UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

February 24, 2023

Lynne Jennings
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U.S. EPA, Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

RE: "Not Likely to Adversely Affect" Programmatic for NPDES Permits in U.S. Environmental Protection Agency Region 1 (EPA NLAA Programmatic)

Dear Ms. Jennings:

We have completed an informal, programmatic consultation pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended, for activities regularly permitted, funded, or otherwise carried out by the U.S. Environmental Protection Agency (EPA). EPA has determined that these activity types and stressor categories, provided they meet the project design criteria (PDC) outlined in this programmatic consultation, are not likely to adversely affect (NLAA) ESA-listed species and designated critical habitat. EPA and NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) agreed to collaborate to create the EPA NLAA Programmatic for NPDES Permits in U.S. EPA Region 1 (as referred to herein as the EPA NLAA Programmatic) during a March 17, 2020 virtual meeting. Through this collaboration, EPA prepared a Biological Assessment (BA), which consists of specific procedures, activity types, and species-specific criteria to minimize adverse effects to ESA-listed species and their habitats from projects, individually or in aggregate, to insignificant and/or discountable levels. We concur with EPA that the activity types and stressor categories addressed herein are not likely to adversely affect ESA-listed species and designated critical habitat under our jurisdiction. This programmatic consultation is effective upon the date of signature of this letter. Together with the PDC, verification form, and standard operating procedures (SOPs) that are attached to this document, this programmatic consultation and concurrence form the basis of the EPA NLAA Programmatic.

Programmatic section 7 consultation can achieve several objectives with positive administrative benefits including streamlining the consultation process between the action agency and us. In this specific case, we have worked cooperatively with EPA to develop specific PDC to be applied to projects proposed for authorization under EPA NPDES permits. These PDC will ensure that all activities, individually and in the aggregate, that "may affect" ESA-listed species and critical habitat under our jurisdiction are "not likely to adversely affect" these species nor critical habitat, and that any effects from those activities to species and critical habitat proposed, listed, or designated by us would be insignificant, discountable, or wholly beneficial. Insignificant effects are so minimal they cannot be measured, whereas discountable effects are those extremely unlikely to occur, and beneficial effects are those with positive impacts and no associated adverse impacts.

You have made the determination that the authorization of activities that generally fall into four categories (Table 1) and are at or below certain stressor thresholds outlined in this programmatic consultation may affect but are not likely to adversely affect species and critical habitats listed by us (Tables 3, 4, and 5).

You made the preceding determinations based on several factors including the implementation of the PDC. We have worked cooperatively to develop a framework for the project screening process that identifies activities that may need further review by us. Our analysis and support for our concurrence with your “not likely to adversely affect” determination on the four activity types and stressor categories is provided below.

Programmatic Consultation Background Information

We have developed a range of techniques to streamline the procedures and time involved in consultations for broad agency programs or numerous similar activities with predictable effects on ESA-listed species and critical habitat. Some of the more common of these techniques, and the requirements for ensuring that streamlined consultation procedures comply with section 7 of the ESA and its implementing regulations, are discussed in the October 2002 joint Services memorandum, *Alternative Approaches for Streamlining Section 7 Consultation on Hazardous Fuels Treatment Projects*. Pursuant to this guidance, programmatic consultations may be conducted on any Federal agency’s proposal to apply specified standards or design criteria to future proposed actions. Programmatic consultations can be used to evaluate the expected effects of groups of similar agency actions expected to be implemented in the future, where specifics of individual projects such as project location are not definitively known. A programmatic consultation must identify PDC and/or standards that will be applicable to all future projects implemented under the program, or in this case, a suite of activity types and associated stressor categories. The PDC for the EPA NLAA Programmatic include the measures contained within your BA to avoid and minimize impacts, and define which projects can be consulted on under this programmatic consultation, versus those that need individual section 7 consultation (informal or formal). These criteria serve to ensure effects from activities that are part of the EPA NLAA Programmatic on ESA-listed species and critical habitat are insignificant, discountable, or wholly beneficial.

Programmatic consultations allow for streamlined project-specific consultations using a verification form because the effects analysis is completed up-front in this programmatic consultation document. At the project-specific consultation stage, a proposed project is reviewed to determine if it can be implemented in accordance with the PDC identified in the programmatic consultation. Consistent with the joint Services’ memo referenced above, the following elements should be included in a programmatic consultation to ensure its consistency with ESA section 7 and its implementing regulations.

1. PDC to prevent or limit future adverse effects on ESA-listed species and critical habitat;

2. Description of the manner in which projects to be implemented under the programmatic consultation may affect ESA-listed species and critical habitat and evaluation of expected level of effects from covered projects;

3. Process for evaluating expected, and tracking of actual, aggregate, or additive effects of all projects expected to be implemented under the activity category. The programmatic consultation document must demonstrate that when the PDC or standards are applied to each project, the aggregate effect of all projects either are not likely to adversely affect ESA-listed species or their critical habitat, or are likely to adversely affect but are not likely to jeopardize ESA-listed species or result in destruction or adverse modification of critical habitat;

4. Procedures for streamlined project-specific consultation. As discussed above, if an approved programmatic consultation document is sufficiently detailed, project-specific consultations ideally will consist of findings made by action agency biologists and consulting agency biologists, respectively. An action agency will provide a description of a proposed project, or batched projects, and an assurance that the project(s) will be implemented in accordance with the PDC, or proper justification must be provided to support why the project is NLAA. The consulting agency reviews the submission and either concurs with the action agency, or identifies adjustments to the project(s) necessary to make it (them) consistent with the programmatic consultation document;

5. Procedures for monitoring projects and validating effects predictions; and,

6. Comprehensive review of the program, generally conducted annually.

Description of the Proposed Action

We have determined that the below NPDES permit activity types in EPA Region 1 (i.e., Massachusetts (MA) and New Hampshire (NH)) are not likely to adversely affect species listed by NOAA Fisheries and are eligible for inclusion under the EPA NLAA Programmatic (see PDC for specific information regarding restrictions on size, timing, etc.). Individual and general permits that fall into the following activity types may be included:

