



NOAA FISHERIES

PROPOSED ACTION Issuing an Incidental Take Permit to Exelon Generating Company, LLC

TYPE OF STATEMENT Draft Environmental Assessment

DATE November 22, 2019

LEAD AGENCY: U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources

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Location: Eddystone, Delaware County, Pennsylvania (RKM 136)

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue an incidental take permit to Exelon Generating Company, LLC, under Section 10(a)(1)(B) of the Endangered Species Act of 1973 as amended (16 U.S.C. 1539(a)(1)(B)), and 50 Code of Federal Regulations (CFR) Part 222.307. The permit would authorize the incidental take of endangered shortnose (*Acipenser brevirostrum*), Atlantic sturgeon (*A. oxyrinchus*) during the conduct of otherwise lawful activities associated with operation and maintenance of the Eddystone Generating Station. The permit would be valid for ten years. Eddystone Generating Station would continue to operate in accordance with National Pollutant Discharge Elimination System (NPDES) permit (permit No.PA0013714) issued October 1, 2014. Eddystone Generating Station is currently in the process of renewing their NPDES permit. On June 21, 2019, Exelon submitted a complete application for an incidental take permit, including a conservation plan to monitor, minimize, and mitigate the impacts of incidental take of shortnose and Atlantic sturgeon to the maximum extent practicable at Eddystone Generating Station.

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1. Introduction and Purpose and Need

The National Marine Fisheries Service (NMFS) received an application from Exelon Generating Company, LLC (herein “Exelon”) requesting an Incidental Take Permit (ITP) for take of endangered shortnose and Atlantic sturgeon associated with operation of the Eddystone Generating Station located in Eddystone, Pennsylvania. NMFS has a statutory responsibility to authorize take of threatened and endangered species pursuant to the Endangered Species Act (ESA), Section 10(a)(1)(B) after receipt and review of an application and if certain findings and determinations are made. In addition, the National Environmental Policy Act (NEPA), 40 Code of Federal Regulations (CFR) Parts 1500 -1508, and the National Oceanic and Atmospheric Administration (NOAA) policy and procedures¹ require all proposals for major federal actions be reviewed with respect to environmental consequences on the human environment. Therefore, NMFS conducted an environmental review of the application submitted by Exelon for the Eddystone Generating Station and determined that preparing an Environmental Assessment (EA) is appropriate to analyze environmental impacts associated with the requested ITP.

This Chapter presents a summary of NMFS’ authority pursuant to the ESA to authorize take of threatened and endangered species associated with an applicants specified activities (Section 1.1), a summary of the applicant’s request (Sections 1.2), and identifies NMFS proposed action and purpose and need (Section 1.3). This Chapter also explains the environmental review process (1.4) and provides other information relevant to the analysis in this EA, such as the scope of the analysis (Section 1.5). The remainder of this EA is organized as follows:

- Chapter 2 describes the applicant’s activities and the alternatives carried forward for analysis as well as alternatives not carried forward for analysis.
- Chapter 3 describes the baseline conditions of the affected environment and the direct, indirect, and cumulative impacts to the affected environment, specifically impacts to shortnose and Atlantic sturgeon associated with NMFS proposed action and alternatives.
- Chapter 4 lists document preparers and agencies consulted and
- Chapter 5 lists references cited.

1.1 Overview of the Endangered Species Act and Relevant Authorities

The ESA establishes a national policy for conserving threatened and endangered species of fish, wildlife, plants and the habitat they depend on. An endangered species is a species in danger of extinction throughout all or a significant portion of its range, and a threatened species is one that is likely to become endangered within the near future throughout all or in a significant portion of its range. The U.S. Fish and Wildlife Service (USFWS) and NMFS jointly administer the ESA and are responsible for listing a species as either threatened or endangered, as well as designating critical habitat where applicable, developing recovery plans for these species, and undertaking other conservation actions pursuant to the ESA. Section 9 of the ESA prohibits the “take”², including incidental take, of endangered and threatened species. NMFS may grant exceptions to

¹ National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6A “Compliance with the National Environmental Policy Act and Executive Order 12114 Environmental Effects Abroad of Major Federal Actions 11988 and 13690 Floodplain Management; and 11990 Protection of Wetlands” and the Companion Manual for NAO 216-6A.

²Take, as defined in Section 3 of the ESA, means to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

the take prohibitions with an incidental take statement or an incidental take permit issued pursuant to ESA section 7 or 10, respectively. In both cases, under section 7 of the ESA, NMFS must determine that the activity that will result in incidental take is not likely to jeopardize the continued existence of the affected listed species.

As described in 50 C.F.R. § 222.307, NMFS may issue permits under Section 10(a)(1)(B) of the ESA to non-Federal entities to take endangered and threatened species when such taking is incidental to an otherwise lawful activity, and when specific issuance criteria have been met. The applicant must submit a completed application and Conservation Plan detailing the anticipated impact of the activity on listed species, the anticipated impacts to habitat, steps that will be taken to monitor, minimize, and mitigate such impacts, and the funding available to do so, as well as alternative actions that have been considered.

Section 7(a)(2) of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with NMFS (or the USFWS) for actions that may affect species listed under the ESA as threatened or endangered or critical habitat designated for such species. Section 7(b)(3) of the ESA requires that at the conclusion of formal consultation, the consulting agency provides an opinion stating whether the federal action agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat.

1.2 Incidental Take Permit Application Summary

Exelon Generation Company, LLC owns the Eddystone Generating Station (herein "Eddystone"), which is a natural gas/fuel oil-fired electric power generating facility that operates as a peaking plant, (i.e., typically running at higher levels of generation capacity during the summer and winter periods). The facility is located in the Borough of Eddystone, Delaware County, Pennsylvania, less than 10 miles downriver of Philadelphia. The facility presently consists of two natural gas/fuel oil-fired electric generating units that are steam-electric generators. Cooling water for each unit is withdrawn from the Delaware River through a cooling water intake structure (CWIS), which is located along the west shore of the River, directly in front of the Station. The operation of the CWIS is the primary aspect of the facility operations under consideration for this ITP for Eddystone due to the potential impacts to ESA-listed sturgeon. Exelon conducted entrainment sampling at Eddystone in 2005, 2006, 2016, and 2017. One Atlantic sturgeon yolk-sac larva was collected in May 2017. Thus, Exelon determined it was necessary to apply for an ITP in accordance with the requirements under Section 10(a)(1)(B) of the ESA for the take of ESA-listed shortnose sturgeon and Atlantic sturgeon (New York Bight Distinct Population Segment (NYB DPS)) due to the operation of the CWIS and vessel activity associated with fuel delivery to the station. Please see <https://www.fisheries.noaa.gov/action/incidental-take-permit-eddystone-generating-station> for a copy of the application and associated Conservation Plan.

1.3 Proposed Action and Purpose and Need

NMFS is proposing to issue an ITP to Exelon pursuant to Section 10(a)(1)(B) of the ESA and the regulations governing the incidental taking of endangered and threatened species (50 CFR

222.307). The proposed ITP would be valid for ten years from the date the ITP is issued. It would authorize an annual incidental take of three Atlantic sturgeon larvae in entrainment sampling, commensurate with an annual take estimate of three age-1 equivalents; an annual take limit of three young-of-the-year (YOY) or older Atlantic sturgeon collected during impingement sampling, commensurate with an annual take estimate of seven YOY or older Atlantic sturgeon; and an annual take limit of three YOY or older shortnose sturgeon collected during impingement sampling, commensurate with an annual take estimate of seven YOY or older shortnose sturgeon. Thus, the annual maximum take limits under the Conservation Plan are three Atlantic sturgeon in entrainment; seven Atlantic Sturgeon in impingement, and seven shortnose sturgeon in impingement. The proposed ITP would also establish a take limit of one Atlantic sturgeon for vessel activity during the ten year lifespan of the ITP. The take limits and methodology for estimating take are explained in greater detail in Appendix C of the Conservation Plan, which is incorporated herein by reference.

