under Section 402(o) of the Federal Act (33 U.S.C. §1342(o)), when a permit is modified, renewed or reissued, all effluent limitations or standards shall be at least as stringent as the final and effective effluent limitations or standards in the previous permit."

The Department also maintains that verification of flow values are appropriate to ensure that reported flow values are accurate for the circulating water system. However, the Department is willing to consider an alternate methodology as described in Part IV.G.1.b.v.

Intake flow monitoring requirements have also been added to the service water system. The permittee shall propose the method of monitoring and begin reporting on Discharge Monitoring Reports (DMRs) designated as DSN 486.

2. Intake Screens and Fish Return System

- Circulator Water System

Part IV.G.2.a of the 2001 NJPDES permit requires the permittee to ensure the proper operation and maintenance of the Ristroph traveling screens at the circulating water system. Part IV.G.2.d of the 2001 NJPDES permit requires the permittee to conduct studies focused on the fish return sluice and sampling pool. The permittee has been operating modified Ristroph traveling screens with a fish return at the circulating water system since 1995. The Department acknowledges the permittee's efforts to incorporate several design and operational improvements over the years to this system to enhance efficacy including the conduct of the required studies. In EPA's 2014 rule, EPA includes a national impingement performance standard based on modified traveling screens with fish returns.

This renewal permit retains the requirement for the permittee to continue using modified Ristroph traveling screens and a fish return system for the circulating water system. The proper operation and maintenance of the Ristroph traveling screens has also been continued in this renewal permit. These conditions are integral to the BTA determination for the circulating water system.

Part IV.G.2.b of the 2001 NJPDES permit requires the permittee to conduct semi-annual training of employees operating the traveling water screens to ensure awareness of the function of the screens. The Department has determined that this requirement should be replaced with a requirement for a sign depicting information regarding the function of the screens. As a result, the permittee is required to post two signs within the screen houses to display the relevant information. The permittee shall submit a drawing of the sign to the Department within EDP + 3 months where the sign shall be posted by **EDP + 6 months**.

Part IV.G.2.d of the 2001 NJPDES permit requires the permittee to submit a ranking of best to worst (i.e. most vulnerable or frail) RIS for which the Ristroph screens are most effective at minimizing mortality. As described previously, the permittee submitted an extensive report with the required ranking as well as an evaluation of abundance. Similar to the concept of vulnerable or frail species, the 2014 rule defines fragile species at 40 CFR 125.92(m). Because 40 CFR 125.94(c)(7) is one of the impingement compliance options which relies on an assessment of fragile and non-fragile species, the Department is requiring the permittee to submit a list of fragile and non-fragile species. This listing shall be submitted by **EDP + 3 months**.

- Service Water System

Modified traveling screens were not required in the 2001 NJPDES permit for the Service Water System. However, Part IV.G.2 has been included in this renewal permit which requires the permittee to install modified traveling screens at the service water system. The service water intake is considered eligible under the 2014 rule as per the definition of cooling water at 40 CFR 125.92(e). As described further under the Section 316(b) determination for the Service Water System, modified traveling screens are proven, effective and readily available and the Department routinely requires the installation of modified traveling screen on many cooling water intakes including for CWIS that are far smaller than 60.48 MGD.

The permittee is required to evaluate and install modified traveling screens during this permit cycle. Specifically, the permittee shall comply with 40 CFR 122.21(r)(6) by EDP + 2 years. Installation of modified traveling screens or another allowable technology as per 40 CFR 125.94(c) shall be completed by **EDP + 4 years**.

3. Wetlands Restoration and Enhancement Efforts

Part IV.G.3.a of the 2001 NJPDES permit requires the permittee to implement the EEP in restoring, enhancing and/or preserving wetlands within the region of the Delaware Estuary. Specifically, this includes the restoration of no less than 10,000 acres of diked wetlands to normal daily tidal inundation; restoration of wetlands dominated by common reed (*Phragmites*) to primarily *Spartina* species and other desirable vegetation; and/or upland buffer. Part IV.G.3.c of the 2001 NJPDES permit describes the criteria for any replacement acreage. Part IV.G.3.b of the 2001 NJPDES permit requires the permittee to develop Management Plans for each of these sites to describe the management needed in order to attain success criteria. PSEG completed this requirement where all Management Plans were submitted to the Department.

To acknowledge compliance with this requirement and to assure that a comprehensive listing is provided for the purposes of the Administrative Record, the following is a summary of the lands that the EEP has restored, enhanced and/or preserved to meet these 2001 NJPDES permit requirements:

Site Name	Creditable Acres	Wetland Acreage	Other Lands	Buffer Acreages	Buffer Credit at 3:1
Diked Salt Hay Farm Restoration					
Commercial Township Salt Hay Farm	3007	2894	938	339	113
Dennis Township Salt Hay Farm	374	369	194	15	5
Maurice River Township Salt Hay Farm	1171	1135	153	108	38
***Phragmites* Dominated**					
Alloways Creek	2051.33	1601	144	1351	450
Cohansey River	503.33	910*	0	145	48
Cedar Swamp (Delaware)	1863**	1863	7		N/A
The Rocks (Delaware)	736 **	736	0		N/A

* Because the Cohansey site was dominated by 45% *Phragmites* prior to the onset of restoration activities, the Department credited the wetlands acreage at this site at a 2:1 ratio (455 acres). ** Only 2000 acres outside of New Jersey is allowable; therefore, these two Delaware sites (2599 acres) only count for 2000 acres towards the 10,000 acre total.					
Upland Buffer					
Bayside Tract Preservation	607.33		2585	1822	607
Dennis Wildlife Management Area	37.83			113	38
New Sweden Wildlife Management Area	102.93			309	103
Heislerville Wildlife Management Area	66.74			200	66.74
Millville Wildlife Management Area	173			521	173
TOTAL	**10,099**				

The wetland restoration sites provide a variety of benefits to the biological community of the Delaware Estuary. Wetland systems provide foraging and refuge habitat, serve as nursery areas for early life stages and juveniles, and provide direct food resources for consumer organisms in the Delaware Estuary food web. An increase in the area of saltmarsh leads to increased growth in marsh grasses which then increases the food supply. Additionally, an increase of saltmarshes also results in an increase in the amount of living space (habitat) available for the various species. For all these reasons, wetlands restoration and enhancement contributes directly to the increased abundance of these species. Wetlands restoration undertaken by the permittee has contributed to the diverse and robust assemblage of marine life in the bay. If these lands were to return to their pre-restoration conditions, valuable fish habitat could be lost or degraded and the biological community may be affected or threatened. PSEG must continue to monitor and manage these restored and/or preserved lands in order to maintain the ecological conditions. This includes the monitoring of vegetative cover to properly manage the lands that have not yet attained success criteria.

However, because the acquisition of land has been completed, some of the permit requirements are no longer necessary. As a result, the Department has not retained the requirements relating to additional land acquisition but has included a permit condition regarding the continued restoration, enhancement and/or preservation through the implementation of the Management Plans. Each site has its own Management Plan which specifies the success criteria along with interim evaluation criteria in the form of trends or trajectories. The success criteria for each site includes percentage of the marsh plain to be colonized by desirable vegetation, reduction of *Phragmites* coverage, and percentage of open water and mud flats. Progress toward success criteria is measured by comparing observed conditions to an expected trend or trajectory for the site. Defined variances from the expected trends or trajectories trigger further formal evaluation of potential problems to determine an appropriate course of action. In other words, PSEG manages restoration of its sites, consulting with its Adaptive Management Team when progress towards meeting success criteria deviates from the expected trajectory. The process of Adaptive Management was initiated after initial restoration activities were completed to ensure that restoration goals are met. Adaptive Management is implemented by a multi-disciplinary team that evaluates the progress of wetland restoration by regular site visits, field observations, and review of monitoring data. The permittee shall continue to work towards attaining success criteria at the remaining sites that have not yet achieved success criteria.

Part IV.G.3.d of the 2001 NJPDES permit required the establishment of an EEPAC to serve as a body to provide technical advice to the permittee concerning the continuing implementation of the Management Plans as well as the design, implementation, modifications and interpretation of the required Biological Monitoring Program. Given the progress of the wetland restoration sites, and the reduced number of issues and sites that continue to require oversight by the EEPAC, as well as the issuance of the 2014 rule, the Department is modifying the role and the scope of the EEPAC. The EEPAC shall focus on the continued implementation of the Management Plans where review and approval of the Biological Monitoring Program is no longer needed. The Department has determined that it is appropriate to modify this permit condition to reduce the number of

required participants on the EEPAC as well as the meeting frequency. Specifically, the EEPAC shall include the following participants, representative from two federal agencies that have jurisdiction over wetland restoration activities or fisheries; a minimum of four scientists with appropriate wetlands expertise; and two representatives of either Cape May, Cumberland, or Salem Counties (as appointed by the governments of Cape May, Cumberland, or Salem Counties). The Department shall designate one representative from the Department. The permittee shall designate a representative to serve on the EEPAC and to serve as the EEPAC's chair. These are the minimum requirements where the permittee can expand the number of participants with Department approval. The permittee shall notify the Department of the selected EEPAC members by **EDP + 3 months**. The Department reserves the right to deny any EEPAC representative if deemed appropriate. Meetings shall be conducted at least once per year.

4. Fish Ladders

Part IV.G.4.a and Part IV.G.4.b of the 2001 NJPDES permit addresses the installation of fish ladders as well as issues relating to operation and maintenance including routine inspections. Part IV.G.4.c of the 2001 NJPDES permit requires monitoring of juvenile and adult passage of river herring in connection with the fish ladder sites whereas Part IV.G.4.d addresses stocking of impoundments.

To acknowledge compliance with this requirement and to assure that a comprehensive listing is provided for the purposes of the Administrative Record, the following table is a list of the installed fish ladders, their associated water bodies and the season during which they were installed.

Fish Ladders Installed by EEP			
Site	**Waterbody**	**Installation Date**	
New Jersey			
Sunset Lake	Cohansey River	Spring	1997
Cooper River Lake	Cooper River	Spring	1998
Newton Lake	Newton Creek	Spring	2004
Stewart Lake	Woodbury Creek	Spring	2004
Delaware			
Silver Lake (Dover)	St. Jones River	Spring	1996
McColley's Pond	Murderkill River	Spring	1996
McGinnis Pond	Murderkill River	Spring	1996
Coursey's Pond	Murderkill River	Spring	1997
Garrisons Lake	Leipsic River	Spring	1999
Moores Lake	St. Jones River	Spring	1999
Noxontown Pond	Appoquinimink Creek	Spring	2004
Silver Lake (Milford)	Mispillion River	Spring	2004

The Department is continuing the requirement for the operation and maintenance of the twelve fish ladder sites in the renewal permit as this requirement provides benefits to river herring and serves to restore historic runs. The continued operation and maintenance of fish ladders will continue to provide long-term benefits to the Estuary through increased river herring spawning and survival.

Because some of the runs associated with fish ladder installation have been reestablished and because there can be mortality associated with river herring monitoring, the Department is no longer requiring monitoring of juvenile and adult passage of river herring or stocking of impoundments.

5. Biological Monitoring Program

Part IV.G.6 of the 2001 NJPDES permit requires the permittee to develop and implement an improved biological monitoring program subject to review by EEPAC and approval by the Department. The 2001

NJPDES permit requires that the following components be included: improved bay-wide abundance monitoring; continued detrital production monitoring (vegetative cover mapping, quantitative field sampling and geomorphology); improved impingement and entrainment monitoring; abundance monitoring for adult and juvenile passage of river herring as well as stocking; review and discussion as to the appropriateness of Atlantic silverside as an RIS; continued study of the fish utilization of restored wetlands; and any other monitoring studies as may be recommended by EEPAC. There have been several revisions to the improved biological monitoring program where the most current version was submitted to the Department on March 6, 2006 and approved on March 30, 2006.

This Department has retained several of the biological monitoring program conditions in this renewal permit but has deemed some of the other conditions no longer necessary. As a result, the biological monitoring program as required by this renewal permit shall include the following components: improved bay-wide abundance monitoring (see below); continued detrital production monitoring (vegetative cover mapping, and geomorphology); impingement and entrainment monitoring; and any other monitoring studies as may be recommended by EEPAC.

The permittee shall prepare a revised biological monitoring program work plan by **EDP + 6 months** to describe the monitoring components. A summary of the baywide abundance monitoring components that shall be included in the Biological Monitoring Program is included below. Note that many of these components are unchanged from the March 6, 2006 program with the exception of some deleted components and the inclusion of the Striped Bass Recruitment Survey and the River Ichthyoplankton Survey. Details regarding these programs and the Department's justification are as follows:

- Baywide Biological Monitoring

  Section 7.E above describes the details of the current biological monitoring program including those study components that focus on baywide monitoring. Because baywide monitoring is integral to understanding the biological community, the Department has retained the **PSEG Baywide Beach Seine**, the **PSEG Baywide Bottom Trawl Survey** as well as the funding of the **Striped Bass Recruitment Survey** (in order to compliment the Beach Seine survey). Additionally, the Department is requiring the continuation of the **PSEG River Ichthyoplankton Survey**.

  The abundance data collected by these surveys is used in conjunction with historical studies to characterize, or update prior information on, the effects of the cooling water intake structure on bay-wide marine populations as well as the balanced indigenous population in the areas affected by the thermal discharge. PSEG's abundance data is also used in conjunction with survey data collected by the Delaware Department of Natural Resources and Environmental Control and the New Jersey Fish and Wildlife to characterize long-terms trends in marine species populations. Long-term trends in juvenile abundance reflect the cumulative effects of all potential stressors in the estuary (e.g. fishing, pollution, environmental conditions, multiple cooling water intakes), as well as in near shore coastal waters for migratory species, on the fishery resources. In addition, long-term abundance data will continue to provide information as to the population status of various aquatic species compared to past levels; information on the factors that may cause changes in their populations over time; and provide a basis for better understanding the interactions and relationships between the species so as to apply this knowledge in making prudent resource management decisions.

  Data from these survey programs shall continue to be summarized and submitted in annual biological monitoring program reports. The result of any monitoring performed as part of the improved biological monitoring program shall be submitted annually by June 30 of that following year in an annual report. The permittee shall also provide by the same deadline the audited raw data from all of its biological monitoring activities to the Department's Marine Fisheries Administration in an appropriate electronic format, including all appropriate supporting tables and documents.

While the Department is continuing the requirement for PSEG to fund the Department's NJFW program regarding the Delaware River Striped Bass Recruitment Survey (Part IV G.5), the Department is amenable to one change. Specifically, rather than the NJFW conducting additional sampling at the 32 fixed stations during June, July and November, sampling shall be discontinued in November.

The Department is also requiring the permittee to reinstate the River Ichthyoplankton Survey beginning in 2016. While PSEG conducted this survey in years 2002 through 2004, the Department has determined that this data is useful and serves to satisfy information gaps. The protocol for this survey is described in the 2004 Biological Monitoring Report (and is summarized previously in this Fact Sheet). The objective is to quantify spawning success of key estuarine dependent species within the Delaware River Estuary. Information from this survey is necessary to understand the recruitment dynamics of these species in order to monitor population health and future recruitment to the fishery (harvestable size and age groups). This is particularly important since the Delaware Estuary was once a major production area for alewife, American shad, blueback herring, and weakfish, but in recent years population levels for all of these species have suffered.

- Vegetative Cover Mapping and Geomorphology

  Vegetative cover mapping and geomorphology is necessary to evaluate the success of the wetlands restoration measures. Vegetative cover at the wetlands restoration sites is monitored using a combination of aerial photography and field sampling methodologies. Aerial photography is conducted annually to map changes in the vegetative communities and the geomorphology associated with the restoration process. Annual mapping of the vegetative communities and geomorphology occurs on all wetland restoration sites that have not met the vegetative success criteria defined in the applicable site-specific Management Plan. Since the permittee is required to comply with the requisite Management Plans, annual mapping of vegetative cover monitoring and geomorphology shall continue during the peak growing season at the reference marshes and all restoration sites that have not met the final success criteria.

- Impingement and Entrainment Monitoring

  The biological monitoring program has historically described the protocol for impingement and entrainment monitoring such as the sampling methodology, materials, frequency etc. The Department has determined it is appropriate to continue to include impingement and entrainment monitoring as a component of the biological monitoring program and results shall continue to be included in annual reports. However, given the fact that the 2014 rule added extensive new requirements pertaining to impingement and entrainment studies, it is acknowledged that this data will be a component of other studies that will be the subject of separate submittals.

6. <u>Entrainment and Impingement Monitoring</u>

Part IV.G.7 of the 2001 NJPDES permit describes the frequency for entrainment and impingement sampling. The permittee has been conducting entrainment and impingement sampling at the circulating water system where results are reported in annual biological monitoring program reports.

The 2014 rule establishes requirements for impingement sampling for certain compliance options under the intended method of compliance with impingement mortality standard as specified at 40 CFR 122.21(r)(6)). Additionally, the 2014 rule establishes requirements for an entrainment characterization study (40 CFR 122.21(r)(9)) which shall include at least two years of sampling data. PSEG-Salem samples significantly more frequently than the impingement and entrainment frequency as specified in the 2014 rule.

Given the size of the intake flow, the Department has determined it appropriate to maintain the current sampling frequency in the renewal permit for the circulating water system as stipulated in the most recent version of the biological monitoring program work plan. The Department has also determined that the entrainment sampling protocol should be adjusted in order to capture identifiable oyster larvae in the 0.075

mm to 0.3 mm range. Entrainment sampling is currently conducted using a plankton net with a 0.5 mm net where a typical sample filters 50 m^3 of intake water. In sum, the following conditions have been included in the renewal permit for the circulating water system:

- Entrainment sampling shall be conducted three days per week at a frequency of seven samples per day during January through March and August through December (non-peak entrainment periods), conditions permitting. Sampling shall also be conducted four days per week at a frequency of fourteen samples per day during the period April through July (peak entrainment periods), conditions permitting. Specimens collected will be identified to the lowest practical taxon and life stage, and counted. The sampling protocol shall be suitable to capture identifiable oyster larvae in the 0.075 mm to 3 mm range. Total length shall be measured to the nearest millimeter for a representative subsample of each target species and life stage per sample. For each sample, additional data collected will include circulator status (on/off), air temperature, water temperature, and salinity.