Table 1. Description of Activity Types Eligible for Inclusion in the EPA NLAA Programmatic

Activity Type	Activity Type Details	Possible Effluent Constitutes	Justification Needed
Tier 1: Municipal WWTF / POTW & Stormwater Outfalls	1. standard effluent[1] (no additional toxic substances), 2. no cooling water intake structure (CWIS), and	-biochemical oxygen demand (BOD5) -total suspended solids (TSS) -pH -oil and grease	No, unless early life stages (ELS), spawning, or critical habitat (CH) are present. If the above are present, a justification for an

[1] Standard effluent is defined as facility discharge impacts to water quality of receiving waters from biochemical oxygen demand (BOD5), total suspended solids (TSS), oil and grease, pH, fecal coliform/E.coli/Enterococcus, nitrogen/phosphorus, temperature, and dissolved oxygen (DO).

Activity Type	Activity Type Details	Possible Effluent Constitutes	Justification Needed
	3. no combined sewer overflows (CSOs).	-fecal coliform/E.coli/ Enterococcus -nitrogen/phosphorus -temperature -dissolved oxygen (DO).	NLAA determination is necessary.
Tier 2: Municipal WWTF / POTW & Stormwater Outfalls + additional stressors	1. non-standard effluent, 2. may contain CWIS with <2 million gallons per day (MGD) design intake with intake velocity <1 feet per second (ft/s), 3. may contain CSOs.	-Tier 1 effluent constituents, -may contain chlorine, heavy metals (e.g., copper, cadmium, lead, nickel), and/or other toxic substances.	Yes, justification necessary because a non-standard pollutant is present in the effluent. Must justify NLAA determination.
Tier 3: Industrial & Stormwater Outfalls	1. non-standard effluent, 2. no CWIS, and 3. no CSOs.	-Tier 1 & Tier 2 effluent constituents, -may contain industrial pollutants (e.g., benzene, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyl (PCBs), (volatile organic compounds) VOCs, formaldehyde, methyl tert-butyl ether (MTBE), hydrogen peroxide).	Yes, justification necessary because a non-standard pollutant is present in the effluent. Must justify NLAA determination.
Tier 4: Industrial & Stormwater Outfalls + additional stressors	1. non-standard effluent, 2. may contain CWIS with <2 MGD design intake and velocity <1 ft/s, 3. may contain CSOs.	-Tier 1 effluent constituents, -Tier 3 effluent constituents, -may also include heavy metals and/or other toxic substances.	Yes, justification necessary because a non-standard pollutant is present in the effluent. Must justify NLAA determination.

Projects eligible for the EPA NLAA Programmatic that fall into one of the four activities types above must meet all applicable PDCs, or provide proper justification for why the project does not meet particular PDCs (e.g., pollutants that are not considered standard effluent[1]), but is still NLAA ESA-listed species or critical habitat. Projects that do not fall into one of the four activities types listed above (i.e., noted as “Other” on the verification form) may still be eligible for inclusion in the EPA NLAA Programmatic provided that they do not introduce any new stressors or any new direct or indirect effects that are likely to adversely affect (LAA) ESA-listed species and critical habitat.

To estimate the volume of projects that may be eligible for consultation under the EPA NLAA Programmatic, we summarized all of the projects in NH and MA that the EPA determined were NLAA ESA-listed species or critical habitat over the past five years. Table 2 shows a summary of data collected for the purposes of this analysis.

Table 2. EPA NLAA Determinations for NOAA Fisheries ESA-listed Species or Critical Habitat (January 1, 2017 – December 31, 2021)

Activity Types	Number of NLAA Determinations
Tier 1	7
Tier 2	3
Tier 3	5
Tier 4	6
Total	**21**

Project Design Criteria (PDC)

Certain activity measures included within your BA to avoid or minimize project impacts have been incorporated into the eligible activity categories in order to prevent or limit future adverse effects on ESA-listed species and critical habitat. Activities outside the scope of these PDC are not authorized without further review, which consists of an individual section 7 consultation, unless proper justification for the project's inclusion in the EPA NLAA Programmatic is provided. Activities within the scope of the PDC may be processed under the appropriate activity category and have been determined "not likely to adversely affect." Additional conditions that exist as intrinsic parts of the permits, and your Standard Operating Procedures (SOPs) will also aid in limiting the scope of activity effects on our species/critical habitat to insignificant and/or discountable.

Framework for Further Project Review

All activities proposed for authorization under this programmatic consultation will require review (i.e., by an EPA biologist) in order to be covered by this ESA section 7 consultation. For those projects that you determine fit within the scope of activity categories of this programmatic consultation, you will submit a verification form to us requesting our concurrence. The verification form demonstrates that an activity is compliance with the requirements of the ESA and either meets all PDC outlined in this programmatic consultation or proper justification for an NLAA determination is provided. Projects that do not meet all of the PDC, relevant thresholds for associated stressors, or provide proper justification will require an individual section 7 consultation, which will result in us issuing a letter of concurrence (LOC) or a Biological Opinion. These projects require a more extensive analysis because the scope of the project appears to be outside the boundaries of the activity categories considered and analyzed in the EPA NLAA Programmatic, or because it is not feasible to assess the effects of such an activity *a priori* without knowing specific details related to the particular action. We have worked cooperatively to develop a framework you will use to identify the activity types that will need individual consultation. This process will ensure that any activity that “may affect” ESA-listed species or critical habitat will be adequately reviewed and consulted upon. If we concur with a “not likely to adversely affect” determination in our LOC during the individual section 7 consultation process, then you may proceed with authorization of the activity.

Whenever there is a question about a project’s eligibility for consultation under the EPA NLAA Programmatic when completing the verification form, the EPA biologist tasked with permitting/authorizing the activity should reach out to a GARFO section 7 biologist for technical assistance.