Since NMFS's proposed action is a direct outcome of Exelon's request for a permit to take ESA-listed sturgeon incidental to conducting an otherwise lawful activity, the purpose of NMFS's action is to evaluate Exelon's application pursuant to Section 10(a)(1)(B) of the ESA. The need for NMFS's action is to meet its obligation to grant or deny the permit request under the ESA. Exelon submitted an adequate and complete application, thus NMFS has a corresponding duty to determine whether and how to authorize take of the ESA-listed sturgeon incidental to the activities described in the application.

To authorize take of ESA-listed species, NMFS evaluates the application to determine that the taking is incidental to, and not the purpose of, an otherwise lawful activity, and that the taking will not appreciably reduce the likelihood of the survival and recovery of listed species in the wild. NMFS also evaluates the best available scientific information to determine whether the mitigation proposed by the applicant, to the maximum extent practicable, will minimize and mitigate the impacts of such taking and whether any additional conservation measures are required to ensure that the taking will not jeopardize the survival and recovery of the ESA-listed species and that the applicant can ensure adequate funding to implement its commitments under the conservation plan and ITP. An ITP must also include requirements or conditions pertaining to monitoring and reporting. NMFS cannot issue an ITP if the criteria specified in Section 10(a)(1)(B) and its implementing regulations are not met.

1.4 Environmental Review Process

Under NEPA, federal agencies are required to examine the environmental impacts of their proposed actions within the United States and its territories. An EA is a concise public document that provides an assessment of the potential effects a major federal action may have on the human environment. Major federal actions include activities that federal agencies fully or partially fund, regulate, conduct or approve. Because the issuance of an ITP would allow for the taking of ESA-listed species, consistent with provisions under Section 10(a)(1)(B) of the ESA, and incidental to the applicant's lawful activities, NMFS considers this to be a major federal action subject to NEPA; therefore, NMFS analyzes the environmental effects associated with authorizing takes of ESA-listed species and prepares the appropriate NEPA documentation. In addition, NMFS, to the fullest extent possible, integrates the requirements of NEPA with other regulatory processes required by law or by agency practice so that all procedures run

concurrently, rather than consecutively. This includes coordination within NOAA (e.g., the Office of the National Marine Sanctuaries) and with other regulatory agencies (e.g., the USFWS), as appropriate, during NEPA reviews prior to implementation of a proposed action to ensure that all applicable requirements are met.

1.4.1 Compliance with Other Laws

NMFS must comply with all applicable federal environmental laws and regulations or executive orders (as applicable) necessary to implement a proposed action. NMFS's evaluation of and compliance with environmental laws and regulations is based on the nature and location of the applicant's proposed activities and NMFS' proposed action. Therefore, this section only summarizes environmental laws and consultations applicable to NMFS' consideration of whether to issue the ITP to Exelon.

Compliance with ESA: NMFS issuance of an ITP is a federal action that is also subject to the consultation requirements under Section 7 of the ESA. As a result, the Office of Protected Resources (OPR) Endangered Species Division is required to ensure the issuance of this ITP to Exelon is not likely to jeopardize the continued existence of any threatened and endangered species or result in the destruction or adverse modification of designated critical habitat for these species. Because the shortnose and Atlantic sturgeon are listed species with confirmed or possible occurrence in vicinity of the facility operation, NMFS OPR Endangered Species Division will initiate formal ESA Section 7 consultation with NMFS OPR ESA Interagency Cooperation Division on the proposed issuance of ITP, pursuant to section 7 of the ESA. As appropriate, the final EA will be informed by the analysis in the final biological opinion.

Compliance with the Magnuson-Stevens Fishery Conservation (MSFCMA): Under Section 305(b)(2), Federal agencies are required to consult with the Secretary of Commerce with respect to any action authorized, funded, undertaken, or proposed to be authorized, funded or undertaken, by such agency which may adversely affect essential fish habitat (EFH) identified under the MSFCMA. OPR determined the issuance of an ITP to Exelon will not adversely affect EFH for any species and there is no designated EFH in the action area. Therefore, an EFH consultation for the issuance of this ITP is not required.

1.4.2 Public Involvement

Per the ESA, once NMFS receives a completed application with adequate information included, NMFS is required to publish a Notice of Receipt (NOR) in the Federal Register. In the NOR, NMFS presents information relevant to the environmental impacts associated with the consideration of whether to issue the ITP for the activities and species described in the application.

NMFS received a draft permit application from Exelon on June 28, 2018 requesting an ITP for shortnose sturgeon and Atlantic sturgeon NYB DPS associated with the operation of the Eddystone facility. Based on our review of the draft application, we requested further information and clarification. On December 21, 2018, Exelon submitted an updated draft application. Based on review of the updated application, NMFS and Exelon held further discussions regarding what information to incorporate in the Conservation Plan. On June 21,

2019, Exelon submitted a revised application. This revised application included the Conservation Plan and analytical methods for estimating potential takes, based on previous feedback and coordination with our office. At that time, the application was considered adequate and complete. On July 16, 2019, NMFS published a NOR of the Exelon application for the Eddystone facility in the Federal Register (84 FR 33924). The comment period ended on August 15, 2019. No comments were received.

1.5 Scope of the Environmental Assessment

This draft EA was prepared in accordance with NEPA (42 USC 4321, et seq.), 40 CFR 1500-1508 and NOAA policy and procedures (NAO 216-6A and the Companion Manual for the NAO 216-6A). The analysis in this EA addresses potential direct, indirect, and cumulative impacts resulting from NMFS' proposed action to authorize incidental take of Atlantic Sturgeon and shortnose sturgeon. However, the scope of this analysis is limited to the decision for which we are responsible (*i.e.*, whether to issue the ITP). This EA provides focused information and analysis on the issuance of an ITP to Exelon, authorizing the incidental take of shortnose and Atlantic sturgeon, and the mitigation and monitoring measures to minimize the effects of that take. The proposed ITP would only authorize incidental take of a maximum of seven shortnose sturgeon and ten Atlantic sturgeon annually, as well as an additional take of a single Atlantic sturgeon over the 10 year lifespan of the permit. Given the very small number of takes authorized for each species, NMFS anticipates effects on the environment will be limited to these species. Most of these takes are not expected to be lethal. In addition, the action area is quite small, primarily limited to the CWIS from the Delaware River, which is an area only 1,720 square feet in size. For these reasons, this EA does not provide a detailed evaluation of the effects to the elements of the human environment listed in Table 1 below.

TABLE 1		
Biological	Physical	Socioeconomic/Cultural
Benthic Communities	Air Quality	Commercial Fishing
Fisheries Resources and Essential Fish Habitat	Farmland Geography	Historic and Cultural Resources
Humans	Geology/sediments	Indigenous Cultural Resources
Invertebrates	Land Use	Low Income Populations
Invasive Species	Oceanography	Military Activities
Marine and Coastal Birds	State Marine Protected Areas	Minority Populations
	Federal Marine Protected Areas	National Historic Preservation Sites

TABLE 1

Biological	Physical	Socioeconomic/Cultural
	National Estuarine Research Reserves	Other Marine Uses: Military activities, Shipping and marine transportation, and Boating
	National Marine Sanctuaries	Recreational Fishing
	National Wildlife Refuges	Public Health and Safety
	Park Land	
	Water Quality	
	Wetlands	
	Wild and Scenic Rivers	

2. Alternatives

As indicated in Chapter 1, NMFS' proposed action is issuance of an ITP to Exelon, which would authorize take of endangered shortnose and Atlantic sturgeon incidental to the operation of the Eddystone facility and require implementation of a Conservation Plan, in accordance with the requirements of the ESA. NMFS's proposed action is triggered by Exelon's request for a permit under Section 10(a)(1)(B) of the ESA. In accordance with the NEPA and the Council on Environmental Quality (CEQ) Regulations, NMFS is required to consider a reasonable range of alternatives to a proposed action as well as the no action alternative. The evaluation of alternatives under NEPA assists NMFS with ensuring that any unnecessary impacts are avoided through an assessment of alternative ways to achieve the purpose and need for our proposed action and that may result in less environmental harm. For the purposes of this EA, an alternative will only meet the purpose and need if it satisfies the requirements under Section 10(a)(1)(B) of the ESA. Therefore, NMFS applied the screening criteria and considerations outlined in section 2.1 to identify which alternatives to carry forward for analysis.