- Impingement sampling shall be conducted three days per week. Ten samples shall be collected per 24-hour period, conditions permitting. All fish collected shall be sorted by species and counted and the condition (live, dead, or damaged) of each specimen will be recorded. Length of each specimen will be measured for a subset of each target species, along with the total aggregate weight for all specimens of each species and condition code. For each sample, additional data collected will include circulator status (on/off), air temperature, water temperature, and salinity.

These conditions have been included in Part IV.G.6.a. and b. of the renewal permit. The Department reserves the right to modify these sampling frequencies once the studies under 40 CFR 122.21(r)(6) and 40 CFR 122.21 (r)(9) are submitted. The biological monitoring program shall be adjusted accordingly to reflect these changes by **EDP + 3 months**.

12 Summary of Chemical-Specific Permit Conditions for Outfalls:

The Permit Summary Table near the end of this fact sheet contains a summary of the quantity and quality of pollutants treated and discharged from the facility and the proposed effluent limitations. The proposed effluent limitations and other pertinent information regarding the draft permit are described below:

A. Basis for Effluent Limitations and Permit Conditions - General:

The effluent limitations and permit conditions in this permit have been developed to ensure compliance with the following, as applicable:

1. NJPDES Regulations (N.J.A.C. 7:14A),
2. New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B),
3. New Jersey's 2012 Integrated Water Quality Monitoring and Assessment Report (includes 305(b) Report and 303(d) List),
4. Requirements of the Delaware River Basin Commission (N.J.A.C. 7:9B-1.5(b)1),
5. Existing permit limitations in accordance with N.J.A.C. 7:14A-13.19 and 40 CFR 122.44 (antibacksliding requirements),
6. Permit limitations in accordance with N.J.A.C. 7:9B-1.5(d) (antidegradation requirements),
7. Statewide Water Quality Management Planning Rules (N.J.A.C. 7:15),
8. Sludge Quality Assurance Regulations (N.J.A.C. 7:14C),
9. Technology Based Treatment Requirements or Effluent Limitation Guidelines Requirements (N.J.A.C. 7:14A- 13.2 to 13.4).

Technology based limitations are authorized by Section 301 of the Clean Water Act, 40 CFR 122, N.J.S.A. 58:10A-4, and N.J.A.C. 7:14A-13.2(a)1.ii., 13.3(b), and 13.4. In general, technology based effluent limitations are based on Effluent Limitation Guidelines (ELGs), developed by the EPA, or on case-by-case limitations developed

through a Best Professional Judgment analysis in cases where ELGs are not available or appropriate. ELGs are minimum technology based requirements applicable on a nation-wide basis and are published in 40 CFR Subchapter N. ELGs consider the category of industry that produce common pollutants taking into account the specific factors unique to a particular type of industry (manufacturing process, type and quantity of pollutants generated, types of treatment facilities available to treat the pollutants, etc.). In cases where ELGs are applicable for surface water dischargers, ELG loading limitations are calculated using the specified concentration value and the production information provided by the permittee. BPJ determinations are authorized by Section 402 (a)(1) of the Clean Water Act.

In accordance with N.J.A.C. 7:14A-13.5, Water Quality Based Effluent Limitations (WQBELs) are imposed when it has been determined that the discharge of a pollutant causes an excursion of criteria specified in the New Jersey SWQS, N.J.A.C. 7:9B-1.1 et seq., and the Federal Water Quality Standards, 40 CFR Part 131. WQBELs are authorized by Section 301 of the Clean Water Act, 40 CFR 122, N.J.S.A. 58:10A-4, and N.J.A.C. 7:14A-13.2 and 13.3. The procedures used to develop WQBELs are contained in the State and Federal Standards. Specific procedures, methodologies, and equations are contained in the current EPA "Technical Support Document for Water Quality-based Toxics Control" (TSD) (EPA- 505/2-90-001) and are referenced in N.J.A.C. 7:14A-13.5 and 13.6.

Expression of all effluent limitations is in accordance with N.J.A.C. 7:14A-13.14 and 13.15.

Whole effluent toxicity is expressed as a minimum as percent effluent.

B. Basis and Derivation for Effluent Limitations and Monitoring Requirements- Specific:

All permit limitations and conditions in this permit action, are equal to or more stringent than those contained in the existing permit action. As a result, this permit action satisfies the federal and state anti-degradation regulations at 40 CFR 131.12 and N.J.A.C. 7:9B-1.5(d), and no further anti-degradation analysis is necessary.

1. DSNs 481 – 486

Effluent Flow: The monitoring conditions for **Effluent Flow** are applied pursuant to N.J.A.C. 7:14A-13.13 and 13.14 and are consistent with the existing permit. Effluent flow shall be calculated on a daily basis for DSNs 481 – 486. The calculation procedures for the purposes of DMR reporting are described in further detail in Part IV.

Effluent Temperature: Monitoring for **Effluent Temperature** is consistent with the existing permit and is required pursuant to N.J.A.C. 7:14A-13.19. Monitoring for effluent temperature for each individual outfall shall occur on a continuous basis. Monitoring and reporting of effluent temperature is necessary to calculate compliance with limitations and conditions imposed for FAC A, B, and C as described later.

Chlorine Produced Oxidants: Effluent limitations and monitoring conditions **Chlorine Produced Oxidants** are consistent with the existing permit and are required pursuant to N.J.A.C. 7:14A-13.19. As described previously, the circulating water system flow, which comprises the most significant portion of the flow through DSNs 481 – 486, is not continuously chlorinated. However, the service water system component of the flow, which is also discharged through DSNs 481 – 486, is continuously chlorinated. Under normal operating conditions, service water system non-contact cooling water is discharged.

When only service water system non-contact cooling water is discharged, an effluent limitation of 0.5 milligrams per liter (mg/L) shall continue to apply as a daily maximum and an effluent limitation of 0.3 mg/L shall apply as a monthly average. These limitations are applied at DSNs 481 – 486. At all other times (i.e. the discharge of circulating water system water non-contact cooling water along with service water system non-contact cooling water), a daily maximum effluent limitation of 0.2 mg/L is applied in accordance with N.J.A.C. 7:14A-13.19 where this limit is consistent with the existing permit. A monthly average reporting

requirement is also applied when service water system non-contact cooling water is not being discharged. Monitoring is required three times per week using a grab sample type under both scenarios.

pH: Monitoring for **pH** is consistent with the existing permit and is required pursuant to N.J.A.C. 7:14A-13.19. Monitoring for pH shall be performed once per week using a grab sample. The daily minimum pH of the effluent shall not be less than 6.0 standard units (s.u.) and the daily maximum pH shall not be greater than 9.0 s.u.. Monitoring for intake pH is also required. If the intake pH is less than 6.0 S.U. the daily minimum pH limitation shall be equivalent to the measured intake pH. If the intake pH is greater than 9.0 s.u., the daily maximum pH limitation shall be equivalent to the measured intake pH.

Whole Effluent Toxicity (WET): Section 101(a) of the CWA establishes a national policy of restoring and maintaining the chemical, physical and biological integrity of the Nation's waters. In addition, section 101(a)(3) of the CWA and the State's SWQS at N.J.A.C. 7:9B-1.5(a)3 state that the discharge of toxic pollutants in toxic amounts is prohibited. Further, 40 CFR 122.44(d) and N.J.A.C. 7:14A-13.6(a) require that where the Department determines that a discharge causes, shows a reasonable potential to cause, or contributes to an excursion above the SWQS, the permitting authority must establish effluent limits for WET. In order to satisfy the requirements of the CWA, the State's SWQS and the NJPDES Regulations, the need for a WQBEL for WET was evaluated for this discharge.

In order to assess the toxicity effects of the circulating water system as well as the effects of DSN 48C and the other wastewater components, the permittee is required to perform acute toxicity testing on a minimum of one representative circulating water system outfall, namely DSNs 481, 482, 484 and/or 485, while DSN 48C effluent is routed to this outfall during sample collection.

Since the discharge was not found to cause or have reasonable potential to cause an exceedance of the acute interpretation of the narrative criteria for WET identified in the SWQS, no new WQBELs have been calculated in this permit action. However, in accordance with the antibacksliding provisions at N.J.A.C. 7:14A-13.19(a), the existing acute WET effluent limitation of LC50≥50% has been retained from the existing permit renewal as an action level.

On January 5, 2009 the New Jersey Pollutant Discharge Elimination System (NJPDES) Rules were readopted. This readoption repealed N.J.A.C. 7:14A-5.3(a) which contained the state minimum effluent standard for acute WET and instead adopted an acute WET action level of LC50≥50% at N.J.A.C. 7:14A-13.18(f). Therefore, consistent with this requirement, the existing and effective acute WET limitation of LC50≥50% is being replaced with an acute WET action level of LC50≥50% in this renewal. Monitoring and reporting will be required to determine whether the discharge causes, shows a reasonable potential to cause, or contributes to an excursion above the SWQS.

Imposing an action level for acute WET will be equally protective of water quality as an effluent limit in this circumstance, since the violation of either the WET limitation or the action level carries with it the same enforceable permit condition to initiate the Toxicity Reduction and Implementation Requirements (TRIR), in order to correct the toxicity problem should this value be exceeded. As a result, the Department anticipates there will be no change in water quality as a result of this change. This change satisfies the antibacksliding provisions at N.J.A.C. 7:14A-13.19, which incorporate Section 402(o)3 of the Federal Clean Water Act, because it includes the TRIR provisions. Specifically, Section 402(o)3 prohibits the revision of an effluent limit "if the implementation of such limitation would result in a violation of a water quality standard." In this circumstance, violation of either the numerically identical action level or an effluent limitation will trigger an enforceable permit condition to conduct a TRIR in order to address or prevent a violation of a water quality standard.

The test species to be used for determining permit compliance with the acute WET action level of LC50≥ 50% effluent shall be the sheepshead minnow (*Cyprinodon variegatus*). The monitoring frequency for acute toxicity is being retained at **twice per year**.

The **Toxicity Reduction Implementation Requirements** (TRIR) are included in accordance with N.J.A.C. 7:14A-13.17(a), 7:14A-6.2(a)5 and recommendations in Section 5.8 of the TSD. The requirements are necessary to expedite compliance with the acute WET toxicity limitation should exceedances of the acute WET limitation occur. As included in section B.1 of the TRIR requirements, the initial step of the TRIR is to identify the variability of the effluent toxicity and to verify that a consistent toxicity problem does in fact exist.

The permittee is required to collect samples for the purpose of acute toxicity testing at a minimum of one representative circulating water system outfall, namely DSNs 481, 482, 484 and/or 485. During sample collection, for the purposes of acute toxicity testing, DSN 48C effluent shall be routed to this representative outfall.

2. DSNs FAC A and FAC B

As described previously, FAC A designates the discharge from Unit 1 (DSNs 481, 482, and 483) whereas FAC B designates the discharge from Unit 2 (DSNs 484, 485 and 486).

The effluent temperature values measured continuously at the individual outfalls for DSNs 481 – 486 shall be utilized in calculating flow-weighted **Effluent Temperature values for FAC A and FAC B** as described in Part IV. Effluent flow is required to be monitored at outfalls 481 – 486 where these values shall be used in any flow-weighted calculation procedure. Monitoring for effluent temperature shall be calculated as the flow-weighted average for FAC A and FAC B as described in the effluent limitations tables for FAC A and FAC B in Part IV. A daily maximum effluent temperature limitation of 46.1°C (115° F) is imposed for FAC A and FAC B during the months of June through September and 43.3°C (110° F) during the months of October through May. These values were utilized in the Section 316(a) Determination. Monthly average reporting is also required for effluent temperature for FAC A and FAC B. These limitations and monitoring conditions are consistent with the existing permit pursuant to N.J.A.C. 7:14A-13.19.

A continuous monitoring condition for **Intake Temperature** is carried forward from the existing permit pursuant to N.J.A.C. 7:14A-13.19. Intake temperature shall be measured at the intake to the main circulating water system for Units 1 and 2 on a continuous basis and shall be averaged daily to obtain the intake temperature for FAC A and for FAC B. The calculated intake temperature values shall be reported as both a daily maximum and a monthly average. In the event that one of the temperature monitoring devices is out of service (such as for calibration and maintenance) the other temperature monitoring device will be used for reporting intake temperature for FAC A and FAC B.

3. DSN FAC C

As described previously, FAC C represents the "facility" namely the discharges from Unit 1 and Unit 2 which are designated as DSNs 481 – 486. **Intake flow** is limited to a monthly average of 3024 MGD total intake for DSNs 481 – 486 as specified in Part IV. Intake flow shall be measured as the sum of the twelve individual intakes to the circulating water system and reported as a monthly average in MGD. The flow of each individual circulating water pump shall be calculated as the product of the number of operating hours for that pump for the reporting period and the flow rate for that pump as indicated in item G.1 of Part IV. The flow rate for each respective pump shall be calculated in accordance with **annual tracer evaluation studies** as described in Part IV.

"Thermal Discharge" for the facility is limited at 30,600 million BTU's per hour as a monthly average. This limit is consistent with the existing permit. The calculation procedure is provided in Part IV.

4. DSN 48C

The effluent limitations and/or monitoring requirements for **Flow**, **Petroleum Hydrocarbons**, **Total Organic Carbon**, **Total Suspended Solids** and **Ammonia** have been retained from the existing permit in accordance with N.J.A.C. 7:14A-13.19. The monitoring frequency of "daily" for flow and "twice per month" for

petroleum hydrocarbons, total organic carbon, total suspended solids and ammonia have also been retained from the existing permit. Although the permittee has demonstrated consistent compliance with the effluent limitations, the Department has determined that it is appropriate to retain the "twice/month" monitoring frequency given the potential contaminants and level of treatment for this wastestream.

The Department has incorporated a semi-annual Waste Characterization Report (WCR) to characterize certain volatile organics, sulfate, and boron as these parameters were detected in the renewal application.

5. DSN 487B

The effluent limitations and/or monitoring requirements for **Flow**, **Effluent Temperature**, **Petroleum Hydrocarbons**, **Total Organic Carbon**, **Total Suspended Solids** and **pH** have been retained from the existing permit in accordance with N.J.A.C. 7:14A-13.19. The monitoring frequency of "once/batch" is still appropriate and has therefore also been retained.

6. DSN 489

The effluent limitations and/or monitoring requirements for **Flow**, **Petroleum Hydrocarbons**, **Total Organic Carbon**, **Total Suspended Solids** and **pH** have been retained from the existing permit in accordance with N.J.A.C. 7:14A-13.19. The monitoring frequency of "monthly" is still appropriate and has therefore also been retained from the existing permit.

C. Reporting Requirements:

All data requested to be submitted by this permit shall be reported on the Discharge Monitoring Reports (DMRs) and Waste Characterization Reports (WCR) as appropriate and submitted to the Department as required by N.J.A.C. 7:14A-6.8(a).

D. General Conditions:

In accordance with N.J.A.C. 7:14A-2.3 and 6.1(b), specific rules from the New Jersey Administrative Code have been incorporated either expressly or by reference in Part I and Part II.

The type(s) and volume(s) of wastewater regulated under this permit are not included in the applicable Water Quality Management Plan.

The operator classification requirement is no longer included in the permit. To obtain or determine the appropriate licensed operator classification for the treatment works specified, the permittee shall contact the Bureau of Construction and Connection Permits at (609) 633-1180.

E. Residuals/Sludge Conditions:

Based upon previous correspondence with PSE&G, the Department is satisfied that the Annual Radioactive Effluent Release Report (ARERR) contains the necessary sludge management information required under the Sludge Quality Assurance Regulations (SQAR, N.J.A.C. 7:14C) and Part II of the permit. Annually, PSE&G shall submit proof of proper sludge management of each sludge type to the following address:

NJDEP-DWQ
Bureau of Pretreatment and Residuals
Mail Code 401-02B, P.O. Box 420
Trenton, NJ 08625-0420

All treatment works with a discharge regulated under N.J.A.C. 7:14A must have permits that implement applicable technical standards for residuals management. Generally, the permit issued to the treatment works generating the

residual will include applicable residual quality monitoring as well as other general conditions required by N.J.A.C. 7:14A-6. In addition, the permit may include conditions related to any aspect of residual management developed on a case-by-case basis where the Department determines that such conditions are necessary to protect public health and the environment.

The permit may also include conditions establishing requirements for treatment works that send residual to other facilities for final use or disposal. Thus, **ALL** residual preparers (that is, generators as well as persons who manage the residual) are required to submit basic information concerning their residual use and disposal practices. This basic information is submitted by compliance with the Sludge Quality Assurance Regulations (N.J.A.C. 7:14C).

The documents listed below have been used to establish the residual conditions of the Draft Permit:

1. EPA "Standards for the use or disposal of sewage sludge" (40 CFR Part 503),
2. "New Jersey Pollutant Discharge Elimination System" (N.J.A.C. 7:14A),
3. Technical Manual for Residuals Management, May 1998,
4. EPA Part 503 Implementation Guidance, EPA 833-R-95-001, October 1995. This document is a compilation of federal requirements, management practices and EPA recommended permit conditions for sewage sludge use and management practices,
5. EPA A Plain English Guide to the EPA Part 503 Biosolids Rule, EPA/832/R-93/003, September 1994,
6. New Jersey "Statewide Sludge Management Plan", January 2006 and
7. New Jersey "Sludge Quality Assurance Regulations" (SQAR), N.J.A.C. 7:14C.

F. Biocides or Other Cooling Water Additives:

The Department has approved the permittee's request to use the following corrosion inhibitors, biocides, or other cooling water additives in its non-contact cooling water:

- Sodium hypochlorite

If the permittee decides to begin using any additional additives in the future, the permittee must notify the Bureau of Surface Water Permitting at least 180 days prior to use so that the permit may be reopened to incorporate any additional limitations deemed necessary.