<u>Implementation of Verification Form</u>

For those projects that you determine fit within the scope of activity categories and stressor thresholds included in this programmatic consultation, you will submit a completed verification form to us that demonstrates the activity is in compliance with the requirements of the ESA. The form will also serve as a record to certify that the activity may affect, but is not likely to adversely affect species or critical habitat listed by us, and is consistent with this programmatic consultation. This will also allow any aggregate effects of the activity categories to be tracked and analyzed on an annual basis. A copy of the verification form is included in this consultation package (Attachment A). You will provide the completed form to us with the required information, and we will review the verification form and note one of the following conclusions:

1. In accordance with the NLAA Programmatic for NPDES Permits in U.S. EPA Region 1, GARFO PRD concurs with EPA’s determination that the action complies with all PDC and applicable state and federal water quality standards and is not likely to adversely affect listed species or critical habitat.

2. In accordance with the NLAA Programmatic Framework for NPDES Permits in U.S. EPA Region 1, GARFO PRD concurs with EPA’s determination that the action is not likely to adversely affect listed species or critical habitat per the justification and/or special conditions provided in Section 4.

3. GARFO PRD does not concur with EPA’s determination that the action complies with the applicable water quality standards (with or without justification), and recommends an individual Section 7 consultation to be completed independent from the NLAA Programmatic for NPDES Permits in U.S. EPA Region 1.

NOAA Fisheries ESA-Listed Species and Critical Habitat in the Action Area

The action area of the EPA NLAA Programmatic is generally defined as waters of NH and MA. Table 3 contains a list of ESA-listed species and critical habitat present in the action area. The regulatory definition of critical habitat according to section 3 of the ESA is "(1) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species." More detailed information on ESA-listed species distribution, life history, and behaviors, as well as the extent and physical and biological features (PBFs) of designated critical habitat, are summarized in our GARFO Maps and Species Tables, which are updated regularly and can be accessed here: https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater

Table 3. NOAA Fisheries ESA-Listed Species and Critical Habitat in the Action Area

Species	ESA Status	Expected Life Stages	Expected Behaviors	Expected Time of Year	Listing Rule/Date	Date of Most Recent Recovery Plan	Effect Determination
North Atlantic Right Whale (*Eubalaena glacialis)*	E	Adults; Juveniles	Foraging; Wintering; Migrating	Year round	73 FR 12024	NMFS 2005	NLAA
Fin Whale (*Balaenoptera physalus)*	E	Adults; Juveniles	Foraging; Wintering; Migrating	Year round	35 FR 18319	NMFS 2010	NLAA
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	E	Adults; Juveniles	Foraging; Migrating	May to November*	35 FR 18319	NMFS *et al*. 2011	NLAA
Leatherback Sea Turtle (*Dermochelys coriacea*)	E	Adults; Juveniles	Foraging; Migrating	May to November*	35 FR 8491	NMFS & USFWS 1992	NLAA
Loggerhead Sea Turtle; Northwest Atlantic DPS (*Caretta caretta)*	T	Adults; Juveniles	Foraging; Migrating	May to November*	76 FR 58868	NMFS & USFWS 2008	NLAA
Green Sea Turtle; North Atlantic DPS (*Chelonia mydas*)	T	Adults; Juveniles	Foraging; Migrating	May to November*	81 FR 20057	NMFS & USFWS 1991	NLAA
Atlantic sturgeon (5 Distinct Population Segments) (*Acipenser oxyrinchus oxyrinchus*)	T (GOM) E (four others)	All life stages (eggs to adults)	Spawning and Rearing (specific rivers); Foraging; Overwintering, Migrating	Year round	77 FR 5880 and 77 FR 5914	N/A	NLAA
Shortnose sturgeon *(Acipenser brevirostrum)*	E	All life stages (eggs to adults)	Spawning and Rearing (specific rivers); Foraging; Overwintering; Migrating	Year round	32 FR 4001	NMFS 1998	NLAA

Table 4. PBFs for Atlantic Sturgeon Critical Habitat

1.	Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand range) for settlement of fertilized eggs, refuge, growth, and development of early life stages;
2.	Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 parts per thousand and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development.
3.	Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support: (1) unimpeded movements of spawning adults to and from spawning sites; (2) seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (3) staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (e.g., at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river;
4.	Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support: (1) spawning; (2) annual and interannual adult, subadult, larval, and juvenile survival; and (3) larval, juvenile, and subadult growth, development, and recruitment (e.g., 13°C to 26° C for spawning habitat and no more than 30° C for juvenile rearing habitat and 6 mg/L dissolved oxygen or greater for juvenile rearing habitat)

The facilities that are expected to seek coverage under the EPA NLAA Programmatic may overlap with designated Atlantic sturgeon critical habitat for the Gulf of Maine and New York Bight Atlantic sturgeon DPSs. More detailed, location specific information about Atlantic sturgeon critical habitat can be found using the ESA Section 7 Mapper: https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=a85c0313b68b44e0927b51928271422a

Table 5. PBFs for North Atlantic Right Whale Critical Habitat

1.	The physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate *Calanus finmarchicus* for right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes;
2.	Low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing *C. finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins;
3.	Late stage *C. finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region;
4.	Diapausing *C. finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region.

Project Design Criteria (PDC)
In order to be eligible for streamlined consultation via verification form, all projects must meet the following criteria, regardless of activity type, or provide a justification for why the criteria do not apply. A section 7 biologist assigned to the project will review the justification. If our section 7 biologist does not accept the justification, USACE must complete an individual section 7 consultation.

Activity Types
A number of NPDES permit authorizations will be eligible for inclusion under the EPA NLAA Programmatic including activities under:

1. General Permits (GPs), which include discharges from industrial sites, construction activities, and municipal stormwater systems, and
2. Individual Permits, which include stormwater, wastewater, or a combination of these discharges from individual facilities.