2.1 Considerations for Selecting Alternatives

Section 10(a)(2)(B) of the ESA specifies that an ITP shall be issued if the following criteria are met in the application and conservation plan:

- (i) the taking will be incidental;
- (ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
- (iii) the applicant will ensure that adequate funding for the plan will be provided;
- (iv) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
- (v) any additional conservation measures are met to meet the requirements of condition iv, above.

Under Section 10 of the ESA, NMFS' primary responsibility in evaluating an ITP application is to determine if the above criteria are met for the applicant's activities and Conservation Plan. Per NMFS regulation found at 50 C.F.R. § 222.307, NMFS will evaluate the sufficiency of the application and Conservation Plan. To issue a permit, NMFS must determine that the issuance criteria are met, including determining that the taking will be incidental, the applicant will monitor, minimize and mitigate the taking, the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild, and the applicant has amended the Conservation Plan to include any measures NMFS deems necessary or appropriate. NMFS has worked with Exelon since the first draft application was received to ensure these criteria have been met. The current conservation plan includes updates and changes requested by NMFS to minimize the impact of this action.

Because NMFS has already worked collaboratively with the applicant to refine the Conservation Plan, the only alternatives we are considering in this draft EA are the no action alternative (i.e. not issuing the permit) and issuing the permit as requested in the revised and final application and Conservation Plan. The applicant provided several alternatives for their facility operation to minimize take, all of which they deemed to be non-feasible for the continued operation of their

facility, therefore, NMFS has addressed those options below in section 2.5, but has not carried them forward for evaluation.

2.2 Description of Specified Activities

As indicated in Chapter 1, the facility is a natural gas/fuel oil-fired electric power generating facility that operates as a peaking plant, (i.e., typically running at higher levels of generation capacity during the summer and winter periods). The facility presently consists of two natural gas/fuel oil-fired electric generating units that are steam-electric generators. The facility is located in the Borough of Eddystone, Delaware County, Pennsylvania, less than 16 kilometers (10 miles) downriver of Philadelphia. Eddystone withdraws cooling water for each unit from the Delaware River through a CWIS, which is located along the west shore of the River, directly in front of the Station. The summer normal net ratings for Eddystone are 380 megawatts for each Unit. Eddystone's average capacity utilization rate (CUR) from 2013 to 2017 was 1.9%. From January through August of 2018, its CUR was 1.0%. Exelon currently anticipates that the units would be retired in 2033. The following explains how the CWIS is designed and works and is based on the application for the ITP, which is also available on NMFS ITP webpage [Incidental Take Permit to Eddystone Generating Station](#).

“The CWIS was designed to reduce fish impingement mortality and entrainment and consists of four separate intake bays (two per unit) (Figure II-3) (Dickinson 1974; Exelon et al. 2008). Each intake bay is divided into two screen wells near the entrance so that two screens and two trash racks can be used to reduce intake velocities (Exelon et al. 2008). There is a curtain wall at the front of the CWIS. After the curtain wall, water passes through vertical-bar trash racks. Each trash rack is approximately 11 feet (“ft”) 2 inches (“in.”) with 0.5 in.-wide bars spaced 3.75 in., center to center. Behind the trash racks, there is an opening to the river to provide a fish escape. A stop log guide behind the fish escape allows each individual intake bay to be sealed off for maintenance. Traveling screens are located in wells behind the stop log guides (Figure II-4) (Exelon et al. 2008).

Each screen well contains a 3/8 in. traveling screen which is located directly on the shoreline and has a through-screen velocity of approximately 0.88 feet per second (“fps”) at mean low water (“MLW”) and design flow (Exelon et al. 2008). Each screen is a 48 ft vertical, chain-link, four post- type machine, on which a continuous series of 54 screen panels travel vertically to collect material from the incoming water. Each screen panel is approximately 10 ft wide and is made of 304 stainless steel mesh. The panels are equipped with debris troughs and a high-pressure spray wash system (HDR 2018c). The Eddystone screens presently run on a timer to operate one rotation every eight hours during non-freezing ambient conditions, one rotation every four hours during freezing conditions, and continuously as needed during the fall leaf season.”

2.3 Alternative 1 No Action Alternative

In accordance with the NOAA Companion Manual (CM) for NAO 216-6A, Section 6.B.i, NMFS is defining the no action alternative as not authorizing the requested incidental take of ESA-listed shortnose and Atlantic sturgeon. This is consistent with our statutory obligation under Section 10(a)(1)(B) of the ESA to either: (1) deny the requested ITP or (2) grant the requested ITP and prescribe mitigation, monitoring, and reporting requirements. Under the no action alternative, NMFS would not issue the ITP, in which case we assume Exelon would continue to operate the Eddystone facility as described in the application without implementing the full suite of specific mitigation measures, monitoring, and reporting explained in the Conservation Plan, and that would be required in the ITP. The CEQ Regulations and the Companion Manual for NAO 216-6A require consideration and analysis of a no action alternative for the purposes of presenting a comparative analysis to the action alternatives. The no action alternative serves as a baseline against which the impacts of the action alternatives will be compared and contrasted.

2.4 Alternative 2 Issuance of the ITP as Requested in Application (Proposed Action)

This alternative involves the operation of Eddystone Generating Station in accordance with the Conservation Plan. As noted in the application and corresponding Conservation plan, Exelon has agreed to fund and implement the Conservation Plan. The overall biological goal of this Plan is to minimize, to the maximum extent practicable, the collection of shortnose and Atlantic sturgeon by the CWIS at the Eddystone facility and to promote the continued recovery of shortnose and Atlantic sturgeon populations in the Delaware. This Plan includes specific minimization and monitoring requirements. In addition, the Conservation Plan also includes an adaptive management strategy to address potential changed circumstances that can be identified. Each of these key plan components is described below.

2.4.1 Minimization, Monitoring, Mitigation and Reporting

To minimize the number of takes associated with the facility operation, Exelon prepared a Conservation Plan that describes measures designed to monitor, minimize, and mitigate, to the maximum extent practicable, the incidental take of shortnose and Atlantic (New York Bight DPS) sturgeon. The goals of the Conservation Plan are to avoid and minimize take, and to aid in the conservation of shortnose and Atlantic (New York Bight DPS) sturgeon in the Delaware River by supporting two initiatives: to build on the existing knowledge of cohorts spawning in the Delaware River; and, to improve knowledge of shortnose and Atlantic sturgeon spatial and temporal use of the freshwater tidal portion of the Delaware River. The ITP, if issued, would require the following mitigation and monitoring measures to avoid or minimize impacts to sturgeon:

Conditions to Monitor, Minimize, and Mitigate Impacts to Listed Species

The following information is contained in Exelon's Conservation Plan. That plan can be accessed on NMFS ITP webpage: [Incidental Take Permit to Eddystone Generating Station](#)

Entrapment Monitoring

Monitoring of the CWIS for the entrainment of Atlantic sturgeon at Eddystone is based on: the established means and methods used during the most recent CWA 316(b) study sampling completed by Exelon; the best available information on Atlantic sturgeon spawning seasons in the Delaware River (i.e., the period(s) when early life-stage Atlantic sturgeon may be susceptible to entrainment at Eddystone); the established knowledge that Atlantic sturgeon early life-stages prefer demersal habitat and their past occurrence in near-bottom entrainment samples; and a monitoring goal of confirming the rate at which early life stage Atlantic sturgeon may be entrained at Eddystone. Monitoring for incidental take of Atlantic sturgeon due to entrainment will specifically consist of the following:

Eddystone will collect entrainment samples during the 17-week period of potential entrainment of Atlantic sturgeon (April through July). On each day of entrainment sampling, samples will be collected over a 24-hour period. The proposed schedule for entrainment sampling is:

- 2 days per week during each week in which Eddystone runs circulating water pumps for two or more days,
- 1 day per week during each week in which Eddystone runs circulating water pumps for one day only, and
- No sampling during each week in which Eddystone does not run circulating water pumps on any days.