G. Delaware River Basin PCB Pollutant Minimization Plan:

On December 15, 2003 the U.S. EPA Regions 2 and 3 adopted a Total Maximum Daily Load for Polychlorinated Biphenyls (PCBs) for Zones 2, 3, 4 and 5 of the tidal Delaware River. On December 15, 2006, the EPA, Regions 2 and 3, adopted a Total Maximum Daily Load (TMDL) for PCBs for Zone 6 (Delaware Bay). This TMDL requires that the facilities identified as discharging PCBs to the Delaware River prepare and implement PCB pollutant reduction plans (hereafter referred to as Pollutant Minimization Plans (PMPs)).

This permit renewal requires continued sampling of the 209 PCB congeners utilizing EPA Method 1668A on an annual basis for DSNs 489A and 48C. Both one dry and one wet weather sample are required for DSN 489A on an annual basis. Only one dry weather sample is required for DSN 48C on an annual basis.

The permittee initially submitted a PMP on October 5, 2005. DRBC approved the PMP in a letter dated April 25, 2006. This permit renewal requires that the permittee continue to implement the approved PMP and submit a PMP annual report to the DRBC and the Department each subsequent year.

Refer to Part IV Section D of this permit for further details regarding the PMP plan requirements applicable to this facility.

13 Variances to Permit Conditions:

A thermal variance is granted with respect to temperature, in accordance with Section 316(a) of the Clean Water Act.

Procedures for modifying a WQBEL are found in the New Jersey NJSWQS, N.J.A.C. 7:9B-1.8 and 1.9. If a WQBEL has been proposed in this permit action, the permittee may request a modification of that limitation in accordance with N.J.A.C. 7:14A-11.7(a). This request must be made prior to the close of the public comment period. The information that must be submitted to support the request may be obtained from the Bureau of Environmental Analysis, Restoration and Standards at (609) 633-1441.

14 Description of Procedures for Reaching a Final Decision on the Draft Action:

Please refer to the procedures described in the public notice that is part of the draft permit. The public notice for this permit action is published in the *South Jersey Times* and in the DEP Bulletin.

15 Contact Information:

If you have any questions regarding this permit action, please contact Heather Genievich or Rachael Pepe of the Bureau of Surface Water Permitting at (609) 292-4860.

16 Permit Summary Table

Unless otherwise noted, all effluent limitations are expressed as maximums. Dashes (--) indicate there is no effluent data, no limitations, or no monitoring for this parameter depending on the column in which it appears.

DSN 481 and 482 – Once-Through Cooling water, Radioactive Liquid Waste Disposal System
DSN 483 – Once Through Cooling Water Only

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014			Existing Permit Limits	Final Permit Limits	Monitoring	
		DSN 481	DSN 482	DSN 483			Frequency	Sample Type
Temperature, Effluent (°C)	Monthly Average Daily Max. Data Points	23.84 29.53 60	23.78 29.42 60	23.58 29.43 60	MR MR	MR MR	1/Day	Continuous
Flow, Effluent (MGD)	Monthly Average Daily Max. Data Points	428.75 485.4 60	406.63 467.58 60	407.77 469.35 60	MR MR	MR MR	1/Day	Calculated
Chlorine Produced Oxidants (mg/L)-During discharge of service water	Monthly Average Data Points Daily Max. Data Points	<0.1 0 DET/ 60ND 0.1 2 DET/ 58 ND	0.1 1 DET/ 59ND 0.2 2 DET/ 58 ND	<0.1 0 DET/ 60ND <0.1 0 DET/ 60ND	0.3 0.5	0.3 0.5	3/Week	Grab
Chlorine Produced Oxidants (mg/L)-During discharge of circulating water	Monthly Average Data Points Daily Max. Data Points	0.1 1 DET/ 59 ND 0.15 2 DET/ 58 ND	0.1 1 DET/ 59 ND 0.2 3 DET/ 57 ND	<0.1 0 DET/ 60ND 0.2 1 DET/ 59ND	MR 0.2	MR 0.2	3/Week	Grab
pH, Effluent (s.u.)	Daily Min. Daily Max. Data Points	7.33 7.80 60	7.4 7.8 60	7.38 7.8 60	6.0 9.0	6.0 9.0	1/Week	Grab
pH, Intake (s.u.)	Daily Min. Daily Max. Data Points	7.53 7.97 60	7.53 7.97 60	7.53 7.97 60	6.0 9.0	6.0 9.0	1/Week	Grab
Acute Toxicity *Cyprinodon variegatus* (%)	Daily Min	--	--	--	50	MR(1)	2/Year	Composite

Footnotes and Abbreviations:
MR- Monitor and report only
(1) The permittee shall maintain toxicity levels which exceed the Action Level of LC50 ≥50%.

DSN 484 and 485 – Once-Through Cooling Water: Radioactive Liquid Waste Disposal System
DSN 486 – Once Through Cooling Water Only

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014			Existing Permit Limits	Final Permit Limits	Monitoring	
		DSN 484	DSN 485	DSN 486			Frequency	Sample Type
Temperature, Effluent (°C)	Monthly Average Daily Max. Data Points	23.7 28.84 60	23.5 28.7 60	23.45 28.99 60	MR MR	MR MR	1/Day	Continuous
Flow, Effluent (MGD)	Monthly Average Daily Max. Data Points	432 485 60	400.4 440.12 60	373.93 416.17 60	MR MR	MR MR	1/Day	Calculated
Flow, Service Water Intake (MGD)	Monthly Average Daily Max.	-- --	-- --	-- --	-- --	MR (DSN 486) MR (DSN 486)	1/Day	Calculated
Chlorine Produced Oxidants (mg/L)-During discharge of service water	Monthly Average Data Points Daily Max. Data Points	0.1 1 DET/ 59 ND 0.2 1 DET/ 59 ND	<0.1 0 DET/ 60 ND <0.1 0 DET/ 60 ND	<0.1 0 DET/ 60 ND <0.1 0 DET/ 60 ND	0.3 0.5	0.3 0.5	3/Week	Grab
Chlorine Produced Oxidants (mg/L)-During discharge of circulating water	Monthly Average Data Points Daily Max. Data Points	<0.1 0 DET/ 60 ND <0.1 0DET/ 60 ND	0.25 2 DET/ 58 ND 0.35 2 DET/ 58 ND	<0.1 0 DET/ 60 ND <0.1 0 DET/ 60 ND	MR 0.2	MR 0.2	3/Week	Grab
pH, Effluent (s.u.)	Daily Min. Daily Max. Data Points	7.38 7.79 60	7.37 7.80 60	7.36 7.77 60	6.0 9.0	6.0 9.0	1/Week	Grab
pH, Intake (s.u.)	Daily Min. Daily Max. Data Points	7.53 7.97 60	7.53 7.97 60	7.53 7.97 60	MR MR	MR MR	1/Week	Grab
Acute toxicity *Cyprinodon variegatus* (%)	Daily Min Data Points	--	>100 11	--	50	MR (1)	2/Year	Composite

Footnotes and Abbreviations:
MR- Monitor and report only
(1) The permittee shall maintain toxicity levels which exceed the Action Level of LC50≥50%.

Thermal Monitoring Points: FAC A, FAC B, FAC C

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014			Existing Permit Limits	Final Permit Limits	Monitoring	
		FAC A	FAC B	FAC C			Frequency	Sample Type
Temperature, Intake (°C)	Monthly Average Daily Max Data Points	15.36 18.03 *60*	15.28 17.92 *59*	-- -- --	MR (1) MR (1)	MR (1) MR (1)	Continuous	Continuous
Temperature, Effluent (°C) June through September	Monthly Average Daily Max Data Points	34.25 36.8 *20*	33.68 36.08 *20*	-- -- --	MR (1) 46.1 (1)	MR (1) 46.1 (1)	Continuous	Continuous
Temperature, Effluent (°C) October through May	Monthly Average Daily Max Data Points	18.29 22.25 *40*	18.05 21.6 39	-- -- --	MR 43.3 (1)	MR 43.3 (1)	Continuous	Continuous
Temperature Differential, Effluent Net (°C)	Monthly Average Daily Max Data Points	8.24 10.24 *60*	8.05 9.74 *59*	-- -- --	MR (1) 15.3 (1)	MR (1) 15.3 (1)	1/Day	Calculated
Flow, Circulating Water Intake (MGD)	Monthly Average Daily Max Data Points	-- -- --	-- -- --	2366.05 2654.52 *59*	3024 (2) MR (2)	3024 (2) MR (2)	1/Day	Calculated
Thermal Discharge, Million BTU's/ hour	Monthly Average Daily Max Data Points	-- -- --	-- -- --	12949.76 14939.83 *59*	MR (2) 30600 (2)	MR (2) 30600 (2)	1/Day	Calculated

Footnotes and Abbreviations:
MR- Monitor and report only

(1) Limits apply to FAC A (DSNs 481, 482, 483) and FAC B (DSNs 484, 485, 486).
(2) Limits apply to FAC C (DSNs 481, 482, 483, 484, 485, 486).

DSN 48C: Non-Radioactive Liquid Waste Disposal System

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014	Existing Permit Limits	Final Permit Limits	Monitoring	
					Frequency	Sample Type
Flow, Effluent (MGD)	Monthly Average Daily Max Data Points	0.32 0.65 60	MR MR	MR MR	1/Day	Calculated
Total Petroleum Hydrocarbon (mg/L)	Monthly Average Daily Max Data Points	4 6 1 DET/ 59 ND	10 15	10 15	2/Month	Grab
Total Organic Carbon (mg/L)	Monthly Average Daily Max Data Points	7.7 9.35 60	MR 50	MR 50	2/Month	Composite
Total Suspended Solids (mg/L)	Monthly Average Daily Max Data Points	7.82 10 60	30 100	30 100	2/Month	Composite
Ammonia (as N) (mg/L)	Monthly Average Data Points Daily Max Data Points	5.6 53 DET/ 8 ND 8.13 54 DET/ 7 ND	35 70	35 70	2/Month	Composite

Footnotes and Abbreviations:
MR- Monitor and report only

DSN 487B: #3 Skim Tank

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014	Existing Permit Limits	Final Permit Limits	Monitoring	
					Frequency	Sample Type
Temperature, Effluent (°C)	Monthly Average Daily Maximum Data	16.9 16.9 1 DET / 0 ND	MR 43.3	MR 43.3	1/Discharge	Grab
Flow, Effluent (MGD)	Monthly Average Daily Maximum Data	0 0 1 DET / 59 ND	MR MR	MR MR	1/Discharge	Calculated
Total Suspended Solids (mg/L)	Monthly Average Daily Maximum Data	<2 <2 1 DET / 59 ND	MR 100	MR 100	1/Discharge	Grab
pH (Standard Units)	Daily Minimum Daily Maximum Data	7.7 7.7 1 DET / 59 ND	6.0 9.0	6.0 9.0	1/Discharge	Grab
Petroleum Hydrocarbons (mg/L)	Monthly Average Daily Maximum Data	<5 <5 1 DET / 59 ND	MR 15	MR 15	1/Discharge	Grab
Total Organic Carbon (mg/L)	Monthly Average Daily Maximum Data	1 1 1 DET / 59 ND	MR 50	MR 50	1/Discharge	Grab

Footnotes and Abbreviations:
MR- Monitor and report only

DSN 489

Parameter	Averaging Period	Discharge Monitoring Report 1/2010- 12/2014	Existing Permit Limits	Final Permit Limits	Monitoring	
					Frequency	Sample Type
Total Organic Carbon (mg/L)	Monthly Average Daily Max. Data Points	6.47 6.47 59 DET/ 1 ND	MR 50	MR 50	1/Month	Grab
Flow, Effluent (MGD)	Monthly Average Daily Max. Data Points	0.048 0.0482 60	MR MR	MR MR	1/Month	Calculated
Total Suspended Solids (mg/L)	Monthly Average Daily Max. Data Points	9.67 9.22 59 DET/ 1 ND	30 100	30 100	1/Month	Grab
pH (s.u.)	Daily Minimum Daily Maximum Data Points	7.58 7.58 60	6.0 9.0	6.0 9.0	1/Month	Grab
Petroleum Hydrocarbons (mg/L)	Monthly Average Daily Max. Data Points	4 4 1 DET/ 59 ND	10 15	10 15	1/Month	Grab

Footnotes and Abbreviations:
MR- Monitor and report only

(a)- Please refer to Section 11.B of this Fact Sheet regarding the specific monitoring and reporting requirements for CPO.
(b)- No data available for May 2011 for FAC B or FAC C.

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17 Contents of the Administrative Record

The following items are used to establish the basis of the Draft Permit:

Rules and Regulations:

1. 33 U.S.C. 1251 et seq., Federal Water Pollution Control Act. [B]
2. 40 CFR Part 131, Federal Water Quality Standards. [B]
3. 40 CFR Part 122, National Pollutant Discharge Elimination System. [B]
4. N.J.S.A. 58:10A-1 et seq., New Jersey Water Pollution Control Act. [A]
5. N.J.A.C. 7:14A-1 et seq., New Jersey Pollutant Discharge Elimination System Regulations. [A]
6. N.J.A.C. 7:9B-1 et seq., New Jersey Surface Water Quality Standards. [A]
7. N.J.A.C. 7:15, Statewide Water Quality Management Planning Rules. [A]
8. N.J.A.C. 7:14C, Sludge Quality Assurance Regulations. [A]
9. Delaware River Basin Commission: Administrative Manual – Part III Water Quality Regulations.
10. 40 CFR Part 125, Criteria and Standards for National Pollutant Discharge Elimination System. [B]
11. 40 CFR Parts 122 and 125 [B]
12. 2004 Phase II Rule for Section 316(b), 40 CFR Parts 122 and 125 [B]
13. Suspension of Regulations Establishing Requirements for Cooling Water intake Structures at Phase II Existing Facilities, published at 72 Fed. Reg. 37107, dated July 9, 2007. [B]
14. Proposed Rule, Cooling Water Intake Structures at Existing Facilities, Notice of Data Availability Related to Impingement and Mortality Control Requirements, published at 77 Fed. Reg. 34315, dated June 11, 2012. [B]
15. Final regulations to Establish Requirements for Cooling Water Intake Structures at Existing Facilities, published at 79 Fed. Reg. 48300, dated August 15, 2014.

Guidance Documents /Memos:

1. "Field Sampling Procedures Manual", published by NJDEP. [A]
2. "NJPDES Monitoring Report Form Reference Manual", updated December 2007, and available on the web at http://www.state.nj.us/dep/dwq/pdf/MRF_Manual.pdf. [A]
3. "EPA Technical Support Document for Water Quality-based Toxics Control", EPA/505/2-90-001, March 1991. [B]
4. New Jersey's 2012 Integrated Water Quality Monitoring and Assessment Report (includes 305 (b) Report 303(d) List). [A]
5. Effluent Discharge Monitoring Report (DMR) form data from January 2010 through December 2014. [A]
6. Compliance Inspections conducted on May 13, 2014, June 6, 2013, and June 19, 2012. [A]
7. Memorandum dated October 28, 2008 from Director James A. Hanlon of EPA's Office of Wastewater Management to Water Division Directors in Regions 1 to 10. [B]
8. 1977 draft CWA section 316(a) guidance entitled "*Interagency 316(a) Technical Guidance Manual And Guide For Thermal Effects Sections Of Nuclear Facilities Environmental Impact Statements.* [B]
9. "Implementation of the Decision in Riverkeeper, Inc. v. EPA, Remanding the Cooling Water Intake Structures Phase II Regulation", memo from Benjamin Grumbles, Assistant Administrator, USEPA, Office of Water to Regional Administrators, dates March 20, 2007. [B]
10. Memorandum dated December 11, 2014 from Deborah G. Nagle, Director, Water Permits Division, EPA to Water Division Directors, Regions 1 to 10. [B]

Technical Studies:

1. "Ranking of RIS Vulnerability", prepared by Lawler, Matusky and Skelly Engineers, LLP, dated October 22, 2001.
2. "Plan of Study for Custom Requirement G.5, Further Study of Intake Protection Technology", prepared by PSEG Nuclear, LLC, dated January 25, 2002.
3. "Custom Requirement G.6, Improved Biological Monitoring Work Plan", prepared by PSEG Nuclear, LLC, dated April 22, 2002.
4. "Custom Requirement G.6, Improved Biological Monitoring Program Work Plan", prepared by PSEG Nuclear, LLC, dated June 12, 2002.

5. "Analysis of Optimum Sampling Frequency for Entrainment and Impingement Monitoring", dated June 31, 2002.
6. "Plan of Study for Custom Requirement G.5, further Study of Intake Protection Technology, Revision 1", prepared by PSEG Nuclear, LLC, dated April 15, 2003.
7. "Salem Generating Station NJPDES Permit No. NJ0005622 Custom Requirement G.5-Multi-Sensory Hybrid intake Protection Technology Feasibility Study Interim Report", submitted by PSEG Nuclear, LLC, dated July 15, 2003.
8. "Salem Generating Station NJPDES Permit No. NJ0005622 Custom Requirement G.6-Improved Biological Monitoring Work Plan (IBMWP)", submitted by PSEG Nuclear, LLC, dated July 15, 2003.
9. "Phase 1 Report, Custom Requirement G.5, Multi-Sensory Hybrid Intake Protection Technology Feasibility Study, Section 316(b) Special Condition", prepared by PSEG, dated December 2003.
10. "Custom Requirement G.5 Multi-Sensory Hybrid Intake Protection Technology Feasibility Study, Section 316(b) Special Condition, Phase 2 Plan of Study", prepared by Alden Research Laboratory, Inc, for PSEG Nuclear, LLC dated December 31, 2003.
11. "Custom Requirement G.6, Improved Biological Monitoring Program Work Plan, prepared by PSEG Nuclear, LLC, dated January 1, 2004.
12. "Expansion of Analyses Section 316 Special Condition", submitted by PSEG Nuclear, LLC, dated May 17, 2004.
13. "Proposal for Information Collection (PIC)", submitted by PSEG Nuclear, LLC, dated November 1, 2004.
14. "Alternative Entrainment Sampling Methods", dated November 30, 2004.
15. "Custom Requirement G.5 Multi-Sensory Hybrid Intake Protection Technology Feasibility Study, Section 316(b) Custom Requirement, Plan of Study", prepared by PSEG Nuclear, LLC, dated May 30, 2005.
16. "Phase 2 Report, Custom Requirement G.5, Multi-Sensory Hybrid Intake Protection Technology Feasibility Study, Section 316(b) Special Condition", prepared by Alden Research Laboratory, Inc, for PSEG Nuclear, LLC, dated February 2005.
17. "Custom Requirement G.6, Improved Biological Monitoring Work Plan", prepared by PSEG Nuclear, LLC, dated March 1, 2006.
18. "Detritus Discharge Pipe, Biological Assessment of Potential Effects on Impinged Organisms", prepared by PSEG Nuclear, LLC, dated July 13, 2011.
19. Endangered Species Act Section 7 Consultation, Biological opinion on continued operation of Salem and Hope Creek Nuclear Generating Stations (NER-2010-6581), issued by NMFS in July 17, 2014.