EPA and GARFO have determined that the activities authorized under the EPA NPDES permits listed above are categorized into four activity types (see Table 1) that are not likely to adversely affect species listed by NMFS and are eligible for inclusion under the EPA NLAA Programmatic:

1. Tier 1: Municipal wastewater treatment facilities and/or stormwater outfalls with standard effluent (i.e., no additional toxic substances) and CWIS or CSOs,
2. Tier 2: Municipal wastewater treatment facilities and/or stormwater outfalls effluent that may contain additional toxic substances that are NLAA ESA-listed species, CWIS, and CSOs,
3. Tier 3: Industrial facilities with standard effluent and stormwater outfalls no CWIS or CSOs, and
4. Tier 4: Industrial facilities with non-standard effluent and stormwater outfalls that may contain CWIS, and/or CSOs.

Table 6. Stressor Categories by Activity Type

	Stressor Category		
Activity Type	Entrainment, Impingement, and Capture	Water Quality	Habitat Modification
Tier 1	N	Y	Y
Tier 2	Y	Y	Y
Tier 3	N	Y	Y
Tier 4	Y	Y	Y

Project Design Criteria (PDC)

The General PDC, below, are not specific to one of the individual stressor categories referenced in Table 6; instead, they encompass general exclusions that apply to all projects, regardless of activity type and the associated stressors. The General PDC, along with the stressor-specific

PDC that follow, constrain the types of projects eligible for this EPA NLAA Programmatic and thus limit the potential for projects to affect ESA-listed species or critical habitat by minimizing effects to insignificant and discountable levels.

General PDC

1. No portion of the proposed action will individually or cumulatively have an adverse effect on ESA-listed species or designated critical habitat.

2. No project will occur in Atlantic or shortnose sturgeon spawning grounds in the Merrimack River, Piscataqua River, Connecticut River, and/or any additional river where spawning grounds are identified[2] unless

    a. effluent is compliant with state water quality standards at the end-of-pipe discharge point, and

    b. an adequate dilution factor in the receiving water body is achieved.

3. Any project within designated Atlantic sturgeon critical habitat must have no effect on hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand) (PBF 1 detailed in Table 4).

4. No changes in temperature, water flow, salinity, or dissolved oxygen levels to a level that may adversely affect ESA-listed species or designated critical habitat.

5. If ESA-listed species are likely to pass through the action area at the time of year when the activity occurs, a zone of passage (~50% of water body) with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., biological stressors such as turbidity or effluent plume must not create barrier to passage nor extend from bank to bank or surface to bottom in a river).

6. Any project in designated North Atlantic right whale critical habitat must have no effect on the physical and biological features (PBFs listed in Table 5).

Effects Analysis

Impingement/Entrainment/Capture PDC

7. No intake of water at cooling water intake structures (CWIS) where early life stages are expected to be present:

- In the Connecticut River Atlantic and/or shortnose sturgeon ELS are expected to be present from April 15 to October 31.

[2] Best available information regarding spawning grounds for Atlantic sturgeon and shortnose sturgeon is located in the Species Tables at https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater and the ESA Section 7 Mapper https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=a85c0313b68b44e0927b51928271422a

- In the Merrimack River up to Haverhill, shortnose sturgeon ELS are expected to be present from April 1 to July 15.
- In areas of a river where Atlantic sturgeon PBF 1 (i.e., hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0 to 0.5 parts per thousand range) needed for the settlement of fertilized eggs, refuge, growth, and development of early life stages), and PBF 2 (i.e., aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development) are present.

8. CWIS must not have greater than 1 ft/s intake velocities in any waters to prevent impingement or entrainment of any juvenile through adult stage[3] ESA-listed sturgeon species. CWIS are required to have appropriate sized mesh screens to block access of aquatic life to CWIS when operationally feasible and ESA-listed species may be present.

Impingement is defined as the entrapment of aquatic species on the outer part of an intake structure or against a screening device during periods of intake water withdrawal and unable to swim away. Entrainment is defined as any aquatic species in the intake water flow entering and passing through a CWIS and into a cooling water system, including the condenser or heat exchanger. CWISs may entrain or impinge aquatic species that are present near a facility's intake, including ESA-listed species. Entrainment of organisms occurs when a facility withdraws water into a CWIS from an adjacent waterbody. CWISs have the potential to entrain small forms of aquatic life that are small enough pass through the screens of a facility's intake.

Your incoming request for consultation defines the activity types and associated CWIS specifications (i.e., facility's design intake) you have determined to be NLAA to ESA-listed species or designated critical habitat.

Effects of Entrainment/Impingement on Whales
Whales are too large to be susceptible to entrainment or impingement by a CWIS with an intake velocity of <1 ft/s and are able to swim away and avoid an intake structure if they were to encounter one. As such, the likelihood that a whale would be entrained or impinged is extremely unlikely and, therefore, discountable.

Effects of Entrainment/Impingement on Sea Turtles
Sea turtles are not known to be vulnerable to entrainment or impingement by CWIS with an intake velocity of <1 ft/s because they are expected to be able to swim away from and avoid the intake. Thus, if a sea turtle were to be present near a CWIS, it would be extremely unlikely to be entrained in or impinged and, therefore, the effects of CWIS on sea turtles is discountable.

Effects of Entrainment/Impingement on Sturgeon
Sturgeon may become impinged on intake screens or entrained in CWISs. Effects to sturgeon can range from temporary impingement to injury or death due to entrainment or prolonged

[3] Any facility with a CWIS where ELS are present is excluded from the EPA NLAA Programmatic and will require individual consultation.

impingement. CWIS characteristics including intake velocity, mesh size of CWIS screens, and volume/frequency of cooling water flow through the facility, in addition to the location and seasonality of the intake, all contribute to the likelihood of effects to an individual. Generally, faster intake velocity and larger mesh size on CWIS screens will increase the likelihood of effects.