Entrainment sampling will be conducted by an experienced biological consulting firm. On each day of sampling, four entrainment samples will be collected at approximately six-hour intervals, resulting in a collection representative of a full 24-hour day. Samples will be collected behind the traveling screens of the operating unit using a permanently mounted sample pipe. A 4-inch pump will pump water from the sample pipe into a 500-micrometer plankton net suspended in a large tank of water. Target sample volume will be 100 m³. Approximately half of the sample volume will be collected from a depth of 32 feet below mean low water (MLW) (i.e., approximately 3 feet above the bottom of the intake forebay), and approximately half of the sample will be collected from a depth of approximately 22.5 feet below MLW. At the end of each sampling period, the net will be washed down so the contents collect in the cod end. The contents of the cod end will be strained through a 500-micrometer sieve, and the material collected on the sieve will be transferred to a labeled sample jar and preserved with formalin.

Preserved samples will be shipped to the contractor's ichthyoplankton laboratory. The field staff will include a Chain of Custody document with each shipment that includes the collection date, collection time, and identification number for each sample in a shipment as well as the total number of samples in the shipment. Upon receipt of the shipment, laboratory staff will verify that all shipped samples were received, and will sign and date the Chain of Custody document. Samples will be sorted by trained technicians and any Atlantic sturgeon larvae will be identified and counted. Exelon will notify NMFS within 24 hours of a confirmed identification of a sturgeon larva.

Exelon will prepare and submit monthly monitoring reports for April through July and an annual monitoring report for each year covered under the ITP. Monthly reports will be submitted within one month of the end of the monthly reporting period, and annual reports will be submitted within three months of the end of the annual reporting period.

Monthly reports will include:

- 1) the volume of cooling water withdrawn on each day of the month;
- 2) the days on which entrainment sampling was scheduled, any reasons sampling did not occur as scheduled, and the days on which sampling was actually conducted;
- 3) the volume of water sampled and the number and life stage of Atlantic sturgeon collected (if any) for each entrainment sample; and
- 4) a narrative describing any issues encountered that interfered with implementation of the Conservation plan.

Annual reports will include:

- 1) an estimate of annual take of Atlantic sturgeon due to entrainment, with a 95% confidence limit, computed using the methods described in Appendix A of the conservation plan;
- 2) an annual data set compiled from the data provided in the monthly monitoring reports; and
- 3) a narrative describing any issues encountered during the year that interfered with implementation of the conservation plan including a description of any corrective actions taken or any proposed issue resolution.

Entrainment monitoring will be conducted for three years following issuance of the ITP. If after three years of monitoring Atlantic sturgeon eggs, larvae or juveniles are collected at a rate significantly above that considered in the ITP, annual monitoring will continue and Exelon will work with NMFS to re-evaluate the relevant provisions of the ITP. Sampling protocols will follow those of the prior three years.

Impingement Monitoring

For impingement, Eddystone will collect impingement samples year-round at the Station for an initial period of three years. Impingement of shortnose and Atlantic sturgeon will be recorded on each day of impingement sampling. Each day of impingement sampling will consist of enumeration of all sturgeon collected in the traveling screen wash water collection basket over a 24-hour period. The proposed schedule for impingement sampling is:

- 1 day per week during each week in which Eddystone runs circulating water pumps for one or more days, and
- No sampling during each week in which Eddystone does not run circulating water pumps on any days.

An experienced biological consulting firm will conduct impingement sampling once per week for every week when the circulating water pumps are in operation throughout the year. On each day of sampling, a single 24-hour sample will be collected. Prior to initiation of sampling, the screens, screenhouse, and sluiceways will be flushed of fish and debris by operating the screens continuously for one full rotation. Additionally, contents of the screen-wash dumpster will be flattened and a layer of plastic sheeting will be put down to separate fish collected during the 24-hour sampling period from previously collected fish and debris. At the end of each sampling period, all fish on top of the layer of plastic sheeting will be separated from the debris, and any shortnose or Atlantic sturgeon will be identified and assessed to determine live/dead status.

If a live shortnose or Atlantic sturgeon is collected in an impingement sample, the following handling procedures will be followed:

1. The personnel handling the sturgeon will put on the appropriate protective equipment as expeditiously as possible while ensuring personnel safety.
2. The live sturgeon will be placed in a tub filled with ambient river water of a sufficient depth to cover the fish.
3. The following information will be collected while giving priority to sturgeon survival over data collection: fork length (cm); photographs of the dorsal, ventral, and lateral sides of the sturgeon; and documentation of any external tags or markings.
4. The sturgeon will be returned to the river as quickly and gently as possible.

For dead shortnose and Atlantic sturgeon, the following procedures will be followed:

1. The fish will be measured and fork length and total length (cm) will be recorded; photographs of the dorsal, ventral, and lateral sides of the sturgeon will be taken; and external tags or markings will be documented.
2. The dead sturgeon will be retained by the monitoring crew and stored frozen until its disposition is discussed with NMFS.

Exelon will notify NMFS within 24 hours of a confirmed identification of a shortnose or Atlantic sturgeon collected in impingement sampling. Additionally, Exelon will include prepare and submit monthly monitoring reports and an annual monitoring report for each year covered under the IITP. Exelon will submit monthly reports within one month of the end of the monthly reporting period, and annual reports within three months of the end of the annual reporting period.

Monthly reports will include:

- 1) the volume of cooling water withdrawn on each day of the month;
- 2) the days on which impingement sampling was conducted;
- 3) the volume of water sampled and the number of shortnose or Atlantic sturgeon collected, if any, along with any additional information collected, as described in the handling procedures above;
- 4) a narrative describing any issues encountered that interfered with implementation of the Conservation plan.

Annual reports will include:

- 1) an estimate of annual take of shortnose and Atlantic sturgeon due to impingement;
- 2) an annual data set compiled from the data provided in the monthly monitoring reports; and
- 3) a narrative describing any issues encountered during that year that interfered with implementation of the Conservation plan, including a description of any corrective actions taken or any proposed issue resolution.

The monitoring and data that Eddystone will provide through this sampling will benefit the species by filling knowledge gaps, thereby enabling informed and tailored actions to protect and conserve shortnose and Atlantic (NY Bight DPS) sturgeon. Additionally, for encounters during impingement sampling associated with CWIS operations, the impingement sampling plan includes handling procedures focused on reducing stress and quickly releasing sturgeon. The sampling plans for both entrainment and impingement include notification and reporting procedures.

Vessel Deliveries

In order to monitor for take, Exelon will submit an annual report to NMFS documenting the date, duration, and number of one-way vessel trips to and from Eddystone. In the event that the number of vessel trips exceeds the greatest annual number used to estimate take in the application (i.e., ten one-way trips), Exelon would submit the report within 30 days of the completion of the eleventh trip.

Avoidance and Minimization Measures

Exelon will only operate Eddystone's circulating water pumps:

- 1) when the Station is generating electricity, which includes 2 days for ramp-up (which includes 36 hours to address contingencies) and 10 days for ramp-down; and
- 2) for incidental maintenance or testing (generally once per month) (referred to collectively as "Essential Station Operations"); or as required by a governmental agency or other entity with jurisdiction to require operations.

Exelon will also limit operations to one circulating water pump per unit when possible. In addition, Exelon will rely on the river water pumps to provide cooling water for other critical Station operations outside of Essential Station Operations. Circulating Water Pumps are used to provide cooling water to the unit during Station operation. Whereas a River Water Pump is designed to provide cooling water to cool the auxiliary plant equipment and for miscellaneous uses (Exelon et al. 2008). They are both part of the CWIS and can lead to entrainment, but the River Water Pump has a much smaller capacity and is therefore less likely to take sturgeon. These measures will avoid and minimize the incidental take of sturgeon due to entrainment or impingement by eliminating or reducing water withdrawals at times when such withdrawals are not specifically required for Essential Station Operations or for governmental agency-mandated use (See **II.A.2 Cooling Water Intake Structure Operations** in the Conservation Plan).