Reports:

1. Biological Monitoring Program Annual Reports 1995 through 2013.

Correspondences:

1. Letter titled, "Deed of Conservation Restriction Notice, Bayside Tract", addressed to Cari J. Wild, Assistant Commissioner of NJDEP from Maureen F. Vaskis of PSEG Services Corporation, dated August 13, 2000.
2. Letter titled, "Biological Monitoring Work Plan (BMWP) and PSEG's Estuary Enhancement Program (EEP)", addressed to Robert McDowell, Director of Division of Fish and Wildlife from Maureen F. Vaskis, dated January 23, 2001.
3. Letter titled, "Escrow Agreement-Custom Requirement G.15", addressed to Cari J. Wild, Assistant Commissioner of NJDEP from Maureen F. Vaskis of PSEG Services Corporation, dated December 27, 2001.
4. Letter titled, "Additional Land Purchases", addressed to Robert McDowell, Director of Division of Fish and Wildlife from Jeffrey J. Pantazes, dated March 12, 2002.
5. Letter titled, "Improved Biological Monitoring Work Plan, Delaware River Striped Bass Recruitment Survey", addressed to Robert McDowell, Director of the Division of Fish and Wildlife from Jeffrey J. Pantazes of PSEG Services Corporation, dated April 4, 2002.
6. Letter titled, "Intake Screens and Fish Return System Evaluation-Work Plan Approval", addressed to David F. Garchow of PSEG Nuclear, LLC from Robert McDowell, Director of the Division of Fish and Wildlife, dated April 30, 2002.
7. Letter titled, "Work Plan Approval for Alternative Entrainment Sampling Methods", addressed to David F. Garchow of PSEG Nuclear, LLC from Robert McDowell, Director of the Division of Fish and Wildlife, dated May 17, 2002.

8. Letter titled, "Work Plan Approval for Multi-Sensory Hybrid Intake Protection Technology", addressed to David F. Garchow of PSEG Nuclear, LLC from Robert McDowell, Director of the Division of Fish and Wildlife, dated May 17, 2002.
9. Letter titled, "Work Plan Approval for Multi-Sensory Hybrid Intake Protection Technology", addressed to Kenneth A. Strait of PSEG Services Corporation from Martin McHugh, Director of Division of Fish and Wildlife, dated July 28, 2003.
10. Letter titled, "Work Plan Approval for Biological Monitoring Program", addressed to Kenneth A. Strait of PSEG Services Corporation from Martin McHugh, Director of Division of Fish and Wildlife, dated July 28, 2003.
11. Letter titled, "Management Plan Approval for: Dennis Creek Wildlife Management Area, New Sweden Wildlife Management Area, Tracts added to Millville Wildlife Management Area, Tracts added to Heislerville Wildlife Management Area", addressed to Kenneth A. Strait of PSEG Services Corporation from Martin McHugh, Director of Division of Fish and Wildlife, dated July 28, 2003.
12. Letter titled, "Circulating Water Intake Screen Pilot Testing", addressed to Susan Rosenwinkel of the Bureau of Point Source Permitting-Region 2 from Jeffrey J. Pantazes, Manager, PSEG Services Corporation dated January 23, 2005.
13. Letter titled, "Completion of Land Acquisition", addressed to Martin McHugh, Director of Division of Fish and Wildlife from Jeffrey J. Pantazes, Manager, PSEG Services Corporation, dated March 14, 2005.
14. Letter titled, "Notice of Administrative Completeness", from NJDEP to Thomas Joyce, Salem Site Vice President, PSEG Nuclear, LLC, dated February 2, 2006.
15. Letter titled, "Work Plan Approval for Biological Monitoring Program", addressed to Kenneth A. Strait of PSEG Services Corporation from David Chanda, Acting Director of Division of Fish and Wildlife, dated March 30, 2006.
16. Letter titled, "PSEG Nuclear LLC, Salem Generating Station, Lower Alloways Creek, Salem County, NJPDES Permit No. NJ0005622", to Maya van Rossum, Executive Director, Delaware Riverkeeper Network from Susan Rosenwinkel, Bureau of Point Source Permitting, Region 2, NJDEP, dated May 2, 2006.
17. Letter titled, "PSEG Nuclear LLC, Salem Generating Station, Lower Alloways Creek, Salem County, NJPDES Permit No. NJ0005622", to Jane Nogaki, New Jersey Environmental Federation, from Susan Rosenwinkel, Bureau of Point Source Permitting, Region 2, NJDEP, dated May 2, 2006.
18. Letter titled, "PSEG Nuclear LLC, Salem Generating Station, Lower Alloways Creek, Salem County, NJPDES Permit No. NJ0005622", to Norm Cohen, Coalition for Peace and Justice-Unplug Salem Campaign, from Susan Rosenwinkel, Bureau of Point Source Permitting, Region 2, NJDEP, dated May 2, 2006.
19. Letter titled, "Circulating Water Intake Screen Pilot Testing, Change to Multi-disc ™ Rotary Screen Panels", addressed to Pilar Patterson, Chief, Bureau of Point Source Permitting, NJDEP from Jeffrey J. Pantazes, Manager, PSEG Services Corporation, dated April 26, 2007.
20. Letter titled, "Comments on Cooling Water Intake Structures at Existing Facilities and Phase I Facilities", from Pilar Patterson, Chief, Bureau of Surface Water Permitting, NJDEP to EPA, Docket No. EPA-HQ-OW-2008-0667-2153, dated August 17, 2011.
21. Letter titled, "Comments on Notice of Data Availability Related to Impingement Mortality Control", from Pilar Patterson, Chief, Bureau of Surface Water Permitting, NJDEP to EPA, Docket No. EPA-HQ-OW-2008-0667-2969, dated July 11, 2012.
22. Letter from Appellants to NJDEP Commissioner Bob Martin concerning Salem NJPDES Renewal Permit Application, dated May 16, 2013.
23. Letter from NJDEP to Appellants Concerning Status of NJPDES Permit Renewal Application for Salem Generating Station, dated March 14, 2014.
24. E-mail dated April 3, 2015 to Heather Genievich of the Bureau of Surface Water Permitting from Steve Mars, Senior Biologist of the US Fish and Wildlife Service regarding federal threatened and endangered species.

<u>Permits / Applications</u>:

1. NJPDES/DSW Permit Application dated January 31, 2006
2. NJPDES/DSW Permit NJ0005622, issued June 29, 2001 and effective August 1, 2001.
3. NJPDES/DSW Permit NJ0005622, issued July 20, 1994 and effective September 1, 1994.
4. DRBC Docket No. D-68-20 CP (Revision 2), dated September 18, 2001.

Meetings / Site Visits:

1. Site Visit on July 31, 2014

Other:

1. Settlement Agreement with the Delaware Riverkeeper Network, The Delaware Riverkeeper, Sierra Club and Clean Water Action, Docket No. A-1908-13, dated November 3, 2014.

Footnotes:

[A] Denotes items that may be found on the New Jersey Department of Environmental Protection (NJDEP) website located at "http://www.state.nj.us/dep/".

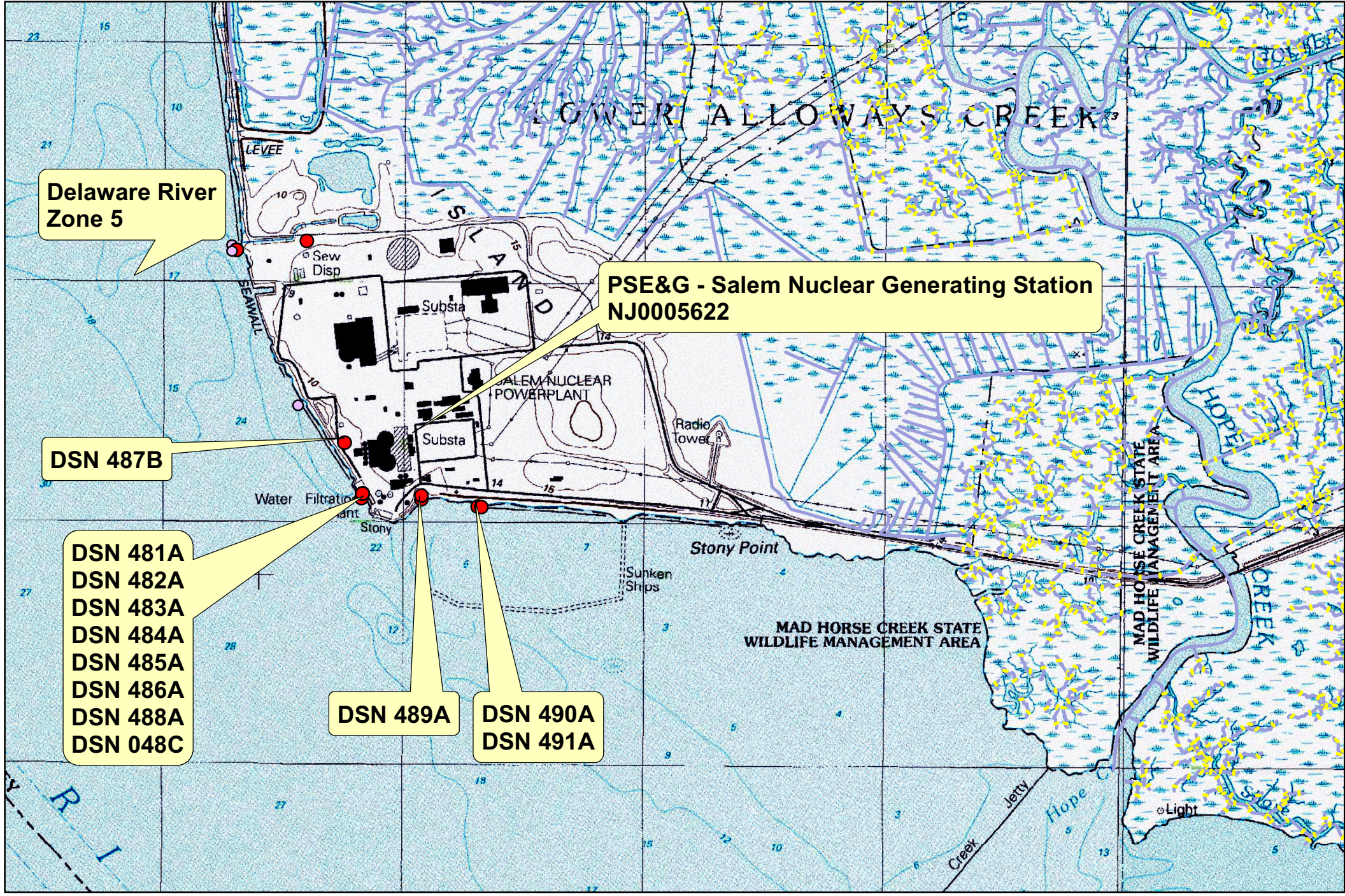
[B] Denotes items that may be found on the United States Environmental Protection Agency (EPA) website at "http://www.epa.gov/".

18 Listing of Acronyms

The following is a list of acronyms used throughout this Fact Sheet:

Acronym	Meaning
ΔT	Temperature Change
$\Delta T_{condenser}$	Temperature Change in Condenser
ACW	Alloway Creek Watershed
AIF	Actual Intake Flow
ATM	Ambient Temperature Model
BIC	Balanced Indigenous Community
BIP	Balanced Indigenous Population
BMWP	Biological Monitoring Work Plan
BPJ	Best Professional Judgment
BTA	Best Technology Available
BTU	British Thermal Unit
CDS	Comprehensive Demonstration Study
CFR	Code of Federal Regulation
CMR	Conditional Mortality Rate
CWA	Clean Water Act
CWIS	Cooling Water Intake Structure
CWS	Cooling Water System
DDP	Detrital Discharge Pipe
DMR	Discharge Monitoring Report
DNREC	Delaware Natural Resource Environmental Commission
DRBC	Delaware River Basin Commission
DSN	Discharge Serial Number
EEP	Estuary Enhancement Program
EEPAC	Estuary Enhancement Program Advisory Committee
ELG	Effluent Limitation Guidelines
EPA	United States Environmental Protection Agency
FFM	Far-Field Model
fpm	Feet Per Minute
Ft/Sec	Feet Per Second
gdw/m^2	Grams Dry Weight Per Meters Squared
GPM	Gallons Per Minute
HDA	Heat Dissipation Area
HUC	Hydrologic Unit Code
HVAC	Heating, Ventilating and Air Conditioning
IBMWP	Improved Biological Monitoring Work Plan
IM	Impingement Mortality
kHz	Kilohertz
m^3	Meters cubed
MAC	Monitoring Advisory Committee
mg/L	milligrams per liter
MGD	Millions of Gallons Per Day

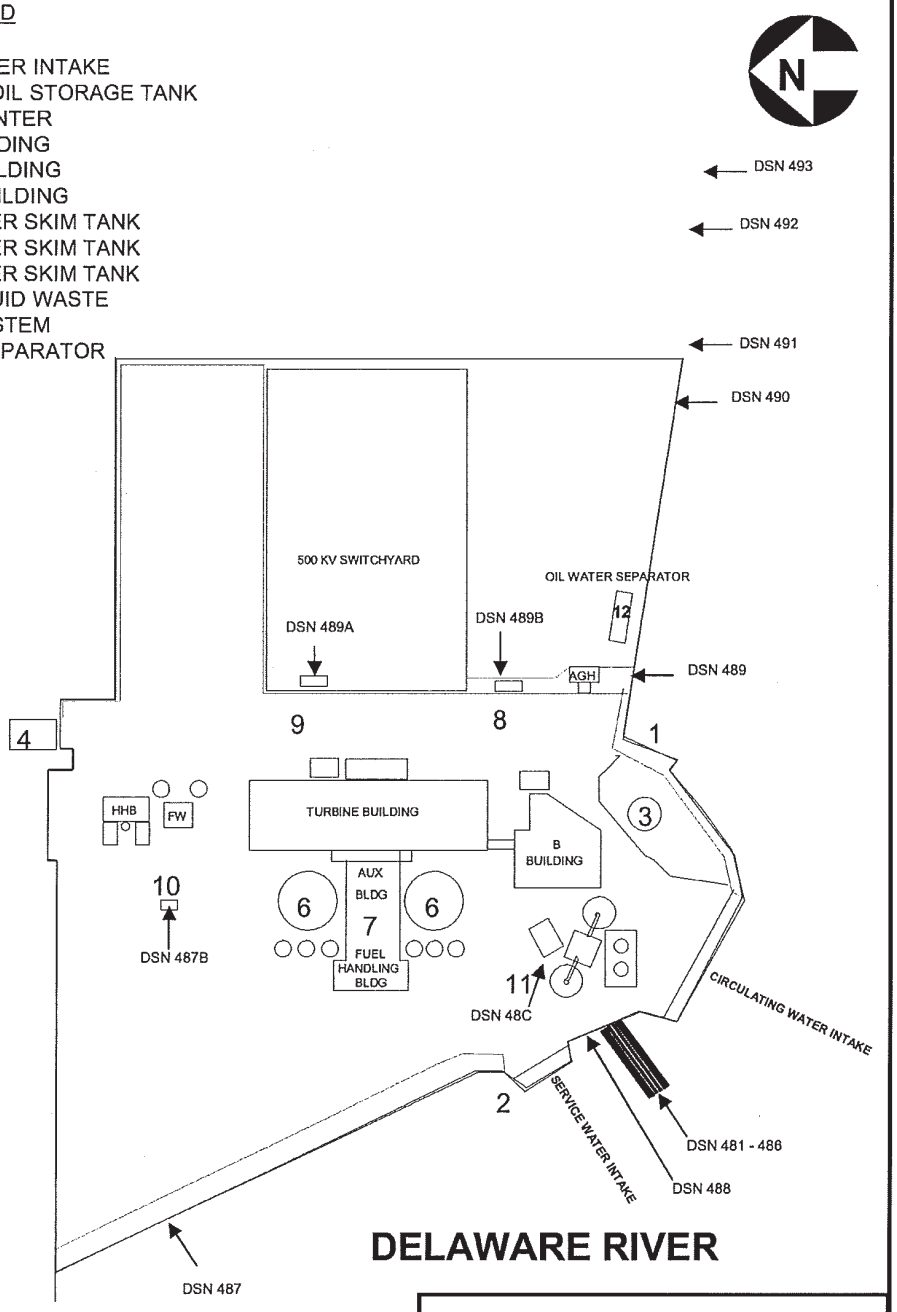
mm	Millimeter
MPAC	Management Plan Advisory Committee
MR	Monitor and Report
MSHIPT	Multi-Sensory Hybrid Intake Protection Technology
MSX	Multinucleated Sphere X
MWe	Megawatts Electric
NFM	Near-Field Model
NJDEP	New Jersey Department of Environmental Protection
N.J.A.C	New Jersey Administrative Code
NJPDES	New Jersey Pollutant Discharge Elimination System
NJFW	New Jersey Division of Fish and Wildlife
N.J.S.A.	New Jersey Statutes Annotated
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPV	Net Present V alue
NRLWDS	Non- Radioactive Liquid Waste Disposal System
OMB	Office of Management and Budget
PCBs	Polychlorinated Biphenyls
PI #	Program Interest Number
PJM	Pennsylvania, New Jersey, Maryland Interconnection, L.L.C.
PMPs	Pollutant Minimization Plans
POS	Plan of Study
psi	Pounds Per Square Inch
RIS	Representative Important Species
rkm	River Kilometer
SAV	Submerged Aquatic Vegetation
R.M.	River Mile
SIC	Standard Industrial Classification
SPL	Sound Pressure Level
s.u.	Standard Units
SWQS	Surface Water Quality Standards
SWS	Service Water System
TIOP	Technology Installation and Operation Plan
TMDL	Total Maximum Daily Load
TRIR	Toxicity Reduction Implementation Requirements
TSD	Technical Support Document
µg/L	micrograms per liter
U.S.C.	United States Code
USNRC	United States Nuclear Regulatory Commission
WCR	Waste Characterization Report
WET	Whole Effluent Toxicity
WTP	Willingness-To-Pay
WQBELs	Water Quality Based Effluent Limitations
ZIM	Zone of Initial Mixing