Facilities eligible for inclusion under the EPA NLAA Programmatic may contain CWIS with less than or equal to 2 million gallons per day (MGD) design intake. No facilities may have CWISs where ELS are expected to be present. Specifically, no CWIS may operate 1) in the Connecticut River from April 15 to October 31; 2) in the Merrimack River up to Haverhill from April 1 to July 15; or 3) in areas of a river where PBF 1 (see Table 4 for Atlantic sturgeon designated critical habitat PBFs) and PBF 2 are present (PDC 7). No projects with CWIS should adversely affect Atlantic sturgeon designated critical habitat (PDC 7). In addition, a facility's CWIS must have an intake velocity of less than 1 ft/s in any waters to prevent impingement or entrainment of any juvenile, subadult, and adult sturgeon life stages in order to be eligible for this programmatic framework. CWIS are also required to have appropriate sized mesh screens to block access of aquatic life to CWIS when operationally feasible and when ESA-listed species may be present (PDC 8).

Sturgeon are susceptible to impingement on and entrainment in CWISs. Impingement of larger fish and entrainment of ELS have also been documented from larger cooling intakes in multiple rivers (Shortnose Sturgeon Status Review Team 2010). Risk of impingement or entrainment to sturgeon is greatest when CWISs are located in or near spawning grounds where ELS sturgeon are smaller in size, are less active (i.e., drift), and are susceptible to intake (Carter and Reader 2000). However, PDC 2 and PDC 7 will ensure that no CWIS are located in areas where spawning may occur or where ELS are present. Therefore, sturgeon ELS will be not at risk of the effects of entrainment or impingement from CWISs and effects will not be considered further. Older life stages of sturgeon (i.e., juvenile, subadult, and adult sturgeon) are expected to avoid CWISs due to their swimming abilities. Kynard and Horgan investigated swimming ability of yearling shortnose sturgeon in an experimental flume and found that most sturgeon could control swimming at more than 1 ft/s (31–34 cm/s) velocity (2002). Furthermore, there have been multiple studies that suggest that juvenile shortnose sturgeon are also capable of sustaining swimming speeds above 1 ft/s (Deslauriers and Kieffer 2012, Kieffer et al. 2009, Deslauriers and Kieffer 2011). Therefore, young-of-year, juvenile, subadult, and adult life stages of Atlantic sturgeon and shortnose sturgeon are expected to be able to avoid intake velocities <1 ft/s and would be able to avoid impingement and entrainment CWISs. In addition, most CWIS remove millions of gallons a day from rivers during the spring and summer months (i.e., <2 MGD design intake allowable under the EPA NLAA Programmatic) for cooling purposes, but the behavior of sturgeon may allow them to avoid intake structures for the most part, since foraging and migration is expected to occur in deep waters (Kynard and Horgan 2002, Shortnose Sturgeon Status Review Team 2010). Given the strong swimming ability and behaviors of sturgeon life stages that are expected to be present near CWIS intakes, in addition to the exclusion of facilities with CWIS where ELS are present, it would be extremely unlikely for any non-ELS sturgeon to have any risk of impingement or entrainment from a CWIS; therefore, effects are discountable.

Sturgeon prey items, including gastropods, amphipods, decapods, isopods, and sand lance, which are present within the water column or on the benthic substrate are susceptible to impingement or entrainment. However, given that facilities with <2 MGD design intake allowable under the EPA NLAA Programmatic are small–scale and will only impact a portion of the overall waterbody in compliance with PDC 5, a very small portion of prey species available to sturgeon in a given area are expected to become entrained or impinged. Furthermore, because sturgeon are expected to avoid areas where the influence of water withdrawal at CWISs is present they will opportunistically forage in other areas within a given action area. Therefore, any effects to sturgeon forage items will be too small to be meaningfully measured or detected, and are therefore, insignificant.

Effects of Entrainment/Impingement on designated Atlantic sturgeon critical habitat

PDC 3 excludes any project that will affect PBF 1 (see Table 4), however, it is possible that permitted projects under the EPA NLAA Programmatic could overlap with PBFs 2, 3, 4. The risk of impingement and entrainment will not affect water quality as described in PBF 4. The gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate that comprise PBF 2 are not expected to be impacted by CWISs, therefore, effects to PBF 4 and PBF 2 will not be considered further. CWISs may create a barrier to passage upstream as described in PBF 3 (i.e., water of appropriate depth and absent physical barriers to passage). Therefore, Atlantic sturgeon may have to swim around CWISs in rivers where critical habitat is present, but we do not expect any impingement and entrainment to occur when CWISs have 1 ft/s or less intake velocity and appropriate sized mesh screens to block access of aquatic life. Effects to sturgeon's ability to migrate upstream for foraging, staging, spawning, rearing, etc. (PBF 3) and any sturgeon movements to avoid a CWIS would be too minor to be meaningfully measured or detected. Therefore, effects from CWISs on the value of PBFs 2, 3, and 4 to the conservation of the species is too small to be meaningfully measured, detected or evaluated and the effects are insignificant.

Water Quality PDC

9. Any discharges must meet state water quality standards[4] (e.g., no discharges of substances in concentrations that may cause acute or chronic adverse reactions, as defined by EPA water quality standards criteria); no discharges of unauthorized or toxic substances without justification supporting a NLAA determination for ESA-listed species.

10. Effluent bacteria levels should not be in excess of levels that will reduce dissolved oxygen levels in the action area.

11. Nutrients must not reduce dissolved oxygen levels (particularly in summer months) in a way that negatively affects ESA-listed species.

[4] Water quality standards (WQS) are defined by EPA as provisions of state, territorial, authorized tribal or federal law approved by EPA that describe the desired condition of a water body and the means by which that condition will be protected or achieved.

12. Increased total suspended solids (TSS) should meet water quality standards (250 mg/L maximum daily, 45 mg/L average weekly, and/or 30 mg/L average monthly) and must not reach levels that may adversely affect should not negatively impact sturgeon early life stages (ELS) or spawning.

13. Effluent temperature must meet water quality standards and an adequate dilution factor for any thermal plume in the receiving water body must be achieved.