Exelon will make all reasonable efforts to schedule fuel oil deliveries outside of the March 15-July 15 time period. For oil deliveries scheduled between March 15 and July 15, the monitoring plan described above will be implemented.

2.5 Alternatives Considered and Eliminated

In coordination with the applicant, NMFS considered other alternative, but did not carry them forward for additional analysis. We considered issuance of a five year ITP instead of ten year ITP. This alternative was eliminated because given the rarity of Atlantic sturgeon entrainment events and shortnose and Atlantic sturgeon impingement events, it is possible that five years is not enough time to better inform the likelihood of entrainment and impingement at Eddystone. Additionally, processing a new request within five years would be burdensome to the agency and Exelon with no added benefit for the species. Exelon also proposed and evaluated other alternatives in their Conservation Plan. These included (1) retrofitting the Station to operate with a closed-cycle recirculating system ("CCRS") utilizing plume-abated mechanical draft cooling towers; (2) installation of fine-mesh modified Ristroph traveling screens ("MRTS") and a fish handling and return system; (3) rebuilding the existing intake to utilize cylindrical wedgewire screens ("CWS"); (4) replacing the existing constant speed pumps with variable speed pumps ("VSPs"); (5) retrofitting the Station's existing traveling screens to MRTSs with a fish handling and return system; and (6) receiving fuel oil via rail or tanker truck delivery. While each of these options have the potential to reduce the likelihood of mortality from facility operations, these

would require changes and modifications to facility operations that are not technically or economically feasible to implement for the reasons explained in greater detail in Exelon's application and conservation plan..

3. Affected Environment and Environmental Consequences

NMFS reviewed all relevant environmental, cultural, historical, social and economic resources based on the specific geographic region associated with NMFS' proposed action and alternatives and Exelon's request for a permit. Based on this review, this chapter describes the affected environment and existing (baseline) conditions and the analysis of environmental impacts associated with the affected environment. As explained in Chapter 1, certain resource categories were not carried forward for further consideration or evaluation in this EA (see Table 1 in Section 1.5) and where appropriate, NMFS relied on and incorporated by reference information in the Application and Conservation Plan related to resource categories and environmental impacts.

3.1 Physical and Biological Environment

This section discusses the physical and biological environments associated with the underlying activity, which is the facility location and operation.

3.1.1 Physical Environment

The action area is the Delaware in the immediate vicinity of Eddystone Generating Station's CWIS, including the circulating water pumps ("CWPs") and the river water pumps ("RWPs") and the portions of the waterway affected by delivery of fuel oil via barge necessary to support the Station's natural gas/No. 2 fuel oil-fired units' operations. **Figure 1** depicts the facility grounds. A detailed description of the action area and associated maps can be found in the Application and Conservation Plan and can be found on NMFS ITP webpage: [Incidental Take Permit to Eddystone Generating Station](#).



Figure 1 Eddystone Generating Station (Source: Eddystone Application and Conservation Plan)

The primary component of the physical environment is the habitat it provides for sturgeon. The facility's CWIS is fed from the Delaware River, which provides habitat for shortnose and Atlantic sturgeon and contains listed critical habitat for the New York Bight DPS of Atlantic sturgeon.

New York Bight DPS Critical Habitat

On August 17, 2017, NMFS issued a final rule to designate critical habitat for the threatened Gulf of Maine DPS of Atlantic sturgeon, the endangered New York Bight DPS of Atlantic sturgeon, the endangered Chesapeake Bay DPS of Atlantic sturgeon, the endangered Carolina DPS of Atlantic sturgeon, and the endangered South Atlantic DPS of Atlantic sturgeon (82 FR 39160). The rule was effective on September 18, 2017. The action area being reviewed overlaps with the Delaware River critical habitat designated for the New York Bight DPS. The physical or biological features identified in the critical habitat designation for the New York Bight DPS of Atlantic sturgeon include: hard bottom substrate in low salinity waters; aquatic habitat with a gradual downstream salinity gradient and soft bottom substrate; waters that allow unimpeded movement, staging, and resting; and water with appropriate temperature, salinity, and oxygen for critical life history functions. The action (i.e. Issuance of the ITP) will not destroy or adversely modify the critical habitat designated for the New York Bight DPS. The action area encompasses a very small portion of the listed critical habitat and will not affect the physical aspects of the habitat. However, the operation of the Eddystone's CWIS could potentially influence available prey for Atlantic sturgeon. Exelon evaluated the potential effects of the CWIS on prey availability in their Conservation Plan. We assessed that information and accept their rationale. The following is an excerpt from the Conservation plan.

“NMFS's critical habitat designation determined that a key conservation objective for the New York Bight DPS of Atlantic sturgeon is to increase abundance by facilitating increased reproduction and recruitment to the marine environment. The final rule specifically recognized that, “the ability of subadults to find and access food is necessary for continued survival, growth, and physiological development to the adult lifestage” (NMFS 2017b). *Gammarus* spp. are among the most abundant macroinvertebrates in the Delaware, and this taxon has been identified as an important component of age-0 Atlantic sturgeon diets in the St. Lawrence Estuary (Guilbard et al. 2007; Nellis and Munro 2007). *Gammarus* spp. are entrained at Eddystone, and this taxon was enumerated in entrainment samples collected during 2017. To evaluate the potential for entrainment of prey species to affect critical habitat for Atlantic sturgeon, entrainment densities of *Gammarus* spp. were compared to *Gammarus* spp. densities in the Delaware in the vicinity of Eddystone. Abundance of *Gammarus* spp. was evaluated from 2002 to 2004 as part of Public Service Enterprise Group's Biological Monitoring Program, the most recent study on *Gammarus* spp. in the Delaware. Ichthyoplankton trawls were conducted between April and July, and densities of target taxa, including *Gammarus* spp., were reported for each sampling zone. In the zone closest to the Station, mean monthly densities (n/1,000 m³) of *Gammarus* spp. ranged from 4,945 to 367,535 between April and July with a mean seasonal density of 143,794 (Table VI-1) (PSEG 2002, 2003, 2004). Monthly mean entrainment densities (n/1,000 m³) at Eddystone between April and July during 2017 ranged from 734 to 6,148 with a seasonal mean density of 3,349 (NAI 2018), approximately 97.7% lower than the

mean density in the River in the vicinity of the Station over the period when the ichthyoplankton trawl was conducted (Table VI-1).

The mean discharge rate of the Delaware River from April through July was 13,559.28 cfs (8,763.59 MGD) over the period from 1970 to 2016 (USGS 2018a). Average actual intake flows at the Station from 2013 to 2017 for the same seasonal period was 277.3 MGD (Table II-2), approximately 3.16% of the River's discharge. Given the low entrainment density of *Gammarus* spp. compared to the density in the River in the vicinity of the Station and the low water withdrawal rate compared to the discharge rate of the Delaware, entrainment of *Gammarus* spp. at Eddystone is not expected to significantly deplete the forage base for Atlantic sturgeon and would, therefore, not result in adverse modification of critical habitat for this species."

3.1.2 Biological Environment

The primary component of the biological environment affected by the proposed action and alternatives are two sturgeon species, shortnose and Atlantic sturgeon NYB DPS, which would be directly impacted by the incidental take associated with the operation of the Eddystone facility. Below is a brief background on each species. No other endangered or threatened species would be affected by issuance of the proposed permit.

Shortnose Sturgeon

Shortnose sturgeon were listed as endangered in 1967 ([32 FR 4001](#)), and the species remained on the endangered species list with the enactment of the ESA in 1973. The species remains listed as endangered throughout its range. Shortnose sturgeon occur in estuaries and rivers along the east coast of North America (Vladykov and Greeley 1963). Their northerly distribution extends to the Saint John River, New Brunswick, Canada, which has the only known population in Canada (Scott and Scott 1988). Their southerly distribution historically extended to the Indian River, Florida (Everman and Bean 1898). At this time critical habitat has not been designated for this species.