USGS Topographical Map
PSE&G - Salem Generating Station
Lower Alloway Creek Twp., Salem County

LEGEND

1. BARGE SLIP
2. SERVICE WATER INTAKE
3. SALEM FUEL OIL STORAGE TANK
4. SECURITY CENTER
5. TURBINE BUILDING
6. REACTOR BUILDING
7. AUXILIARY BUILDING
8. No.1 OIL/WATER SKIM TANK
9. No.2 OIL/WATER SKIM TANK
10. No.3 OIL/WATER SKIM TANK
11. NON-RAD LIQUID WASTE DISPOSAL SYSTEM
12. OIL WATER SEPARATOR



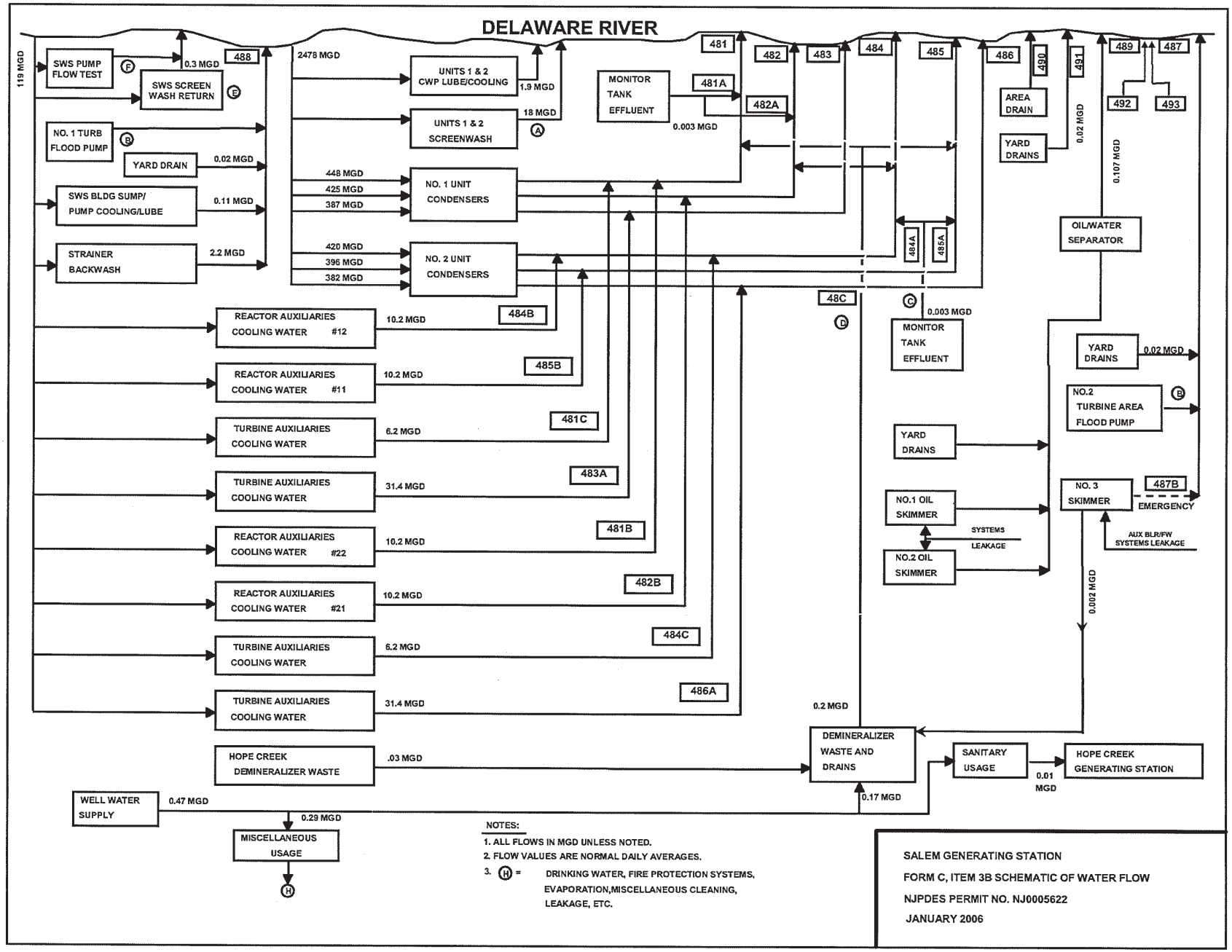
SECURITY FENCE

SALEM GENERATING STATION
NJPDES PERMIT No. NJ0005622

SITE LOCATION MAP SHOWING
INTAKE AND DISCHARGE POINTS

FORM C, ITEM 3A

JANUARY 2006


DELAWARE RIVER
119 MGD
SWS PUMP FLOW TEST
F
0.3 MGD
488
SWS SCREEN WASH RETURN
E
NO. 1 TURB FLOOD PUMP
B
YARD DRAIN
0.02 MGD
SWS BLDG SUMP/ PUMP COOLING/LUBE
0.11 MGD
STRAINER BACKWASH
2.2 MGD
2478 MGD
UNITS 1 & 2 CWP LUBE/COOLING
1.9 MGD
UNITS 1 & 2 SCREENWASH
18 MGD
A
448 MGD
425 MGD
387 MGD
NO. 1 UNIT CONDENSERS
420 MGD
396 MGD
382 MGD
NO. 2 UNIT CONDENSERS
MONITOR TANK EFFLUENT
0.003 MGD
481
481A
482
482A
483
484
485
484A
485A
486
AREA DRAIN
YARD DRAINS
0.02 MGD
490
491
489
487
492
493
0.107 MGD
OIL/WATER SEPARATOR
48C
C
D
0.003 MGD
MONITOR TANK EFFLUENT
YARD DRAINS
0.02 MGD
NO.2 TURBINE AREA FLOOD PUMP
B
YARD DRAINS
NO. 3 SKIMMER
487B
EMERGENCY
AUX BLR/FW SYSTEMS LEAKAGE
NO.1 OIL SKIMMER
SYSTEMS LEAKAGE
NO.2 OIL SKIMMER
0.002 MGD
REACTOR AUXILIARIES COOLING WATER #12
10.2 MGD
484B
REACTOR AUXILIARIES COOLING WATER #11
10.2 MGD
485B
TURBINE AUXILIARIES COOLING WATER
6.2 MGD
481C
TURBINE AUXILIARIES COOLING WATER
31.4 MGD
483A
REACTOR AUXILIARIES COOLING WATER #22
10.2 MGD
481B
REACTOR AUXILIARIES COOLING WATER #21
10.2 MGD
482B
TURBINE AUXILIARIES COOLING WATER
6.2 MGD
484C
TURBINE AUXILIARIES COOLING WATER
31.4 MGD
486A
0.2 MGD
HOPE CREEK DEMINERALIZER WASTE
.03 MGD
DEMINERALIZER WASTE AND DRAINS
SANITARY USAGE
0.01 MGD
HOPE CREEK GENERATING STATION
0.17 MGD
WELL WATER SUPPLY
0.47 MGD
0.29 MGD
MISCELLANEOUS USAGE
H
NOTES:
1. ALL FLOWS IN MGD UNLESS NOTED.
2. FLOW VALUES ARE NORMAL DAILY AVERAGES.
3. H = DRINKING WATER, FIRE PROTECTION SYSTEMS, EVAPORATION,MISCELLANEOUS CLEANING, LEAKAGE, ETC.
SALEM GENERATING STATION
FORM C, ITEM 3B SCHEMATIC OF WATER FLOW
NJPDES PERMIT NO. NJ0005622
JANUARY 2006

NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

The New Jersey Department of Environmental Protection hereby grants you a NJPDES permit for the facility/activity named in this document. This permit is the regulatory mechanism used by the Department to help ensure your discharge will not harm the environment. By complying with the terms and conditions specified, you are assuming an important role in protecting New Jersey's valuable water resources. Your acceptance of this permit is an agreement to conform with all of its provisions when constructing, installing, modifying, or operating any facility for the collection, treatment, or discharge of pollutants to waters of the state. If you have any questions about this document, please feel free to contact the Department representative listed in the permit cover letter. Your cooperation in helping us protect and safeguard our state's environment is appreciated.

Permit Number: NJ0005622

Draft: Surface Water Renewal Permit Action

Permittee:
PSEG Nuclear, LLC
P.O. Box 236
Hancocks Bridge, NJ 08038

Co-Permittee:

Property Owner:
PSEG Nuclear, LLC
P.O. Box 236
Hancocks Bridge, NJ 08038

Location Of Activity:
PSEG Nuclear LLC Salem Generating Station
Alloway Creek Neck Rd
Lower Alloways Creek Township, Salem County

Authorization Covered Under This Approval	Issuance Date	Effective Date	Expiration Date
B -Industrial Wastewater	PENDING	PENDING	PENDING

By Authority of:
Commissioner's Office

DEP AUTHORIZATION
Pilar Patterson, Chief
Bureau of Surface Water Permitting
Division of Water Quality

(Terms, conditions and provisions attached hereto)

PART I
GENERAL REQUIREMENTS:
NJPDES

A. General Requirements of all NJPDES Permits

1. Requirements Incorporated by Reference

a. The permittee shall comply with all conditions set forth in this permit and with all the applicable requirements incorporated into this permit by reference. The permittee is required to comply with the regulations, including those cited in paragraphs b. through e. following, which are in effect as of the effective date of the final permit.

b. General Conditions

Penalties for Violations	N.J.A.C. 7:14-8.1 et seq.
Incorporation by Reference	N.J.A.C. 7:14A-2.3
Toxic Pollutants	N.J.A.C. 7:14A-6.2(a)4i
Duty to Comply	N.J.A.C. 7:14A-6.2(a)1 & 4
Duty to Mitigate	N.J.A.C. 7:14A-6.2(a)5 & 11
Inspection and Entry	N.J.A.C. 7:14A-2.11(e)
Enforcement Action	N.J.A.C. 7:14A-2.9
Duty to Reapply	N.J.A.C. 7:14A-4.2(e)3
Signatory Requirements for Applications and Reports	N.J.A.C. 7:14A-4.9
Effect of Permit/Other Laws	N.J.A.C. 7:14A-6.2(a)6 & 7 & 2.9(c)
Severability	N.J.A.C. 7:14A-2.2
Administrative Continuation of Permits	N.J.A.C. 7:14A-2.8
Permit Actions	N.J.A.C. 7:14A-2.7(c)
Reopener Clause	N.J.A.C. 7:14A-6.2(a)10
Permit Duration and Renewal	N.J.A.C. 7:14A-2.7(a) & (b)
Consolidation of Permit Process	N.J.A.C. 7:14A-15.5
Confidentiality	N.J.A.C. 7:14A-18.2 & 2.11(g)
Fee Schedule	N.J.A.C. 7:14A-3.1
Treatment Works Approval	N.J.A.C. 7:14A-22 & 23

c. Operation And Maintenance

Need to Halt or Reduce not a Defense	N.J.A.C. 7:14A-2.9(b)
Proper Operation and Maintenance	N.J.A.C. 7:14A-6.12

d. Monitoring And Records

Monitoring	N.J.A.C. 7:14A-6.5
Recordkeeping	N.J.A.C. 7:14A-6.6
Signatory Requirements for Monitoring Reports	N.J.A.C. 7:14A-6.9

e. Reporting Requirements

Planned Changes	N.J.A.C. 7:14A-6.7
Reporting of Monitoring Results	N.J.A.C. 7:14A-6.8
Noncompliance Reporting	N.J.A.C. 7:14A-6.10 & 6.8(h)
Hotline/Two Hour & Twenty-four Hour Reporting	N.J.A.C. 7:14A-6.10(c) & (d)
Written Reporting	N.J.A.C. 7:14A-6.10(e) &(f) & 6.8(h)
Duty to Provide Information	N.J.A.C. 7:14A-2.11, 6.2(a)14 & 18.1
Schedules of Compliance	N.J.A.C. 7:14A-6.4
Transfer	N.J.A.C. 7:14A-6.2(a)8 & 16.2

PART II

GENERAL REQUIREMENTS: DISCHARGE CATEGORIES

A. Additional Requirements Incorporated By Reference

1. Requirements for Discharges to Surface Waters

a. In addition to conditions in Part I of this permit, the conditions in this section are applicable to activities at the permitted location and are incorporated by reference. The permittee is required to comply with the regulations which are in effect as of the effective date of the final permit.

i. Surface Water Quality Standards N.J.A.C. 7:9B-1

ii. Water Quality Management Planning Regulations N.J.A.C. 7:15

B. General Conditions

1. Scope

a. The issuance of this permit shall not be considered as a waiver of any applicable federal, state, and local rules, regulations and ordinances.

2. Permit Renewal Requirement

a. Permit conditions remain in effect and enforceable until and unless the permit is modified, renewed or revoked by the Department.

b. Submit a complete permit renewal application: 180 days before the Expiration Date.

3. Notification of Non-Compliance

a. The permittee shall notify the Department of all non-compliance when required in accordance with N.J.A.C. 7:14A-6.10 by contacting the DEP HOTLINE at 1-877-WARNDEP (1-877-927-6337).

b. The permittee shall submit a written report as required by N.J.A.C. 7:14A-6.10 within five days.

4. Notification of Changes

a. The permittee shall give written notification to the Department of any planned physical or operational alterations or additions to the permitted facility when the alteration is expected to result in a significant change in the permittee's discharge and/or residuals use or disposal practices including the cessation of discharge in accordance with N.J.A.C. 7:14A-6.7.

b. Prior to any change in ownership, the current permittee shall comply with the requirements of N.J.A.C. 7:14A-16.2, pertaining to the notification of change in ownership.

5. Access to Information

a. The permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to enter upon a person's premises, for purposes of inspection, and to access / copy any records that must be kept under the conditions of this permit.

6. Operator Certification

a. Pursuant to N.J.A.C. 7:10A-1.1 et seq. every wastewater system not exempt pursuant to N.J.A.C. 7:10A-1.1(b) requires a licensed operator. The operator of a system shall meet the Department's requirements pursuant to N.J.A.C. 7:10A-1.1 and any amendments. The name of the proposed operator, where required shall be submitted to the Department at the address below, in order that his/her qualifications may be determined prior to initiating operation of the treatment works.

i. Notifications shall be submitted to:
NJDEP
Examination and Licensing Unit
P.O. Box 417
Trenton, New Jersey 08625
(609)777-1012.

b. The permittee shall notify the Department of any changes in licensed operator within two weeks of the change.

7. Operation Restrictions

a. The operation of a waste treatment or disposal facility shall at no time create: (a) a discharge, except as authorized by the Department in the manner and location specified in Part III of this permit; (b) any discharge to the waters of the state or any standing or ponded condtion for water or waste, except as specifically authorized by a valid NJPDES permit.

8. Residuals Management

a. The permittee shall comply with land-based sludge management criteria and shall conform with the requirements for the management of residuals and grit and screenings under N.J.A.C. 7:14A-6.15(a), which includes:

i. Standards for the Use or Disposal of Residual, N.J.A.C. 7:14A-20;

ii. Section 405 of the Federal Act governing the disposal of sludge from treatment works treating domestic sewage;

iii. The Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq., and the Solid Waste Management Rules, N.J.A.C. 7:26;

iv. The Sludge Quality Assurance Regulations, N.J.A.C. 7:14C;

v. The Statewide Sludge Management Plan promulgated pursuant to the Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq., and the Solid Waste Management Act, N.J.S.A. 13:1E-1 et seq.; and

vi. The provisions concerning disposal of sewage sludge and septage in sanitary landfills set forth at N.J.S.A. 13:1E-42 and the Statewide Sludge Management Plan.

vii. Residual that is disposed in a municipal solid waste landfill unit shall meet the requirements in 40 CFR Part 258 and/or N.J.A.C. 7:26 concerning the quality of residual disposed in a municipal solid waste landfill unit. (That is, passes the Toxicity Characteristic Leaching Procedure and does not contain "free liquids" as defined at N.J.A.C. 7:14A-1.2.)

b. If any applicable standard for residual use or disposal is promulgated under section 405(d)of the Federal Act and Sections 4 and 6 of the State Act and that standard is more stringent than any limitation on the pollutant or practice in the permit, the Department may modify or revoke and reissue the permit to conform to the standard for residual use or disposal.

c. The permittee shall make provisions for storage, or some other approved alternative management strategy, for anticipated downtimes at a primary residual management alternative. The permittee shall not be permitted to store residual beyond the capacity of the structural treatment and storage components of the treatment works. N.J.A.C. 7:14A-20.8(a) and N.J.A.C. 7:26 provide for the temporary storage of residuals for periods not exceeding six months, provided such storage does not cause pollutants to enter surface or ground waters of the State. The storage of residual for more than six months is not authorized under this permit. However, this prohibition does not apply to residual that remains on the land for longer than six months when the person who prepares the residual demonstrates that the land on which the residual remains is not a surface disposal site or landfill. The demonstration shall explain why residual must remain on the land for longer than six months prior to final use or disposal, discuss the approximate time period during which the residual shall be used or disposed and provide documentation of ultimate residual management arrangements. Said demonstration shall be in writing, be kept on file by the person who prepares residual, and submitted to the Department upon request.

d. The permittee shall comply with the appropriate adopted District Solid Waste or Sludge Management Plan (which by definition in N.J.A.C. 7:14A-1.2 includes Generator Sludge Management Plans), unless otherwise specifically exempted by the Department.

e. The preparer must notify and provide information necessary to comply with the N.J.A.C. 7:14A-20 land application requirements to the person who applies bulk residual to the land. This shall include, but not be limited to, the applicable recordkeeping requirements and certification statements of 40 CFR 503.17 as referenced at N.J.A.C 7:14A-20.7(j).

f. The preparer who provides residual to another person who further prepares the residual for application to the land must provide this person with notification and information necessary to comply with the N.J.A.C. 7:14A-20 land application requirements.

g. Any person who prepares bulk residual in New Jersey that is applied to land in a State other than New Jersey shall comply with the requirement at N.J.A.C. 7:14A-20.7(b)1.ix to submit to the Department written proof of compliance with or satisfaction of all applicable statutes, regulations, and guidelines of the state in which land application will occur.