Multiple types of wastewater discharges are expected to be covered under the EPA NLAA Programmatic (*i.e.*, municipal wastewater, CSOs, industrial or power plant wastewater and cooling water, or stormwater). The individual pollutants in any given wastewater discharge vary greatly based on a number of factors, but also generally have similar constituents. Municipal wastewater may contain bacteria, BOD5, TSS, and nutrients, however, the concentration of pollutants in stormwater is generally more dilute than in directly discharged facility wastewater (EPA 2004). Wastewater from industrial facilities (i.e., commercial establishments and power plants) can contribute the above pollutants in addition to oils and grease, chlorine, and a variety of other substances. Given that there are a number of possible pollutants associated with wastewater discharges, this EPA NLAA Programmatic will consider effects of the pollutants that are found most often in wastewater: oil and grease, pH, TSS, nutrients, dissolved oxygen/biochemical oxygen demand, bacteria, and temperature. A number of pollutants (metals, chlorine, etc.) may be present in wastewater that contribute to poor water quality and thereby may impact the health of ESA-listed species. Many activity-specific details (i.e., the action area, species present, life stages expected) will be considered in order to assess the effects of these other pollutants on an individual basis (either in the verification form in the justification section or in informal consultation format) to ensure that they are NLAA to ESA-listed species.

CSOs and Stormwater

During sizable wet weather occurrences, combined flow of stormwater and wastewater may exceed the capacity of a facility. When the capacity is exceeded, a portion of the untreated combined flow is discharged to the receiving waters via a CSO outfall. CSOs are subject to NPDES permit water-quality requirements, but are not subject to the secondary treatment regulations (40 CFR §133.103(a)). The framework for compliance with Clean Water Act requirements for CSOs is set forth in EPA's National CSO Control Policy, 59 Fed. Reg. 18688 (1994). The National CSO Control Policy objectives are to ensure that CSO discharges only occur as a result of wet weather, to minimize water quality and aquatic biota impacts, and to bring all discharge points into compliance with applicable CWA requirements and water quality standards. There are 22 facilities in MA that are permitted to discharge from CSO outfalls and six facilities in NH according to a 2004 EPA Report (https://www.epa.gov/sites/default/files/2015-10/documents/csossortc2004_chapter04.pdf).

At the start of a wet weather event large enough to trigger CSO activation, a "first flush" occurs. This is defined as the transport of effluent solids in a combined sewer system that: (1) have settled in pipes during periods between wet weather events; and (2) have washed off of impermeable surfaces (e.g., streets and parking lots) during the beginning of a wet weather event. The "first flush" of stormwater discharge has the highest concentration of pollutants (Gupta and Saul 1995), however, as it occurs at the beginning of a storm event, the first flush may receive treatment as it is conveyed to and treated at the facility and discharged through the main outfall. Once the capacity of the combined sewer collection system is exceeded, subsequent overflows are released from CSOs, in some cases after primary treatment, depending on the intensity of the rain event. After the first flush, effluent is more dilute (i.e., most pollutants were removed in the first flush) and therefore, primary effluent constituents (e.g., TSS, bacteria) are significantly diluted. The effluent is diluted further upon discharge to the receiving waters running at high flows and volumes due to the storm. Concentrations of contaminants during CSO events are the result of several factors: (1) the concentration of pollutants in effluent, (2) resuspension of organic material from within the system, and (3) concentration of pollutants in the stormwater draining to the system (Madoux-Humery 2015). Therefore, concentrations of pollutants from CSOs are highly variable based on several factors specific to an individual facility and the associated system.

The concentration of pollutants in stormwater is generally more dilute than in wastewater and CSO effluent, but can contain significant amounts of pollutants similar to those found in wastewater discharges. Pollutant concentrations in stormwater can vary substantially, not only from community to community and event to event, but also within a given event based on the amount of precipitation, duration, and intensity.

Due to the nature of CSO and stormwater discharges, effluent is expected to be rapidly diluted to non-detectable levels. In addition, these events are highly variable, generally infrequent, and temporary in nature (*i.e.*, discharge will only occur during large storm events). TSS and bacteria are primary constituents of CSO and stormwater effluent (EPA 2004), therefore, effects of stormwater and CSO effluent to water quality will be considered below. These effluent types may also affect the concentration of dissolved oxygen in receiving waters, therefore, effects to DO will be considered.

Pollutants

The Clean Water Act (CWA) section 304(a)(4) designates the following as "conventional" pollutants: biochemical oxygen demand (BOD_5), total suspended solids (TSS), fecal coliform, pH, Fecal coliform, and oil and grease (44 FR 44503, 44 FR 52685). EPA has established numeric and narrative state water quality criteria for MA and NH for a number of pollutants, of which you have include in Table 3 and 4 of the Biological Assessment (BA) for this consultation. For the purposes of the EPA NLAA Programmatic, standard effluent is defined as facility discharge impacts to water quality from oil and grease, pH, TSS/turbidity, nutrients, dissolved oxygen/biochemical oxygen demand, bacteria, and temperature.

To gain insight into effluent discharged to receiving waters in MA and NH to establish average, maximum, or minimum of each pollutant that is identified as standard effluent for the purposes of this EPA NLAA Programmatic, we collected water quality standard numeric criteria for facilities with NPDES permits in the rivers and coastal areas where ESA-listed species are present. We performed an analysis of the maximum and/or average criteria for those facility permits and compared that to effects thresholds for ESA-listed species. The facilities used in this analysis are expected to seek future coverage under the EPA NLAA Programmatic.

EPA develops water quality standards criteria to limit or prohibit discharges of pollutants to assure that surface water quality standards and designated uses (i.e., classes) of the receiving waters are protected and maintained. The individual class designated for each waterbody is based on multiple factors, which is detailed by state[5]. Although Class C waters exist per MA regulations, there are also no Class C or SC waters in MA, therefore, criteria for Class C waters will not be considered herein (MassDEP 2021).