Shortnose sturgeon spend most of their life in their natal river systems, only occasionally entering the marine environment. The species appears to be estuarine anadromous in the southern part of its range, but in some northern rivers, it is "freshwater amphidromous" (i.e., adults spawn in freshwater but regularly enter saltwater habitats during their life (Kieffer and Kynard 1993). Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985).

Current Status Range-wide

There is no current total population estimate for shortnose sturgeon range wide. In general, populations in the Northeast are larger and more stable than those in the Southeast (SSSRT 2010). Population size throughout the species' range is considered to be stable; however, most riverine populations are below the historic population sizes and most likely are below the carrying capacity of the river (Kynard 1997, Kynard *et al.* 2016).

Delaware River

Shortnose sturgeon range from the Delaware Bay up to at least Scudders Falls (RKM 223); there are no dams within the species' range on this river. The population is considered stable (comparing 1981-1984 to 1999-2003) at around 12,000 adults (ERC 2006, as cited in NMFS 2018, Hastings et al. 1987). Spawning occurs primarily between Scudders Falls and the Trenton rapids. Overwintering and foraging also occur in the river. Shortnose sturgeon have been documented to use the Chesapeake-Delaware Canal to move from the Chesapeake Bay to the Delaware River.

Detailed information on the status of shortnose sturgeon, including information on population structuring, taxonomy and life history, distribution and abundance, and threats throughout each range, can be found on NMFS website: <https://www.fisheries.noaa.gov/species/shortnose-sturgeon> and in the [Biological Assessment of Shortnose Sturgeon](#). Additionally, a more detailed description of the status of shortnose sturgeon in the Delaware River is available in the Conservation Plan and can be found on NMFS ITP webpage: [Incidental Take Permit to Eddystone Generating Station](#)..

Atlantic Sturgeon|

On February 6, 2012, NMFS listed the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs as endangered, and the Gulf of Maine DPS as threatened ([77 FR 5880](#) and [77 FR 5914](#)). On August 17, 2017, NMFS designated critical habitat for this species including the reach of the Delaware from the Trenton-Morrisville Route 1 Toll Bridge downstream to where the river mouth discharges into Delaware Bay. However, based on tagging records and the relatively low rate of gene flow reported in population genetic studies provide evidence that Atlantic sturgeon return to their natal river to spawn (ASSRT 2007), thus, for the purposes of this analysis, all Atlantic sturgeon larvae entrained during Eddystone operations are considered to belong to the NYB DPS of Atlantic sturgeon. Similarly, because adult Atlantic sturgeon enter the freshwater of their natal river to spawn, and Eddystone is located within the tidal, freshwater reach of the Delaware River, any adult Atlantic sturgeon impinged at Eddystone is expected to belong to the NYB DPS.

Current Status

The New York Bight DPS includes the following: all anadromous Atlantic sturgeon spawned in the watersheds that drain into coastal waters from Chatham, MA to the Delaware-Maryland border on Fenwick Island. Within this range, Atlantic sturgeon historically spawned in the Connecticut, Delaware, Hudson, and Taunton Rivers (ASSRT 2007, Hilton et al. 2016, Murawski and Pacheco 1977, Secor 2002). Currently New York Bight DPS spawn in the Hudson and Delaware rivers and dams do not block access to historical habitat. While genetic testing can differentiate between individuals originating from the Hudson or Delaware Rivers the available information suggests that the straying rate is high between these rivers. There are no empirical abundance estimates of the number of Atlantic sturgeon in the New York Bight DPS.

Detailed information on the status of Atlantic sturgeon, including information on population structuring, taxonomy and life history, distribution and abundance, and threats throughout each range, can be found on NMFS website: <https://www.fisheries.noaa.gov/species/atlantic-sturgeon> and in the [Atlantic sturgeon status review \(ASSRT 2007\)](#). Additionally, a more detailed description of the status of Atlantic sturgeon in the Delaware River is available in the Conservation Plan Plan and can be found on NMFS ITP webpage: [Incidental Take Permit to](#)

[Eddystone Generating Station](#). We will also provide additional information in the final EA from the Biological Opinion that is currently being prepared for the proposed action.

3.2 Environmental Consequences Common to All Alternatives

This section address the relevant direct, indirect, and cumulative impacts to shortnose and Atlantic sturgeon associated with the alternatives.

3.2.1 *Incidental Take of Shortnose and Atlantic Sturgeon*

3.2.1.1 *Entrainment*

Entrainment means the transport through the cooling water system of sturgeon that pass through the 3/8 in. mesh openings of the intake screens, as they are too small to be retained by the traveling screens. Planktonic organisms are susceptible to entrainment because their small size and limited swimming ability reduce the potential for escape from the entrained water mass and allow passage through the mesh of the traveling screens. Entrained fish are typically limited to the younger life stages of fish and this is the case for Atlantic sturgeon. Any entrained larvae pass through the circulating pumps and condenser tubes along with the cooling water. The cooling water and any entrained fish larvae then enter the discharge canal or conduit for return to the Estuary. During their passage through the plant, entrained individuals experience a variety of stresses, some of which may cause death. Survival rates for fish larvae entrained by power plants depend on the species' hardiness as well as their responses to thermal stresses.

3.2.1.2 *Impingement*

Impingement means physical contact with the intake screens during Eddystone's withdrawal of cooling water by sturgeon large enough to be retained by the 3/8 in. traveling screens. To keep condensers from clogging with solid materials and biota, power plant cooling water intake systems use a combination of large- and finer-mesh screens. Typically, the large-mesh screens or bar racks (3-4 in. slot width) are fixed in place while the finer-mesh screens can move to facilitate cleaning. These movable screens are called traveling screens. As the water passes through these screens, organisms larger than the mesh openings, such as larger invertebrates and fish, can be impinged against the screens. Because their more limited swimming abilities, most fish impinged are less than 1 year old. Various screen wash systems are employed for periodically removing impinged fish from the screens and returning them to the Estuary. Continuous rotation of traveling screens, as employed at Eddystone, reduces the amount of time the fish are in contact with the screen and substantially increases post-impingement survival. The survival rate for impinged fish is species specific, varies with size and season, and depends on several other power plant-related factors, such as intake velocity, plant design, and operating conditions.

3.2.1.3 Vessel Deliveries

The effects of vessels on Atlantic sturgeon may involve disturbance or injury/mortality due to collisions or entanglement in anchor lines. Large vessels have been typically implicated because of their deep draft relative to smaller vessels, which increases the probability of vessel collision with demersal fishes like sturgeon, even in deep water (Brown and Murphy 2010). Vessel deliveries are not expected to result in take of shortnose sturgeon.

3.3 Effects of the Take Under the No Action Alternative

If an ITP is not issued to Exelon, for the purposes of this analysis, NMFS assumes that status quo for the facility would be maintained. While NMFS cannot know what measures the Exelon would implement absent the ITP, thus, the assumption is that Exelon would maintain normal operations of the Eddystone Generating Station without the full suite of measures to monitor, minimize, and mitigate the impact of incidental take under the proposed Conservation Plan. Thus, the reduction in adverse impacts that are expected for the species from implementing that full suite of measures would not be achieved. Additionally, if no ITP is issued, Exelon would not receive an exemption from the ESA prohibitions against take; therefore, any incidental take of shortnose or Atlantic sturgeon resulting from the operation of the facility would not be exempt from the ESA's prohibitions on take. If Exelon continued to operate Eddystone Generating Station without an ITP, and take did occur, Exelon Generating Company, LLC, could be liable to third party lawsuits and enforcement actions for violating the ESA and illegally taking endangered or threatened species

3.4 Effects of Take under Alternative 2- Issue Permit as Requested in Application (Proposed Action)

This subsection discusses estimated incidental take specific to the two sturgeon species, the shortnose sturgeon and Atlantic sturgeon, which are the subject of the ITP request. Details regarding the methodology used to estimate the number of incidental takes of larvae and adult sturgeon over the next ten years included in Exelon's Conservation Plan, is available on NMFS ITP webpage, [Incidental Take Permit to Eddystone Generating Station](#).