PART III
LIMITS AND MONITORING REQUIREMENTS

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
048C SW Outfall 48C	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples obtained for this internal monitoring point shall be collected after all treatment has been performed but prior to mixing with any circulating water system effluent. The permittee has the ability to route the discharge from 48C to DSN's 481, 482, 484 and/or 485.

Contributing Waste Types

Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - A - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
Solids, Total Suspended	Effluent Gross Value	*****	*****	*****	*****	30 Monthly Average	100 Daily Maximum	MG/L	2/Month	Composite
January thru December	QL	***	***		***	***	***			
Nitrogen, Ammonia Total (as N)	Effluent Gross Value	*****	*****	*****	*****	35 Monthly Average	70 Daily Maximum	MG/L	2/Month	Composite
January thru December	QL	***	***		***	***	***			
Petroleum Hydrocarbons	Effluent Gross Value	*****	*****	*****	*****	10 Monthly Average	15 Daily Maximum	MG/L	2/Month	Grab
January thru December	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - A - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Carbon, Tot Organic (TOC)	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	50 Daily Maximum	MG/L	2/Month	Composite
January thru December	QL	***	***		***	***	***			

Surface Water WCR - Semi Annual Reporting Requirements:

Submit a Semi-Annual WCR: within twenty-five days after the end of every 6 month monitoring period beginning from the effective date of the permit (EDP).

Table III - A - 2: Surface Water WCR - Semi Annual Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Compliance Quantity	Units	Sample Type	Monitoring Period
Sulfate, Total (as SO4)	Effluent Gross Value	REPORT	UG/L	Grab	January thru December
Boron, Total (as B)	Effluent Gross Value	REPORT	UG/L	Grab	January thru December
Dichlorobromomethane	Effluent Gross Value	REPORT	UG/L	Grab	January thru December
Bromoform	Effluent Gross Value	REPORT	UG/L	Grab	January thru December

Surface Water WCR - Semi Annual Reporting Requirements:

Submit a Semi-Annual WCR: within twenty-five days after the end of every 6 month monitoring period beginning from the effective date of the permit (EDP).

Table III - A - 2: Surface Water WCR - Semi Annual Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Compliance Quantity	Units	Sample Type	Monitoring Period
Chloroform	Effluent Gross Value	REPORT	UG/L	Grab	January thru December
Acrylonitrile	Effluent Gross Value	REPORT	UG/L	Grab	January thru December
Chlorodibromomethane	Effluent Gross Value	REPORT	UG/L	Grab	January thru December

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
481A SW Outfall 481A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO.

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - B - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
LC50 Statre 96hr Acu Cyprinodon	Effluent Gross Value	*****	*****	*****	REPORT Daily Minimum	*****	*****	%EFFL	2/Year	Composite
January thru December	AL	***	***		50	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - B - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
482A SW Outfall 482A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO.

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - C - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
LC50 Statre 96hr Acu Cyprinodon	Effluent Gross Value	*****	*****	*****	REPORT Daily Minimum	*****	*****	%EFFL	2/Year	Composite
January thru December	AL	***	***		50	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - C - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
483A SW Outfall 483A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO.

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - D - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - D - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
484A SW Outfall 484A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO..

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - E - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
LC50 Statre 96hr Acu Cyprinodon	Effluent Gross Value	*****	*****	*****	REPORT Daily Minimum	*****	*****	%EFFL	2/Year	Composite
January thru December	AL	***	***		50	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - E - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
485A SW Outfall 485A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO.

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - F - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
LC50 Statre 96hr Acu Cyprinodon	Effluent Gross Value	*****	*****	*****	REPORT Daily Minimum	*****	*****	%EFFL	2/Year	Composite
January thru December	AL	***	***		50	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

The permittee is required to perform acute toxicity testing on a minimum of one representative CWS outfall while DSN 48C is being routed to that outfall.

Table III - F - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
486A SW Outfall 486A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained at the discharge "standpipe" which is a point after combination of the two circulators and introduction of all other wastewater components. Unless service water system is being discharged, the effluent limits of 0.2 mg/L (daily max.) and "monitor only" (monthly average) apply for CPO.

Contributing Waste Types

Non-contact Cooling Water, Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

Intake flow reporting for "Raw/Sew/Influent" for DSN 486 refers to the service water intake.

Table III - G - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Raw Sew/influent	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			
pH	Intake From Stream	*****	*****	*****	REPORT Daily Minimum	*****	REPORT Daily Maximum	SU	1/Week	Grab
January thru December	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Comments:

Intake flow reporting for "Raw/Sew/Influent" for DSN 486 refers to the service water intake.

Table III - G - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Chlorine Produced Oxidants Option 1	Effluent Gross Value	*****	*****	*****	*****	0.3 Monthly Average	0.5 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Chlorine Produced Oxidants Option 2	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	0.2 Daily Maximum	MG/L	3/Week	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	1/Day	Continuous
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
487B SW Outfall 487B	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples shall be obtained from the discharge monitoroing point of the #3 Skim Tank. DSN 487B discharges to Zone 5 of the Delaware River

Contributing Waste Types

Process Water, Storm Water Runoff

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - H - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Batch	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Batch	Grab
January thru December	QL	***	***		***	***	***			
Solids, Total Suspended	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	100 Daily Maximum	MG/L	1/Batch	Grab
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	43.3 Daily Maximum	DEG.C	1/Batch	Grab
January thru December	QL	***	***		***	***	***			
Petroleum Hydrocarbons	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	15 Daily Maximum	MG/L	1/Batch	Grab
January thru December	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - H - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Carbon, Tot Organic (TOC)	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	50 Daily Maximum	MG/L	1/Batch	Grab
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
489A SW Outfall 489A	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples for DSN 489 shall be obtained at the terminus of the oil/water separator. DSN 489 discharges to Zone 5 of the Delaware River.

Contributing Waste Types

Storm Water Runoff

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - I - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Effluent Gross Value	REPORT Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Month	Calculated
January thru December	QL	***	***		***	***	***			
pH	Effluent Gross Value	*****	*****	*****	6.0 Daily Minimum	*****	9.0 Daily Maximum	SU	1/Month	Grab
January thru December	QL	***	***		***	***	***			
Solids, Total Suspended	Effluent Gross Value	*****	*****	*****	100 Daily Maximum	30 Monthly Average	*****	MG/L	1/Month	Grab
January thru December	QL	***	***		***	***	***			
Petroleum Hydrocarbons	Effluent Gross Value	*****	*****	*****	*****	10 Monthly Average	15 Daily Maximum	MG/L	1/Month	Grab
January thru December	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - I - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Carbon, Tot Organic (TOC)	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	50 Daily Maximum	MG/L	1/Month	Grab
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
FACA SW Outfall FACA	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples collected at DSN's 481A, 482A and 483A shall be reported as a whole to represent the thermal discharge from Unit 1. DSN's 481A, 482A and 483A discharge to Zone 5 of the Delaware River.

Contributing Waste Types

Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - J - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Temperature, oC	Raw Sew/influent	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	Continuous	Continuous
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	*****	DEG.C	Continuous	Continuous
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	*****	46.1 Daily Maximum	DEG.C	Continuous	Continuous
June thru September	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	*****	43.3 Daily Maximum	DEG.C	Continuous	Continuous
October thru May	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - J - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Temperature, oC	Effluent Net Value	*****	*****	*****	*****	REPORT Monthly Average	15.3 Daily Maximum	DEG.C	1/Day	Calculated
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
FACB SW Outfall FACB	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples collected at DSN's 484A, 485A and 486A shall be reported as a whole to represent the thermal discharge from Unit 2. DSN's 484A, 485A and 486A discharge to Zone 5 of the Delaware River.

Contributing Waste Types

Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - K - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Temperature, oC	Raw Sew/influent	*****	*****	*****	*****	REPORT Monthly Average	REPORT Daily Maximum	DEG.C	Continuous	Continuous
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	REPORT Monthly Average	*****	DEG.C	Continuous	Continuous
January thru December	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	*****	46.1 Daily Maximum	DEG.C	Continuous	Continuous
June thru September	QL	***	***		***	***	***			
Temperature, oC	Effluent Gross Value	*****	*****	*****	*****	*****	43.3 Daily Maximum	DEG.C	Continuous	Continuous
October thru May	QL	***	***		***	***	***			

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - K - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Temperature, oC	Effluent Net Value	*****	*****	*****	*****	REPORT Monthly Average	15.3 Daily Maximum	DEG.C	1/Day	Calculated
January thru December	QL	***	***		***	***	***			

MONITORED LOCATION:	RECEIVING STREAM:	STREAM CLASSIFICATION:	DISCHARGE CATEGORY(IES):
FACC SW Outfall FACC	Delaware River	Mainstem Delaware-Zone 5	B - Industrial Wastewater

Location Description

Samples collected at DSN's 481-486 shall be reported as a whole to represent the thermal discharge and circulating water system intake flow from the facility as a whole. DSN's 481-486 discharge to Zone 5 of the Delaware River.

Contributing Waste Types

Process Water

Surface Water DMR Reporting Requirements:

Submit a Monthly DMR: within twenty-five days after the end of every month beginning from the effective date of the permit (EDP).

Table III - L - 1: Surface Water DMR Limits and Monitoring Requirements

PHASE: Final **PHASE Start Date:** **PHASE End Date:**

Parameter	Sample Point	Limit	Limit	Units	Limit	Limit	Limit	Units	Frequency	Sample Type
Flow, In Conduit or Thru Treatment Plant	Raw Sew/influent	3024 Monthly Average	REPORT Daily Maximum	MGD	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			
Thermal Discharge Million BTUs per Hr	Effluent Net Value	REPORT Monthly Average	30600 Daily Maximum	MBTU/HR	*****	*****	*****	*****	1/Day	Calculated
January thru December	QL	***	***		***	***	***			

PART IV

SPECIFIC REQUIREMENTS: NARRATIVE

Notes and Definitions

A. Footnotes

B. Definitions

Industrial Wastewater

A. MONITORING REQUIREMENTS

1. Standard Monitoring Requirements

a. Each analysis required by this permit shall be performed by a New Jersey Certified Laboratory that is certified to perform that analysis.

b. The permittee shall perform all water/wastewater analyses in accordance with the analytical test procedures specified in 40 CFR 136 unless other test procedures have been approved by the Department in writing or as otherwise specified in the permit.

c. When more than one test procedure is approved for the analysis of a pollutant or pollutant parameter, the test procedure must be sufficiently sensitive as defined at 40 CFR 136, 122.21(e)(3), and 122.44(i)(1)(iv).

d. All sampling shall be conducted in accordance with the Department's Field Sampling Procedures Manual, or an alternate method approved by the Department in writing.

e. All monitoring shall be conducted as specified in Part III.

f. All sample frequencies expressed in Part III are minimum requirements. Any additional samples taken consistent with the monitoring and reporting requirements contained herein shall be reported on the Monitoring Report Forms.

g. Annual and semi-annual wastewater testing shall be conducted in a different quarter of each year so that tests are conducted in each of the four permit quarters of the permit cycle. Testing may be conducted during any month of the permit quarters.

h. The permittee shall comply with 40 CFR 423 regarding the discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

B. RECORDKEEPING

1. Standard Recordkeeping Requirements

a. The permittee shall retain records of all monitoring information, including 1) all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation (if applicable), 2) copies of all reports required by this NJPDES permit, 3) all data used to complete the application for a NJPDES permit, and 4) monitoring information required by the permit related to the permittee's residual use and/or disposal practices, for a period of at least 5 years, or longer as required by N.J.A.C. 7:14A-20, from the date of the sample, measurement, report, application or record.

b. Records of monitoring information shall include 1) the date, locations, and time of sampling or measurements, 2) the individual(s) who performed the sampling or measurements, 3) the date(s) the 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.

C. REPORTING

1. Standard Reporting Requirements

Industrial Wastewater

a. The permittee shall submit all required monitoring results to the Department on the forms provided to them. The Monitoring Report Forms (MRFs) may be provided to the permittee in either a paper format or in an electronic file format. Unless otherwise noted, all requirements below pertain to both paper and electronic formats.

b. Any MRFs in paper format shall be submitted to the following addresses:

   i. NJDEP
   Mail Code 401-02B
   Division of Water Quality
   Office of Permit Management
   P.O. Box 420
   Trenton, New Jersey 08625-0420.

   ii. Delaware River Basin Commission (DRBC)
   P. O. Box 7360
   West Trenton, New Jersey 08628

   iii. (if requested by the Water Compliance and Enforcement Bureau)
   NJDEP: Southern Bureau of Water Compliance and Enforcement
   One Port Center
   2 Riverside Drive, Suite 201
   Camden, New Jersey 08103

c. Any electronic data submission shall be in accordance with the guidelines and provisions outlined in the Department's Electronic Data Interchange (EDI) agreement with the permittee. Paper copies must be available for on-site inspection by DEP personnel or provided to the DEP upon written request.

d. All monitoring report forms shall be certified by the highest ranking official having day-to-day managerial and operational responsibilities for the discharging facility.

e. The highest ranking official may delegate responsibility to certify the monitoring report forms in his or her absence. Authorizations for other individuals to sign shall be made in accordance with N.J.A.C. 7:14A-4.9(b).

f. Monitoring results shall be submitted in accordance with the current Discharge Monitoring Report Manual and any updates thereof.

g. If monitoring for a parameter is not required in a monitoring period, the permittee must report "CODE=N" for that parameter.

h. For intermittent discharges, the permittee shall obtain a sample during at least one of the discharge events occurring during a monitoring period.

i. If there are no discharge events during an entire monitoring period, the permittee must notify the Department when submitting the monitoring results. This is accomplished by placing a check mark in the "No Discharge this monitoring period" box on the paper or electronic version of the monitoring report submittal form.

D. SUBMITTALS

1. Standard Submittal Requirements

a. The permittee shall amend the Operation & Maintenance Manual whenever there is a change in the treatment works design, construction, operations or maintenance which substantially changes the treatment works operations and maintenance procedures.

2. Delaware River Basin PCB Requirements

a. On December 15, 2003, the U.S. EPA, Regions 2 and 3, adopted a Total Maximum Daily Load (TMDL) for PCBs for Zones 2, 3, 4, and 5 of the tidal Delaware River. On December 15, 2006, the U.S. EPA, Regions 2 and 3, adopted a Total Maximum Daily Load (TMDL) for PCBs for Zone 6 (Delaware Bay). The TMDLs require the facilities identified as discharging PCBs to these zones of the Delaware River or to the tidal portions of tributaries to these zones to conduct monitoring for 209 PCB congeners, and prepare and implement a PCB Pollutant Minimization Plan (PMP).

b. Subsequent monitoring required by DRBC in 2005 confirmed the presence of PCBs, and indicates that this facility does not contribute to 99% of the cumulative loadings from all point sources. Therefore, the permittee shall collect one 24-hour composite or a grab (as determined by DRBC Sampling protocol) sample annually during a wet weather flow and one 24-hour composite sample annually during a dry weather flow at DSN 489. In addition, one dry weather samples shall be collected annually at DSN 48C.

c. All sample analyses shall be performed using EPA Method 1668A, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment, and Tissue by HRGC/HRMS. EPA-821-R-00-002, December 1999 as supplemented or amended, and results for all 209 PCB congeners shall be reported. Project-specific, sample collection protocols, analytical procedures, and reporting requirements at http://www.state.nj.us/drbc/quality/toxics/pcbs/monitoring.html shall be followed. Monitoring information, sample data, and reports associated with PCB monitoring shall be submitted to the Department and DRBC in the form of two compact discs in the format referenced at http://www.nj.gov/drbc/library/documents/PCB-EDD011309.pdf.

d. In accordance with the U.S. EPA Regions 2 and 3 Total Maximum Daily Loads (TMDLs) for PCBs for Zones 2-5 of the Tidal Delaware River, the permittee submitted a Pollutant Minimization Plan (PMP) which was approved on April 25, 2006. The permittee shall continue to comply with the requirements of Section 4.30.9 of DRBC's Water Quality Regulations. Therefore, the permittee shall:.

   i. Continue to implement the PMP to achieve PCB loading reduction goals, and;

   ii. Submit an Annual Report on the yearly anniversary of the commencement of the PMP to DRBC and the Department consistent with the guidance specified at http://www.state.nj.us/drbc/programs/quality/pmp.html.

e. The PCB data shall be submitted to the DRBC only, The PMP (if needed) and PMP Annual Reports shall be submitted to the following:.

   i. Delaware River Basin Commission
   Modeling, Monitoring & Assessment Branch
   P.O. Box 7360
   West Trenton, NJ 08628

E. FACILITY MANAGEMENT

1. Discharge Requirements

a. The permittee shall discharge at the locations specified in PART III of this permit.

b. The permittee shall not discharge foam or cause foaming of the receiving water that: 1) Forms objectionable deposits on the receiving water, 2) Forms floating masses producing a nuisance, or 3) Interferes with a designated use of the waterbody.

c. The permittee's discharge shall not produce objectionable color or odor in the receiving stream.

d. The discharge shall not exhibit a visible sheen.

e. The Permittee is authorized to use the following corrosion inhibitors, biocides, or other cooling water additives:.

i. DSNs 481-486: Sodium hypochlorite may be used in the service water system, if needed, in excess of two hours per day to allow for continuous chlorination to control macroinvertebrate fouling.

ii. DSNs 481-486: Sodium hypochlorite may also be added to the circulating water system to control biofouling, upon prior notification to the Department. As part of this notification, the permittee shall provide the Department with a methodology for sodium hypochlorite addition. Upon approval by the Department, in writing, chlorine produced oxidants may not be discharged from DSNs 481-486 for more than two hours per day where chlorine produced oxidants shall be monitored three times per day at DSNs 481-486 during this two hour period. A daily maximum effluent limitation of 0.2 mg/L would apply during the chlorination of the main condensers where the permittee would be required to maintain a log noting the time and duration of chlorination of the main condensers.

iii. DSN 48C: The permittee is authorized to use the following additives in the steam plant and the non-radioactive liquid waste disposal system: ammonium hydroxide, hydrazine, ethanolamine, which are used for corrosion control in the plant steam systems; sodium hypochlorite, hydrogen peroxide, sodium hydroxide, and a coagulant aid, which are used in the non-radioactive liquid waste disposal treatment system; and sodium hydroxide and sulfuric acid, which are used to regulate demineralizers.

iv. DSN 487B: Ammonia and hydrazine are used for corrosion control in the auxiliary boiler blowdown.

v. All outfalls: If the permittee decided to begin using additional agents or replace the above agents in the future for any outfalls, the permittee must notify the Department at least 180 days prior to use so that the permit may be reopened, if necessary, to incorporate any additional limitations deemed necessary.