The CWA prohibits the discharge of any pollutant unless that discharge complies with NPDES permit requirements. A NPDES permit must include any water quality-based limitations necessary to ensure all discharges meet water quality standards. Pollutant thresholds for an individual facility are established by the individual NPDES permit as detailed in 314 CMR 3.00. EPA considers natural background conditions and existing discharges when developing water quality standards criteria. EPA's acute (i.e., highest concentration of exposure for no more than one hour) and chronic (long-term exposure) water quality criteria are developed based on toxicity data for aquatic organisms (EPA 1985). The sensitivity of a broad range of aquatic species to toxic compounds was tested to develop acute (CMC) and chronic (CCC) criteria including salmonids and other fish species (e.g., bass, fathead minnow) and benthic species (e.g., rotifer, annelid, mollusk). Toxicity data from the most sensitive life stage is used, when available. The CCC and CMC criteria are designed to ensure that aquatic species exposed to pollutants in compliance with these levels will not experience any impairment to their growth, survival, or reproduction. As these criteria are derived from data using the most sensitive aquatic species and life stages for which information is available, discharges of pollutants that are in compliance with water quality criteria are expected to result in effects to listed species that will be so small they would not be meaningfully detected. However, given that listed species may be more sensitive to some pollutants than the EPA criteria provides, the best available species-specific data related to effects of pollutants analyzed in this EPA NLAA Programmatic on ESA-listed species are considered below.

Oil and Grease

Oil and grease is not a single chemical constituent, but includes a range of organic compounds with varying physical, chemical, and toxicological properties, including both petroleum-based (e.g., hydrocarbons) and non-petroleum-based compounds (e.g., vegetable and animal-derived oils, greases, fats, and waxes). Oil and grease is present in a wide variety of industrial and municipal discharges and is included in many wastewater discharge permits (EPA 2013). MA water quality standards state that Class A and SA waters shall be free from oil and grease, petrochemicals and other volatile or synthetic organic pollutants and all other class waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water. NH water quality standards state that waters shall contain no oil or grease in such concentrations that would impair any existing or designated uses. In sum, for both MA and NH, precise water quality standards for the discharge of oil and grease are determined by waterbody type based on designated class and use.

[5] Massachusetts: https://www.mass.gov/doc/314-cmr-400/download;
New Hampshire: https://www.epa.gov/sites/default/files/2014-12/documents/nh-chapter1700.pdf

According to the best available data[6], the maximum daily effluent limit for oil and grease in MA facilities surveyed (both municipal and industrial facilities) is 15 mg/L, while criteria for NH facilities surveyed (both municipal and industrial facilities) is 20 mg/L. The majority of facilities in the survey also have 15 mg/L in MA and 20 mg/L in NH for oil and grease limits. Based on this data, 20 mg/L (maximum daily) may be present in the immediate vicinity of the facility's outfall(s) that are eligible for inclusion under the EPA NLAA Programmatic.

Effects of oil and grease on whales:
Marine mammals are at increased risk of interacting with floating oil (and grease is assumed to have similar characteristics) because they make frequent contact with the water surface to breathe (Peterson et al. 2003). Oil and grease is most likely to affect whales if it is present on the surface of the water where they breach the surface for air. Within the tidally influenced, open-ocean areas where whales will be present, it is highly unlikely that a whale will ingest the maximum daily ≤ 20 mg/L of oil and grease on the surface of the water. The high degree of dilution provided by the high energy, tidally influenced receiving water where large whales would be present would ensure that any facility discharge of oil or grease would be well-mixed within a short distance from the discharge outfalls. Furthermore, PDC 9 requires that all discharges meet MA and NH water quality standards and excludes discharges of substances in concentrations that may cause acute or chronic adverse reactions. We also do not expect minimal (≤ 20 mg/L for most facilities) oil and grease associated with projects under this programmatic consultation to affect whale prey items (i.e., copepods, small schooling fish, krill). Therefore, whales are unlikely to interact with oil and grease on the surface of the water, and any effects would be so minor as to be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of oil and grease on sea turtles:
Similar to marine mammals, sea turtles breathe air and make frequent contact with the sea surface, where oil and grease may be present. However, also similar to whales, the high degree of dilution provided by the high energy, tidally influenced receiving water where sea turtles would be present would ensure that any oil and grease (≤ 20 mg/L maximum daily discharge) discharged would be well-mixed within a short distance from the discharge outfalls. PDC 9 requires that all discharges meet MA and NH water quality standards and excludes discharges of substances in concentrations that may cause acute or chronic adverse reactions. We also do not expect minimal (≤ 20 mg/L for most facilities) oil and grease associated with projects under this programmatic consultation to affect sea turtle prey items. Leatherbacks primarily feed on jellyfish, which occur in the water column and not expected near the surface, so we do not expect jellyfish to be affected by oil and grease from NPDES discharges. Green sea turtles primarily feed on aquatic vegetation and PDC 9 requires that effluent meet water quality standards, therefore, no project is expected to adversely affect submerged aquatic vegetation (SAV). Kemp's ridley and loggerhead sea turtles feed on benthic shellfish or crustaceans, which will not

[6] An analysis of facilities with NPDES permits in the rivers/coastal areas where ESA-listed species are present in Massachusetts and New Hampshire was completed to inform the information herein. EPA's Water Quality Standards for each facility (numeric criteria and narrative criteria) and thresholds for pollutant constituents in facility effluent were collected and maximum, minimum, and mean levels by state were defined. The facilities in this analysis are expected to seek future coverage under the EPA NLAA Programmatic.