Effects due Entrainment

Entrainment sampling was conducted at Eddystone in 2005, 2006, 2016, and 2017. One Atlantic sturgeon yolk-sac larva was collected in the three years of sampling (sampling design, including sampling intensity and months of sampling, and sampling methods for each year are summarized in Appendix A of the Conservation Plan. Since the entrainment of a single Atlantic sturgeon larvae, in May 2017, as a result of Exelon's CWA 316(b) sampling, Exelon anticipates that entrainment as a result of CWIS operations can occur. Exelon used data, including the take of Atlantic sturgeon larvae, associated with the CWA 316(b) entrainment sampling and scaled upward to reflect intake flows at Eddystone to estimate the probability and number of Atlantic sturgeon larvae that might be entrained when the circulating cooling water system is in operation. Based on this approach, Exelon estimated the incidental take of 3 Atlantic sturgeon larvae per year during sampling, which is commensurate with the annual take estimate of 3 age-1 equivalents due to entrainment as a result of CWIS operations.

The effects of entrainment associated with Eddystone's CWIS operations are not likely to result in adverse effects to Atlantic sturgeon NYB DPS or further reduce the likelihood of the survival and recovery of the species in the wild. This is because if any larvae were entrained, extending these losses over the 10-year term of a permit should not have a measurable effect on the size, reproductive potential, or growth of the Atlantic sturgeon NYB DPS because the loss of larvae, even at potentially high numbers, is small compared to the number of eggs that an individual female can produce (from 800,000 to 2.4 million eggs) when it spawns (Smith 1985).

Shortnose sturgeon have low vulnerability to entrainment from operation of Eddystone's CWIS because the Shortnose sturgeon spawn in the northern most areas of the Estuary (between Trenton and Lambertville and eggs and larvae rear above RKM 214 (NMFS 2017³). Therefore, early life stages would not be expected to occur near Eddystone. In addition, shortnose sturgeon eggs are demersal and adhesive and, upon hatching, yolk-sac larvae and larvae seek cover on the bottom. As a result, the eggs and larvae of shortnose sturgeon are located primarily upstream of RM 136, well upriver of Eddystone's CWIS. Thus, few entrainable life stages of shortnose sturgeon occur near Eddystone. The preference of shortnose sturgeon larvae for deeper waters and their benthic orientation, coupled with the fact that the intake system is located along the shore, additionally reduces the possibility of their entrainment at Eddystone. Based on these factors, we determined the effects of entrainment are not likely to result in adverse effects to Shortnose sturgeon or further reduce the likelihood of the survival and recovery of the species in the wild.

Estimates of Impingement

Impingement sampling was conducted at Eddystone in 1976-1978, 1987-1992, and 2005-2006. No shortnose or Atlantic sturgeon were collected during those years of impingement sampling. Data from those impingement sampling programs were used to estimate average annual numbers of shortnose and Atlantic sturgeon potentially impinged at Eddystone. Exelon estimated the annual incidental take of three young-of-the-year (YOY) or older for both shortnose and Atlantic sturgeon collected in impingement sampling. Based on modeling described in the Conservation Plan, we assume a maximum of seven YOY or older shortnose and Atlantic sturgeon would be taken by impingement annually

According to Exelon, the traveling screens at Eddystone have a through-screen velocity of 26.8 cm/s (0.88 fps) and an approach velocity of 13.1 cm/s (0.43 fps) at mean low water when Eddystone is operating at design flow. Adult Atlantic sturgeon should be able to avoid impingement at velocities up to 3 fps (NMFS 2013), velocities well in excess of those experienced at the Station's CWIS. Additionally, juvenile Atlantic sturgeon should be capable of avoiding impingement at velocities equal to or greater than those experienced at Eddystone based on swim tunnel performance studies of juvenile and sub-adult Atlantic, white, and lake sturgeon that have demonstrated that fish are capable of burst swim speeds of approximately 65 cm/s (2.1 fps) and prolonged swim speeds of 45 cm/s (1.5 fps) (NMFS 2014). Therefore, the potential for impingement of Atlantic sturgeon on the traveling screens at Eddystone is likely very low.

³ https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/garfo_master_esa_species_table_-_shortnose_sturgeon_09172018.pdf

Based on the distribution of shortnose sturgeon concentration areas (up river of Eddystone), juvenile and adult shortnose sturgeon are unlikely to frequent the action area and appear to have relatively low vulnerability to impingement at Eddystone. Further, juvenile shortnose sturgeon prefer the deeper waters of channel areas, where they are found on the bottom. This deep benthic orientation, combined with the fact that the intakes of these power plants are located along the shore, further reduces vulnerability to impingement at Eddystone.

Because future operation of Eddystone is expected to be similar to that observed in the past, it is reasonable to expect that impingement of shortnose and Atlantic sturgeon juveniles and adults in the near-term future will be unlikely, but not impossible. It is possible that impingement risk could increase over the ITP term if abundance of these species were to increase in the Delaware River. Based on these data, NMFS concludes that an annual incidental take of shortnose and Atlantic sturgeon through impingement of less than 3 observed through sampling and 7 overall, will not significantly affect the continued recovery of these populations in the Delaware River. It is also important to recognize that many impinged fish survive once returned to the Estuary such that lethal take due to impingement will be considerably lower. Hardier species, like sturgeon, are likely to exhibit extremely high survival after impingement (Muessig et al. 1988; Fletcher 1990).

Vessel deliveries

There are thousands of vessels operating in the action area (Delaware River) each year. Given the high amount of vessel traffic in this area, the increase in vessel traffic due to vessel deliveries to Eddystone is extremely small (5 round trips). Therefore, the corresponding increase in risk of strike is very small and cannot be implicitly measured or detected. Nevertheless, the effects of this action are not believed to be significant. Additionally, vessel strikes are thought to predominantly occur between May through July and likely affect adults migrating through the river to spawning grounds (Brown and Murphy 2010). Exelon proposes to make all reasonable efforts to schedule fuel oil deliveries outside this timeframe. Thus Exelon requests a ten-year take limit for vessel activity of 1 Atlantic sturgeon, commensurate with the rounded up value of 0.3 Atlantic sturgeon over 10 years.

3.5 Cumulative Impacts

In reviewing the definition of cumulative effects, per 40 CFR 1508.7⁴, information provided in the application about the project area along with a query of the NMFS Authorizations and Permits for Protected Species (APPS) system and review of recently completed Biological Opinions⁵, we identified several past, current and reasonably foreseeable future activities.

⁴ “Cumulative effects is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time”.