2. Applicability of Discharge Limitations and Effective Dates

a. Surface Water Discharge Monitoring Report (DMR) Form Requirements

i. The final effluent limitations and monitoring conditions contained in Part III for all outfalls apply for the full term of this permit action.

b. Wastewater Characterization Report (WCR) Form Requirements

i. The final effluent monitoring conditions contained in Part III for all outfalls apply for the full term of this permit action.

3. Operation, Maintenance and Emergency conditions

a. The permittee shall operate and maintain treatment works and facilities which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit as specified in the Operation & Maintenance Manual.

b. The permittee shall develop emergency procedures to ensure effective operation of the treatment works under emergency conditions in accordance with NJAC 7:14A-6.12(d).

4. Toxicity Testing Requirements - Acute Whole Effluent Toxicity

a. The permittee shall conduct toxicity tests on its wastewater discharge in accordance with the provisions in this section. Such testing will determine if appropriately selected effluent concentrations adversely affect the test species.

b. Acute toxicity tests shall be conducted using the test species and method identified in Part III of this permit.

c. Any test that does not meet the specifications of N.J.A.C. 7:18, laboratory certification regulations, must be repeated within 30 days of the completion of the initial test. The repeat test shall not replace subsequent testing required in Part III.

d. The permittee shall resubmit an Acute Methodology Questionnaire within 60 days of any change in laboratory.

e. Submit an acute whole effluent toxicity test report: within twenty-five days after the end of every 6 month monitoring period beginning from the effective date of the permit (EDP). The permittee shall submit toxicity test results on appropriate forms.

f. Test reports shall be submitted to:

i. New Jersey Department of Environmental Protection
Mail Code 401-02B
Division of Water Quality
Bureau of Surface Water Permitting
401 East State Street
P.O. Box 420
Trenton, New Jersey 08625-0420.

5. Toxicity Reduction Implementation Requirements (TRIR)

a. The permittee shall initiate a tiered toxicity investigation if two out of six consecutive WET tests demonstrate that the effluent does not comply or will not comply with the toxicity limit or action level specified in Part III of this permit.

i. If the exceedence of the toxicity limit or action level is directly caused by a documented facility upset, or other unusual event which has been identified and appropriately remedied by the permittee, the toxicity test data collected during the event may be eliminated when determining the need for initiating a TRIR upon written Department approval.

b. The permittee shall begin toxicity characterization within 30 days of the end of the monitoring period when the second toxicity test exceeds the toxicity limits or action levels in Part III. The monitoring frequency for toxicity testing shall be increased to monthly. Up to 12 additional tests may be required.

i. The permittee may return to the toxicity testing frequency specified in Part III if four consecutive toxicity tests conducted during the Toxicity Characterization do not exceed the toxicity limit or action level.

ii. If two out of any six consecutive, acceptable tests again exceed the toxicity limit or action level in Part III, the permittee shall repeat the Toxicity Reduction Implementation Requirements.

c. The permittee shall initiate a preliminary toxicity identification (PTI) upon the third exceedence of the toxicity limit or action level specified in Part III during toxicity characterization.

i. The permittee may return to the monitoring frequency specified in PART III while conducting the PTI. If more frequent WET testing is performed during the PTI, the permittee shall submit all biomonitoring reports to the DEP and report the results for the most sensitive species on the DMR.

ii. As appropriate, the PTI shall include:
(1) treatment plant performance evaluation,
(2) pretreatment program information,
(3) evaluation of ammonia and chlorine produced oxidants levels and their effect on the toxicity of the discharge,
(4) evaluation of chemical use and processes at the facility, and
(5) an evaluation of incidental facility procedures such as floor washing, and chemical spill disposal which may contribute to effluent toxicity.

iii. If the permittee demonstrates that the cause of toxicity is the chlorine added for disinfection or the ammonia concentration in the effluent and the chlorine and/or ammonia concentrations are below the established water quality based effluent limitation for chlorine and/or ammonia, the permittee shall identify the procedures to be used in future toxicity tests to account for chlorine and/or ammonia toxicity in their preliminary toxicity identification report.

iv. The permittee shall submit a Preliminary Toxicity Identification Notification within 15 months of triggering TRIR. This notification shall include a determination that the permittee intends to demonstrate compliance OR plans to initiate a Comprehensive Toxicity Investigation (CTI).

d. The permittee must demonstrate compliance with the WET limitation or action level in four consecutive WET tests to satisfy the requirements of the Toxicity Reduction Investigation Requirements. After successful completion, the permittee may return to the WET monitoring frequency specified in PART III.

e. The permittee shall initiate a CTI if the PTI does not identify the cause of toxicity and a demonstration of consistent compliance with the toxicity limit or action level in Part III can not be made.

i. The permittee shall develop a project study plan identifying the party or parties responsible for conducting the comprehensive evaluation, establish a schedule for completing the study, and a description of the technical approach to be utilized.

ii. If the permittee determines that the PTI has failed to demonstrate consistent compliance with the toxicity limit or action level in Part III , a Comprehensive Toxicity Investigation Workplan must be prepared and submitted within 90 days.

iii. The permittee shall summarize the data collected and the actions taken in CTI Quarterly Reports. The reports shall be submitted within 30 calendar days after the end of each quarter.

iv. The permittee shall submit a Final CTI Report 90 calendar days after the last quarterly report. The final CTI report shall include the corrective actions identified to reduce toxicity and a schedule for implementing these corrective actions.

f. Upon receipt of written approval from the Department of the corrective action schedule, the permittee shall implement those corrective actions consistent with that schedule.

i. The permittee shall satisfy the requirements of the Toxicity Reduction Implementation Requirements and return to the original toxicity monitoring frequency after corrective actions are implemented and the permittee demonstrates consistent compliance with the toxicity limit or action level in Part III in four consecutive toxicity tests.

ii. If the implemented corrective measures do not result in consistent compliance with the toxicity limit or action level in Part III, the permittee shall submit a plan for resuming the CTI.

iii. Documents regarding Toxicity Investigations shall be sent to the following:
New Jersey Department of Environmental Protection
Mail Code 401-02B
Division of Water Quality
Bureau of Surface Water Permitting
401 East State Street
P.O. Box 420
Trenton, New Jersey 08625-0420.

F. CONDITIONS FOR MODIFICATION

1. Causes for Modification

a. The Department may modify or revoke and reissue any permit to incorporate 1) any applicable effluent standard or any effluent limitation, including any effluent standards or effluent limitations to control the discharge of toxic pollutants or pollutant parameters such as acute or chronic whole effluent toxicity and chemical specific toxic parameters, 2) toxicity reduction requirements, or 3) the implementation of a TMDL or watershed management plan adopted in accordance with N.J.A.C. 7:15-7.

b. The permittee may request a minor modification to eliminate the monitoring requirements associated with a discharge authorized by this permit when the discharge ceases due to changes at the facility.

G. Custom Requirement

1. Intake Flow Limit and Dye Tracer Evaluation

a. The permittee shall limit the circulating water system intake flow to a monthly average rate not to exceed 3024 million gallons per day. This limit is included in Part III under FAC C. Reporting and compliance with this limitation shall be determined in accordance with the calculations described under item G.10.c.i. below for FAC C, as well as in item G.1.b. below.

b. Circulating water system intake flow shall be calculated in accordance with Part IV.G.10. The flow rate for each individual circulating water pump shall be determined every year using a dye tracer evaluation ("the Tracer Evaluation"). Tracer Evaluation testing shall be performed as follows:.

i. Prior to performing each annual test, the appropriate Enforcement Region must be notified regarding the use of any dye. Oral notification satisfies this requirement.

ii. Upon completion of the Tracer Evaluation for each individual pump, the permittee shall report the following to the Department; 1) Date of dye tracer evaluation; 2) Final concentration of dye in discharge; 3) Total dye discharged; and 4) Flow rate of circulating water pump(s) tested.

iii. The report required to be submitted pursuant to G.1.b.ii. above shall be submitted in accordance with the DMR schedule for the month which follows the month that the Tracer Evaluation is performed. The individual circulating water pump flow rates determined for each pump shall be used in calculating the circulating water system intake, as required for FAC C in Part III, for the month which follows the month that the Tracer Evaluation was performed.

iv. Either Rhodamine WT or Uranine dye are approved for this testing. The Department may approve other dyes for use after reviewing product information including MSDS.

v. The Department reserves the right to review and approve an alternate flow verification methodology via a minor modification to this permit.

2. Intake Screens and Fish Return System

a. Circulating Water System.

i. The permittee shall ensure proper operation and maintenance of its Ristroph Traveling Screens at all times to minimize impingement effects on aquatic life.

ii. The permittee shall post a sign in each of the two intake bays to describe the basic function of the traveling screens and how they reduce impingement mortality.

iii. The permittee shall submit a listing of fragile and non-fragile species to the Department by EDP + 3 months. Fragile species are defined at 40 CFR 125.92(m) and are relevant to 40 CFR 122.21(r)4.

b. Service Water System.

i. The permittee shall comply with 40 CFR 122.21(r)(6) to evaluate options to address impingement at the service water system. A study shall be submitted by EDP + 2 years as described in Part IV.G.7.d.

ii. The permittee shall comply with 40 CFR 125.94(c) and install the chosen technology by EDP + 4 years.

3. Wetland Restoration and Enhancement Efforts

a. The permittee shall continue to implement the Estuary Enhancement Program in restoring, enhancing and/or preserving wetlands within the region of the Delaware Estuary. The permittee shall continue to restore an aggregate of no less than 10,000 acres of: (1) diked wetlands; and/or (2) wetlands dominated by common reed (Phragmites australis) to Spartina species with other naturally occurring march grasses; and/or upland buffer.

b. The permittee shall continue to implement the Management Plans for the Dennis, Commercial, Maurice River Township, the Bayside Tract, Cohansey, Alloways, the Rocks (in Delaware), Cedar Swamp (in Delaware), Dennis Wildlife Management Area, New Sweden Wildlife Management Area, Heislerville Wildlife Management Area and Millville Wildlife Management Area. The Management Plans and any necessary revisions are automatically incorporated as conditions of this NJPDES permit. The permittee must continue to implement the Management Plan(s) with respect to maintenance during any period of time the NJPDES permit is extended, including any lands that have met the success criteria.

c. The permittee shall continue to manage an Estuary Enhancement Program Advisory Committee (EEPAC) to serve as a body to provide technical advice to the permittee concerning any continuing implementation of the existing Management Plans. Any future Management Plan(s) must be submitted to the EEPAC for technical advice prior to submission to the Department for approval. Conditions regarding the EEPAC are as follows:.

   i. The permittee shall submit notification to the Department regarding selected members of the EEPAC. The EEPAC shall consist of representatives from two federal agencies that have jurisdiction over wetland restoration activities or fisheries; four scientists with appropriate wetlands expertise; and two representative of either Cape May, Cumberland, or Salem Counties (as appointed by the governments of Cape May, Cumberland, or Salem Counties). The Department shall designate one representative to serve on the EEPAC The permittee shall designate a representative to serve on the EEPAC and to serve as the EEPAC's chair. These are the minimum requirements where the permittee can expand on this list if desired.

   ii. A complete list of EEPAC members shall be submitted to the Department within 3 months from the effective date of the permit (EDP). The Department reserves the right to deny any member where any such denial will be within 30 days of submission of such list.

   iii. The EEPAC shall meet at least once per year and can terminate once all success criteria have been met.

4. Fish Ladders

a. The permittee has installed twelve fish ladders as described in the Biological Monitoring Program Annual Reports. The permittee shall operate and maintain these ladders in accordance with the developed operations and maintenance manuals or by ensuring that agreements exist that require other parties to be responsible for operaitons and maintenance.

b. The permittee shall perform inspections during the upstream adult migration period to ensure that the ladders are operating as designed. The permittee shall provide formal notification to the ladder owner of any maintenance issues identified during routine inspections.

c. Documentation concerning inspection and any maintenance issues shall be made available to the Department upon request.

5. Biological Monitoring Program

a. The permittee shall continue to implement the improved biological monitoring program and incorporate any updates as set forth in this permit. The biological monitoring program shall include, at a minimum: impingement and entrainment monitoring; bay-wide abundance monitoring (PSEG Baywide Beach Seine Survey, PSEG Baywide Bottom Trawl Survey, and PSEG River Ichthyoplankton Survey); vegetative cover mapping (aerial photography) and geomorphology mapping (aerial photography) of sites that have not attained success criteria; and other special monitoring studies as may be required by the Department.

b. The permittee shall continue to comply with the terms and conditions of the June 12, 2002 letter to ensure that the sampling objectives of the PSEG Beach Seine program and the Delaware River Striped Bass Recruitment Beach Seine Sampling are satisfied without duplication of sampling effort. Conditions of the sampling protocol have been slightly modified as follows:.

   i. The Department's Division of Fish and Wildlife (NJFW) shall sample twice per month (August to October) at 32 fixed stations as well as additional sampling at these stations during June and July. Sampling shall be performed once per month in June and twice per month during July. A total of ten beach seine survey events will be conducted during the June to November period.

   ii. Both PSEG and NJFW will jointly develop an estimate of the average area swept by the seines including observations and measurements associated with each group's sampling efforts including measurement of individual length (nearest millimeter) for up to 30 specimens per haul of the following species: American shad, blueback herring, alewife, Atlantic menhaden, bay anchovy, Atlantic silversides, striped bass, white perch, bluefish, Atlantic croaker, spot, weakfish, and blue crab.

   iii. PSEG will provide its seine data to the NJFW by March 1 and conversely NJFW will provide its seine data to PSEG by March 1.

c. The updated Biological Monitoring Program Work Plan shall be submitted within EDP + 3 months. Not later than 60 days after the Department's approval of the Work Plan, the permittee shall implement the Work Plan. The improved Biological Monitoring Program Work Plan is automatically incorporated as a condition of this permit upon final approval by the Department.

d. Results of the Biological Monitoring Program shall be submitted to the Department as follows:.

   i. Annually by June 30 of the following year in an annual report to be submitted to the Bureau of Surface Water Permitting.

   ii. Audited raw data from all biological monitoring activities shall be provided to the Department’s Marine Fisheries Administration in an appropriate electronic format, including all appropriate supporting tables and documents. This submittal shall include raw data from the current year and shall be submitted annually by June 30 of the following year. Data from all previous years of monitoring shall be provided by June 30, 2016. Results shall be sent to:

   NJ DFW
   Mail Code 501-03
   PO Box 420
   Trenton, NJ 08625-0420.

6. Entrainment and Impingement Monitoring

a. Entrainment Monitoring for Circulating Water System.

i. Entrainment sampling shall be conducted three days per week at a frequency of seven samples per day during January through March and August through December (non-peak entrainment periods), conditions permitting. Sampling shall also be conducted four days per week at a frequency of fourteen samples per day during the period April through July (peak entrainment periods), conditions permitting.

ii. Specimens collected will be identified to the lowest practical taxon and life stage, and counted. The sampling protocol shall be suitable to capture identifiable oyster larvae in the 0.75 mm to 3 mm range. Total length shall be measured to the nearest millimeter for a representative subsample of each target species and life stage per sample. For each sample, additional data collected will include circulator status (on/off), air temperature, water temperature, and salinity.

b. Impingement Monitoring for Circulating Water System.

i. Impingement sampling collections shall be made three days per week. Ten samples shall be collected per 24-hour period, conditions permitting.

ii. All fish collected shall be sorted by species and counted and the condition (live, dead, or damaged) of each specimen will be recorded. Length of each specimen will be measured for a subset of each target species, along with the total aggregate weight for all specimens of each species and condition code. For each sample, additional data collected will include circulator status (on/off), air temperature, water temperature, and salinity.

c. Entrainment and Impingement Monitoring at Service Water System.

i. The permittee shall comply with 40 CFR 122.21(r)(6) and 40 CFR 122.21(r)(9) for the service water system. The permittee can conduct impingement and entrainment sampling at the service water intake or can develop a methodology for adapting data from the circulating water system to the service water system. The permittee shall summarize its methodology for sampling the service water in a revised biological monitoring program as per Part IV.G.5.c.

7. Section 316(b) Application Components for All Facilities

a. Source water physical data (40 CFR 122.21(r)(2)); Cooling water intake structure data (40 CFR 122.21(r)(3)); and Cooling water system data (40 CFR 122.21(r)(5)) - These requirements have been fully satisfied based on information provided in the 2006 NJPDES renewal application at Sections 4-II and 5-II. However, any updated operational information pertaining to these requirements that is relevant to the period of study represented with the application components at 40 CFR 122.21(r) can be submitted along with those submissions at that time.

b. Source water baseline biological characterization data - The requirements at 40 CFR 122.21(r)(4)(i) through (viii) have been satisfied based on previous application submissions. However, the 2014 rule contains new requirements at 40 CFR 122.21(r)(4)(x) – (xii). The permittee shall submit either an update of current information or new information relevant to these three items below within EDP + 6 months. These requirements are as follows:.

i. Identification of protective measures and stabilization activities that have been implemented and a description of how these measure and activities affected the baseline water condition in the vicinity of the intake.

ii. A list of fragile species applicable to the Station that are not already identified as fragile at 40 CFR 125.92(m).

iii. Any information submitted in order to obtain an incidental take exemption or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service. Exemption or authorization may be used to satisfy the permit application information requirement of paragraph 40 CFR 122.95(f) if included in the application.

c. Chosen method(s) of compliance with impingement mortality standard for the circulating water system (40 CFR 122.21(r)(6)) - The permittee shall submit a determination for the circulating water system within EDP + 3 years along with any study components that are required based on the chosen option. If 40 CFR 125.94 (c)(5) or (6) is chosen, an impingement technology performance optimization study shall also be submitted as follows:.

   i. The impingement technology performance optimization study must include at least two years of biological data collection measuring the reduction in impingement mortality achieved by the modified traveling screens as defined at 40 CFR 125.92(s) and demonstrating that the operation has been optimized to minimize impingement mortality. A description of any biological data collection and data collection approach used in measuring impingement mortality must be included. This shall also include the percent impingement mortality reflecting optimized operation of the modified traveling screen and all supporting calculations.

d. Chosen method(s) of compliance with impingement mortality standard for the service water system (40 CFR 122.21(r)(6) – The permittee shall submit a determination for the service water system within EDP + 3 years along with any study components that are required based on the chosen option. If 40 CFR 125.94 (c)(5) or (6) is chosen, an impingement technology performance optimization study shall also be submitted as follows:.

   i. The impingement technology performance optimization study must include at least two years of biological data collection measuring the reduction in impingement mortality achieved by the modified traveling screens as defined at 40 CFR 125.92(s) and demonstrating that the operation has been optimized to minimize impingement mortality. A description of any biological data collection and data collection approach used in measuring impingement mortality must be included. The Department would consider a proposal to utilize data from the circulating water system for the service water system.

e. Entrainment Performance Studies (40 CFR 122.21(r)(7)) - The permittee shall submit any previously conducted entrainment performance studies that address technology efficacy, through-facility entrainment survival, and other entrainment studies within EDP + 3 years. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from their locations are relevant and representative of conditions at the Station. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definition of entrainment at 40 CFR 125.92(h).

f. Operational Status (40 CFR 122.21(r)(8)) - The permittee shall submit a description of the operational status of each generating, production, or process unit that uses cooling water. The permittee shall submit the necessary information within EDP + 3 years so that the information corresponds with the impingement and entrainment study components. Additionally, the operational status information must address both the circulating water system and the service water system, including but not limited to:.

i. For power production or steam generation, descriptions of individual unit operating status including the age of each unit; capacity utilization rate (or equivalent) for the previous 5 years (including any extended or unusual outages that significantly affect current data for flow); impingement, entrainment, or other factors (including identification of any operating unit with a capacity utilization rate of less than 8 percent averaged over a 24-month block contiguous period); and any major upgrades completed within the last 15 years (including but not limited to boiler replacement, condenser replacement, turbine replacement or changes to fuel type).

ii. Descriptions of completed, approached, or scheduled upgrades and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities.

iii. Descriptions of plans or schedules for any new units planned within the next 5 years.

g. Entrainment Characterization Study (40 CFR 122.21(r)(9)) - The permittee shall submit the Entrainment Characterization Study where the period of data collection shall span for at least 2 years. This shall include entrainment at both the circulating water system and the service water system. This two year data collection period shall correspond with the benefits valuation study period at 40 CFR 122.21(r)(11). Species included in the Entrainment Characterization Study shall not be limited to RIS but shall include characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species). The Entrainment Characterization Study must include the following components:.

i. Identification and documentation of the data collection period and frequency. The study should identify and document organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by the Director, and any species protected under Federal, State, or Tribal law, including threatened or endangered species with a habitat range that includes waters in the vicinity of the cooling after intake structure. Biological data collection must be representative of the entrainment at the intake subject to this provision. The study shall identify and document how the location of the cooling water intake structure in the waterbody and the water column are accounted for by the data collection locations;.

ii. Characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species), including a description of their abundance and their temporal and spatial characteristics in the vicinity of the cooling water intake structure(s). This characterization shall be based on sufficient data to characterize annual, seasonal, and diel variations in entrainment, including but not limited to variations related to climate and weather differences, spawning, feeding and water column migration. This characterization may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Identification of all life stages of fish and shellfish must include identification of any surrogate species used, and identification of data representing both motile and non-motile life-stages of organisms;.

iii. Documentation of the current entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal law (including threatened or endangered species). The documentation may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Entrainment data to support the facility's calculations must be collected during periods of representative operational flows for the cooling water intake structure, and the flows associated with the data collection must be documented. The method used to determine latent mortality along with data for specific organisms mortality or survival that is applied to other life-stages of species must be identified. The owner or operator of the facility must identify and document all assumptions and calculations used to determine the total entrainment for that facility together with all methods and quality assurance/quality control procedures for data collection and data analysis. The proposed data collection and data analysis methods must be appropriate for a quantitative survey.

iv. The Entrainment Characterization Study shall be submitted by EDP + 3 years.

8. Section 316(b) Application Components for Facilities with Actual Intake Flow > 125 MGD

a. Comprehensive Technical Feasibility and Cost Evaluation Study (40 CFR 122.21 (r)(10)) - The permitee shall submit an engineering study of the technical feasibility and incremental costs of candidate entrainment control technologies. This includes an evaluation of the technical feasibility of closed-cycle recirculating systems as defined at 40 CFR 125.92(c), fine mesh screens with a mesh size of 2 millimeters or smaller, and water reuse or alternate sources of cooling water. In addition, this study shall include:.

i. A description of all technologies and operational measures considered (including alternate designs of closed-cycle recirculating systems such as natural draft cooling towers, mechanical draft cooling towers, hybrid designs, and compact or multi-cell arrangements);.

ii. A discussion of land availability, including an evaluation of adjacent land and acres potentially available due to generating unit retirements, other buildings and equipment retirements, and potential for repurposing of areas developed for transmission yards, and parking lots;.

iii. A discussion of available sources of process water, grey water, waste water, reclaimed water, or other waters of appropriate quantity and quality for use as some or all of the cooling water needs of the facility;.

iv. Documentation of factors other than costs that may make a candidate technology impractical or infeasible for further evaluation; and.

v. The study must include engineering cost estimates of all technologies considered in Part IV.G.8.a(i)-(iv) above. Facility costs must also be adjusted to estimate social costs. All costs must be presented as the net present value (NPV) and the corresponding annual value. Costs must be clearly labeled as compliance costs or social costs. The permitee must separately discuss facility level compliance costs and social costs, and provide documentation as described at 40 CFR 122.21(r)(10)(iii).

vi. The Comprehensive Technical Feasibility and Cost Evaluation study shall be completed by EDP +3 years and is then subjected to peer review as per Part IV.G.8.d below.

b. Benefits Valuation Study (40 CFR 122.21(r)(11)) - The permitee must submit an evaluation of the benefits of the candidate entrainment reduction technologies and operational measures evaluated in paragraph (r)(l0) including using the Entrainment Characterization Study completed as per 40 CFR 122.21(r)(9). Each category of benefits must be described narratively, and when possible, benefits should be quantified in physical or biological units and monetized using appropriate economic valuation methods. The benefits valuation study must include, but is not limited to, the following elements:.

   i. Incremental changes in the numbers of individual fish and shellfish lost due to impingement mortality and entrainment as defined in 40 CFR 125.92, for all life stages of each exposed species;.

   ii. Description of basis for any estimates of changes in the stock sizes or harvest levels of commercial and recreational fish or shellfish species or forage fish species;.

   iii. Description of basis for any monetized values assigned to changes in the stock size or harvest levels of commercial and recreational fish or shellfish species, forage fish, and to any other ecosystem or non use benefits;.

   iv. A discussion of mitigation efforts completed prior to October 14, 2014 including how long they have been in effect and how effective they have been;.

   v. Discussion, with quantification and monetization, where possible, of any other benefits expected to accrue to the environment and local communities, including but not limited to improvements for mammals, birds, and other organisms and aquatic habitats; and.

   vi. Discussion, with quantification and monetization, where possible, of any benefits expected to result from any reductions in thermal discharges from entrainment technologies.

c. Non-water Quality Environmental and Other Impacts Study (40 CFR 122.21(r)(12)) - The permittee must submit a detailed facility-specific discussion of the changes in non-water quality environmental and other impacts attributed to each technology and operational measure considered in the Comprensive Technical Feasibility and Cost Evaluation Study above. The study should detail both impacts increased and impacts decreased. The study shall be completed by EDP + 3 years and is then subject to peer review as per Part IV.G.8.d below. The study must include the following:.

   i. Estimates of changes to energy consumption, including but not limited to auxiliary power consumption and turbine backpressure energy penalty;.

   ii. Estimates of air pollutant emissions and of the human health and environmental impacts associated with such emissions;.

   iii. Estimates of changes in noise;.

   iv. A discussion of impacts to safety, including documentation of the potential for plumes, icing, and availability of emergency cooling water;.

   v. A discussion of facility reliability, including but not limited to facility availability, production of steam, impacts to production based on process unit heating or cooling, and reliability due to cooling water availability;.

   vi. Significant changes in consumption of water, including a facility-specific comparison of the evaporative losses of both once-through cooling and closed-cycle recirculating systems, and documentation of impacts attributable to changes in water consumption.

vii. A discussion of all reasonable attempts to mitigate these factors.

d. Peer Review (40 CFR 122.21(r)(13)) - The permitee shall conduct an external peer review of each report as follows:.

i. The permittee must select peer reviewers and notify the Department by EDP + 2 years. The Department may disapprove of a peer reviewer or require additional peer reviewers within 90 days of receipt of this information.

ii. The Director may confer with EPA, Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the cooling water intake structure, independent system operators, and state public utility regulatory agencies, to determine which peer review comments must be addressed.

iii. The permittee must provide an explanation for any significant reviewer comments not accepted. Peer reviewers must have appropriate qualifications and their names and credentials must be included in the peer review report.

iv. The permittee shall complete the Non-Water Quality Environmental and Other Impacts Study by EDP + 3 years. The study shall then be sent to the selected peer reviewer to be completed and submitted to the Department by EDP + 4 years.

9. Section 316(a) Variance Conditions

a. Notwithstanding any other provision of this permit, the Department reserves the right to seek termination of the Section 316(a) variance granted or termination of this permit based on the permittee's noncompliance with any term or condition of this permit. Further, the Department specifically reserves the right to seek penalties pursuant to N.J.S.A. 58:10A-10 et seq. based on the permittee's noncompliance with any term or condition of this permit.

b. If upon renewal, the permittee wants the Section 316(a) variance to be continued, the request for the variance along with a basis for its continuance must be submitted at the time of application for the renewal permit. The Department's Section 316(a) determination shall include, but not be limited to: 1) a review of whether the nature of the thermal discharge or the aquatic population associated with the Station has changed; 2) whether the protection and propagation of the balanced indigenous population is assured; 3) whether the best scientific methods to assess the effect of the permittee's cooling system have changed; 4) whether the technical knowledge of stresses caused by the cooling system has changed.

10. Custom NJPDES Monitoring Requirements

a. DSNs 481-486.

i. Effluent flow- Effluent flow is calculated daily as the sum of the circulating water flow and the service water flow. The circulating water flow for each outfall is calculated as the number of operating hours of the circulating water pumps and the flow rates for each pump. The service water contribution is calculated from the service water pump operating hours times the design flow rate of the service water pumps. The flow rates measured over the course of a calendar day shall be averaged on a a daily basis consistent with the definition of daily discharge pursuant to N.J.A.C. 7:14A-1.2. These daily discharge points shall be utilized for the purposes of completing discharge monitoring reports as well as for calculation purposes.

ii. Effluent Temperature- Effluent temperature shall be measured at DSNs 481-486 on a continuous basis. Effluent flow for DSNs 481-486 is reported on DMRs as indicated in Part III. The effluent temperature values measured over the course of a calendar day shall be averaged on a daily basis consistent with the definition of daily discharge pursuant to N.J.A.C. 7:14A-1.2. These daily discharge points shall be utilized for the purposes of completing discharge monitoring reports as well as for calculation purposes.

iii. Chlorine Produced Oxidants- Option 1: The daily maximum limitation of 0.5 mg/L and the monthly average limitation of 0.3 mg/L shall apply when only service water system non-contact cooling water is discharged through DSNs 481-486. Option 2: The daily maximum limitation of 0.2 mg/L shall apply when predominantly circulating water system water is being discharged through DSNs 481-486. Under normal operating conditions (i.e. no outage), the permittee discharges under an Option 2 scenario.

iv. Intake pH- One sample of intake water shall be analyzed for pH and shall be reported as intake pH for DSNs 481-486.

b. FAC A and FAC B.

i. Intake Temperature- Intake temperature shall be measured at the intake to the main circulating water system for Units 1 and 2 on a continuous basis. The intake temperatures from Units 1 and 2 shall be averaged to obtain the intake temperature for FAC A (Unit 1) as well as the intake temperature for FAC B (Unit 2). In the event that one of the temperature monitoring devices is out of service (such as for calibration and maintenance) the other temperature monitoring device will be applied to both units for reporting intake temperature.

ii. Effluent temperature for FAC A and FAC B shall be calculated and reported as follows:

Effluent Temperature for FAC A = [(Eff. Temp. at DSN 481 x Eff. Flow at DSN 481) + (Eff. Temp. at DSN 482 x Eff. Flow at DSN 482) + (Eff. Temp. at DSN 483 x Eff. Flow at DSN 483)] / (Eff. Flow at DSN 481 + Eff. Flow at DSN 482 + Eff. Flow at DSN 483)

Effluent Temperature for FAC B = [(Eff. Temp. at DSN 484 x Eff. Flow at DSN 484) + (Eff. Temp. at DSN 485 x Eff. Flow at DSN 485) + (Eff. Temp. at DSN 486 x Eff. Flow at DSN 486)] / (Eff. Flow at DSN 484 + Eff. Flow at DSN 485 + Eff. Flow at DSN 486).

iii. Differential Temperature- Differential temperature shall be calculated by subtracting the daily intake temperature from the daily effluent temperature where the values for intake temperature and effluent temperature values are explained above. The permittee calculates differential temperature on an hourly basis where the daily differential temperature is an arithmetic average of the values obtained during the course of the day. This is consistent with the definition of "daily discharge" in accordance with N.J.A.C. 7:14A-1.2.

c. FAC C.

i. Intake Flow- Intake flow for the circulating water system is calculated as the sum of the twelve individual circulating water system intakes and reported as a monthly average in million gallons per day. The flow of each individual circulating water pump shall be calculated as the product of the number of operating hours for that pump for the reporting period and the flow rate for that pump. The flow rate for each respective pump shall be assessed on an annual basis in accordance with the Tracer Evaluation Requirement in item G.1. For the purposes of DMR reporting, the intake flow values measured over the course of a calendar day shall be averaged on a daily basis consistent with the definition of daily discharge pursuant to N.J.A.C. 7:14A-1.2.

ii. Thermal Discharge- Thermal discharge in MBTU/Hr is the total heat released from Unit 1 (FAC A) and Unit 2 (FAC B) where it shall be calculated as follows:

Thermal Discharge FAC C (MBTU/Hr) = [M1Cp(Teff-Tint)]Unit 1 + [M2Cp(Teff-Tint)]Unit 2/1,000,000

Where:
M1 = Mass flow rate of water from Unit 1 in lbs/hour (includes circulating water flow as well as service water flow)
M2 = Mass flow rate of water from Unit 2 in lbs/hour (includes circulating water flow as well as service water flow)
Mass flow rate is equal to flow in gal/hour x 8.34 lb/gallon
Teff = effluent temperature from Unit (e.g. Unit 1)
Tint = intake temperature from Unit
Cp is the specific heat capacity of water which is 1 BTU/lb degrees Fahrenheit.

d. DSN 48C and DSN 489: During periods of maintenance, calibration or failure of the flow meter, flow can be calculated using the operating hours of the discharge pumps times the flow rate of the discharge pumps.

11. Other Regulatory Requirements

a. The permittee shall discharge so as not to violate the Delaware River Basin Commission Water Quality Regulations as amended for Zone 5 waters. This includes the stream quality objectives for radioactivity, namely: alpha emitters- maximum 3 pc/L (picocuries per liter) and beta emitters- maximum 1,000 pc/L. The permittee shall ensure compliance with the heat dissipation area set forth in any current DRBC docket. Compliance may be determined by the DRBC based on its own sampling events.

b. The permittee shall comply with all regulations set forth in N.J.S.A. 26:2D-1 et seq. regarding Radiation Protection. All radioactive wastes shall be collected, removed, and disposed of in accordance with N.J.S.A. 7:28-11.1 et seq.

c. The permittee is licensed by the U.S. Nuclear Regulatory Commission (USNRC) and responsible to that agency for compliance with radiological effluent limitations, monitoring requirements, and other licensing conditions.

d. The permittee is required to comply with Section 4.2 of Appendix B to the NRC Facility Operating Licenses Nos. DPR-70 and DPR-75 which includes National Marine Fisheries Service's (NMFS) Section 7 Consultation Biological Opinion related to the operation of Salem Units 1 and 2 Generating Stations, including attachments, and all subsequent amendments as may be approved by NMFS. All correspondence between the permittee and the NMFS specifically related to Salem's effects on threatened and endangered species shall be sent to the Department at the following address:

   Director, Division of Fish and Wildlife
   501 East State Street, P.O. Box 400
   Trenton, NJ 08625-0400.

e. As per 40 CFR 125.98(j), this permit does not authorize the take, as defined at 16 U.S.C. 1532(19), of threatened or endangered species of fish or wildlife. Such take is prohibited under the Endangered Species Act unless it is exempted pursuant to 16 U.S.C. 1536(o) or permitted pursuant to 16 U.S.C. 1539(a). Absent such exemption or permit, any facility operating under the authority of this regulation must not take threatened or endangered wildlife.