⁵ Biological Opinion for the Deepening and Maintenance of the Delaware River Federal Navigation Channel, December 2018 and the Biological Opinion for the Delaware River Partners Gibbstown Terminal and Logistic Center Development, December 2017

Table 2 Activities and Projects Considered for Potential Cumulative Impacts

Activity/Project	Time Frame	Potential Impact to Sturgeon
<p>Crown Landing LNG Project Construct and operate a Liquefied Natural Gas (LNG) import terminal on the banks of Delaware River</p>	<p>Construction has not begun and would require re-initiation of the consultation</p>	<p>Incidental Take Statement (ITS) exempting the take (lethal entrainment in cutterhead dredge) of up to 3 shortnose sturgeon during the initial dredging needed to create the berthing area and the death of up to an additional 3 shortnose sturgeon over the first ten years of maintenance dredging. The opinion on the action concluded that the construction of the project was not likely to jeopardize the continued existence of shortnose sturgeon.</p>
<p>Salem and Hope Creek Nuclear Generating Stations Located on adjacent sites within a 740-acre parcel of property at the southern end of Artificial Island in Lower Alloways Creek Township, Salem County, New Jersey.</p>	<p>Salem Unit 1 is authorized to operate until 2036 and Salem Unit 2 until 2040. Hope Creek is authorized to operate until 2046.</p>	<p>The opinion on the action concluded that the continued operation of the Salem 1, Salem 2 and Hope Creek Nuclear Generating Stations through the duration of extended operating licenses may adversely affect but is not likely to jeopardize the continued existence of any listed species.</p>
<p>Delaware River Partners (DRP) Marine Terminal Develop a multiuse deep-water seaport and international logistics center on a portion of the former Dupont Repauno Property in Gibbstown, New Jersey.</p>	<p>Valid until 2047</p>	<p>The opinion on the action concluded that construction activities were not likely to adversely affect listed species. ITS exempting the take up to six adult Atlantic sturgeon during the 30 years of terminal operation. Additionally, up to one adult shortnose sturgeon will be taken during 30 years of terminal operation.</p>
<p>Hal Brundage of Environmental Research and Consulting, Inc. Scientific research Permit (#19331)</p>	<p>Expires on June 30, 2021</p>	<p>For shortnose sturgeon, authorized to handle up to 420 adults, sub-adults, and juveniles, and to anesthetize two additional sets of 30 adults/sub-adults and 30 juveniles and to surgically implant them with acoustic transmitters. An additional sub-set of 20 adults/sub-adults will be tethered in a nylon sock for remote hydro-acoustic testing. For Atlantic sturgeon, authorized to handle up to 430 juveniles. In addition, 70 adult/sub-adult may be captured with a sub-set of 20 of these that tethered in a nylon sock for remote hydro-acoustic testing. Samples of 500 early life stages of both species may be collected. There will be up to two incidental mortalities of each species each year, but no more than one adult of each species is anticipated.</p>
<p>Dr. Dewayne Fox of Delaware State University Scientific research permit (#20508)</p>	<p>Expires on March 31, 2027</p>	<p>Targeting both Atlantic (n=1701) and shortnose (n=501) sturgeons in mid-Atlantic ocean, bay, and river environments, specifically the Delaware River/Estuary, Hudson River/Estuary, and coastal environment between Virginia and New York. One unintentional mortality of an adult is anticipated for both sturgeon species.</p>

Activity/Project	Time Frame	Potential Impact to Sturgeon
Stonybrook and Monmouth Universities Research permit (#20351)	Expires on March 31, 2027	Plan to capture and release 1035 Atlantic sturgeon and 470 shortnose sturgeon to meet the objectives outlined above. Within the Delaware River/Bay, one unintentional mortality of an adult (NYB DPS) Atlantic sturgeon and two unintentional mortalities of juvenile Atlantic sturgeon (NYB DPS) are anticipated.
Department of Natural Resources and Environmental Control (DNREC) Research permit (#19255)	Expires on February 5, 2020	Annual take activities (capture and release) include capturing up to 50 juvenile shortnose sturgeon and 10 adult/sub-adult shortnose sturgeon. Concurrent takes of 175 Atlantic sturgeon juveniles and 10 adult/sub-adult also may occur each year. Fifteen other juvenile shortnose and 30 other juvenile Atlantic sturgeon will be anesthetized and implanted with acoustic transmitters; 30 other juvenile Atlantic sturgeon would be gastric lavaged for diet analysis; and another 30 other Atlantic sturgeon would be fin ray sampled for age analysis. One unintentional mortality of an adult/sub-adult/juvenile of each species, annually (but not to exceed 2 adults or sub-adults of each species over the life of the permit)
Deepening and Maintenance of the Delaware River Federal Navigation Channel		The proposed action has the potential to result in the mortality of shortnose sturgeon, and individuals from the New York Bight, Gulf of Maine, Chesapeake Bay and South Atlantic DPSs of Atlantic sturgeon due to entrainment in hopper or cutterhead dredges, entrapment in mechanical dredges, relocation trawling, and blasting activities. In the Opinion completed in December 2018, it was determined that the take associated with this action may adversely affect, but is not likely to jeopardize the continued existence of listed species.
Weeks Marine Inc. Blanket Dredging Maintenance dredging of 31 port facilities along the Delaware and Schuylkill Rivers.	Valid until 2024; No dredging will take place between March 15 and June 30 of any year.	Determined that all effects to endangered Atlantic and shortnose sturgeon would be insignificant and discountable. The 31 port facilities are located in New Jersey's Mercer, Burlington, Camden, and Gloucester counties, Pennsylvania's Delaware, Bucks and Philadelphia counties, and Delaware's New Castle County.

Activity/Project	Time Frame	Potential Impact to Sturgeon
State Water Fisheries	Ongoing	In the past, it was estimated that over 100 shortnose sturgeon were captured annually in shad fisheries in the Delaware River, with an unknown mortality rate (O’Herron and Able 1985); no recent estimates of captures or mortality are available. Atlantic sturgeon were also likely incidentally captured in shad fisheries in the river; however, estimates of the number of captures or the mortality rate are not available. Recreational shad fishing is currently allowed within the Delaware River with hook and line only; commercial fishing for shad occurs with gill nets, but only in Delaware Bay. Shortnose and Atlantic sturgeon continue to be exposed to the risk of interactions with this fishery; however, because increased controls have been placed on the shad fishery, impacts to shortnose and Atlantic sturgeon are likely less than they were in the past (NMFS 2018).
Vessel Activity on the Delaware	Ongoing	Vessel traffic, including commercial cargo ships, tankers, tug boats, fishing boats, and recreational motorboats, has been identified as a source of sturgeon mortality (ASMFC 2017). The factors relevant to determining the risk to sturgeon from vessel strikes are currently unknown. However, we expect they are related to size and speed of the vessels, navigational clearance (i.e., depth of water and draft of the vessel) in the area where the vessel is operating, and the behavior of sturgeon in the area (e.g., foraging, migrating, etc.). Data on the potential impact of vessel activity was taken from the Biological opinions listed above: “Data combined from Delaware’s Department of Natural Resources and Environmental Control (DNREC) and the Atlantic sturgeon salvage program from recovered carcasses in the Delaware River and Estuary indicate that between 2005 and 2016, 92 sturgeon mortalities were attributable to vessel strikes (an additional 47 had an unknown cause of death).”

Shortnose and Atlantic sturgeon are the only resources identified as being potentially affected by issuance of this ITP. The impact of the potential low level of authorized take of shortnose and Atlantic Sturgeon, when added to other past, present and reasonably foreseeable future projects in the Delaware River, discussed above, is not expected to result in population-level effects for shortnose or Atlantic sturgeon. Additionally, the proposed action is not expected to have impacts on shortnose sturgeon habitat or Atlantic sturgeon habitat or critical habitat.

3.6 Conclusion

In general, it is possible for the loss of individuals from a DPS or species to effect reproduction rates and distribution of a species. However, this is only likely to occur when there are very few individuals in a population, the individuals occur in a very limited geographic range or a species has extremely low levels of genetic diversity. However, as indicated in Section 3.1.2 of this EA,

this is not the case for the shortnose sturgeon or the Atlantic sturgeon. For the Atlantic sturgeon, larvae removed by Eddystone operations would represent a small fraction of the larvae produced by the spawning population of Atlantic sturgeon in the Delaware River and for the shortnose sturgeon, take due to entrainment is not believed to occur. In absence of these factors and the estimated number of incidental takes that would be authorized by the issuance of an ITP to Exelon, we do not expect adverse impacts to either of these sturgeon species or populations. Finally, based on the considerations identified in this EA regarding potential impacts to shortnose and Atlantic sturgeon, we preliminarily determined that Alternative 2 would not have significant direct, indirect or cumulative impacts to shortnose and Atlantic sturgeon. . In addition, data collected through mitigation measures and reporting that will be required in the ITP and Conservation plan will help inform and fill data gaps for the species.

4. List of Preparers and Agencies Consulted

This document was prepared by the Endangered Species Conservation Division of NMFS' Office of Protected Resources (F/PR3) in Silver Spring, Maryland.

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