come in contact with the water surface where oil and grease may be present. Therefore, sea turtles and their prey items are unlikely to interact with oil and grease on the surface of the water, and any effects would be so minor as to be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of oil and grease on sturgeon:
Unlike whales and sea turtles, sturgeon are benthic feeders and not expected to make frequent contact with the sea surface, where oil and grease may be present. Oil and grease discharges authorized under MA and NH WQS (≤ 20 mg/L for most facilities surveyed) are not expected to come in contact with benthic habitat where sturgeon may be foraging or migrating. Oil and grease will generally float on the surface of the water, which will minimize exposure of most subtidal (i.e. benthic) species (Chang et al. 2014). We also do not expect minimal oil and grease associated with discharges under this programmatic consultation to affect sturgeon benthic prey items (e.g., benthic insects, crustaceans, mollusks, and polychaetes) for the same reasons mentioned above. Benthic prey items will remain on the benthos and are unlikely to come in contact with oil and grease on the water surface. The fifty-percent lethal concentration of oil to test organisms over a 48-hour period has been found to be 10 to 50 mg/L for Daphnia magna, the water flea, 5 to 15 mg/L for Artemia, small brine shrimp, and 5 to 10 mg/L for rainbow trout larvae (2002 National Academy of Science). Sturgeon may surface occasionally; therefore, any contact with oil and grease on the surface would be infrequent and short in duration. Given that any effects to sturgeon and their prey would be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of oil and grease on designated Atlantic sturgeon critical habitat:
PDC 3 excludes any activity that will affect Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. It is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4 (see Table 4). Less than 20 mg/L of oil is also not expected to adversely affect soft substrate or salinity, as described in PBF 2. Oil and grease discharges will not create barriers to passage for sturgeon species or effect depth as described in PBF 3. The minimal amount of oil and grease discharged from facilities will likely float on the surface of the water and thereby not adversely affect the overall water quality within the water column, including temperature, salinity, and dissolved oxygen (PBF 4). Therefore, any effects from oil and grease to the value of PBFs 2, 3, and 4 to the conservation of the species is too small to be meaningfully measured or detected and are insignificant.

Effects of oil and grease on designated North Atlantic right whale critical habitat:
PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Discharges of oil and grease (≤ 20 mg/L for most facilities surveyed) from activities permitted under this programmatic are not expected to overlap with the PBFs. Any oil and grease will float on the surface of the water and is not expected to affect ocean currents, circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whale critical habitat PBFs 1, 2, 3, and 4. Therefore, effects from oil and grease on North Atlantic right whale critical habitat will not be considered further.

pH
Discharges with pH values markedly different from the receiving water pH can kill aquatic life and have an indirect effect on the toxicity of other pollutants in the receiving water. In both MA and NH, precise water quality standards for pH are determined by waterbody type based on designated class and use. The MA water quality standards specify that pH should be in the range of no lower than 6.5 through 9.0 standard units (S.U.) and not more than 0.2 to 1.0 S.U. outside of the natural background range, with the precise range specified based on designated water class and use. NH water quality standards state that pH shall be between 6.5 to 8.0 S.U. unless due to natural causes. The majority of facilities surveyed set a standard of pH of 6.5 to 8.5 S.U. in MA and NH (Env-Wq 1703.18(b) *(314 CMR 4.05(4)(a)(3) and 4.05(4)(b)(3))*.

Effects of pH changes on whales:
The pH of seawater is 8.1 S.U. at the surface and decreases to between 7.7 to 7.8 S.U. with increasing depth (Capurro 1970, EPA 1986). Adequate mixing of discharges is expected to occur in open-ocean and tidal areas where whales and their prey may be present. In addition, numerous studies have confirmed that a pH within the range of 6.5 to 9.0 S.U. is harmless to most aquatic life. Given this information, effects to whales and their prey due to changes in pH of receiving waters caused by discharges that are in compliance with MA and NH water quality criteria (within the range of 6.5 to 9.0 S.U.) would be so minor as to be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of pH changes on sea turtles:
The pH of seawater is 8.1 S.U. at the surface and decreases to between 7.7 to 7.8 S.U. with increasing depth (Capurro 1970, EPA 1986). Similar to whales, adequate mixing of discharges is expected to occur in open-ocean and tidal areas where sea turtles and their prey and food sources may be present. In addition, numerous studies have confirmed that a pH within the range of 6.5 to 9.0 S.U. is harmless to most aquatic life. Given this information, effects to sea turtles and their prey / food sources from changes in pH of receiving waters caused by discharges that are in compliance with MA and NH water quality criteria (within the range of 6.5 to 9.0 S.U.) would be so minor as to be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of pH changes on sturgeon:
The pH of most freshwater areas containing healthy fish populations ranges from about 6 to 9 S.U. (Ellis 1937) and a pH between 6.5 and 9.0 S.U. is considered harmless to freshwater fish and expected to be protective of their prey (EPA 1986). Due to their anadromous nature, shortnose and Atlantic sturgeon may be impacted by changes in pH in both fresh and saltwater. As stated previously, the pH of seawater is 8.1 S.U. at the surface and decreases to between 7.7 to 7.8 S.U. with increasing depth (Capurro 1970, EPA 1986), which is in the range of protective pH for aquatic life. Given this information, effects to sturgeon and their prey due to changes in pH of receiving waters caused by discharges that are in compliance with MA and NH water quality criteria (within the range of 6.5 to 9.0 S.U.) would be so minor as to be too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of pH changes on designated Atlantic sturgeon critical habitat:
PDC 3 excludes any activity that will affect Atlantic sturgeon critical habitat PBF 1 (see Table 4), therefore, effects to PBF 1 will not be considered further. PDC 1 excludes any project that may adversely affect Atlantic sturgeon designated critical habitat, but it is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4. However, changes in pH are not expected to impact soft substrate or salinity gradient, as described in PBF 2 (see Table 4). Changes in pH will not create barriers to passage for sturgeon species and will not adversely affect PBF 3. Any pH changes are also not expected to adversely affect water quality within the water column, including temperature, salinity, and dissolved oxygen (PBF 4). In addition, discharges are not authorized to change pH more than 1.0 S.U. outside of the natural background range, according to MA water quality standards. Any effects from changes in a receiving water's pH to the value of PBFs 2, 3, and 4 to the conservation of the species is too small to be meaningfully measured or detected and are, therefore, insignificant.

Effects of pH changes on designated North Atlantic right whale critical habitat:
PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Changes in pH associated with discharge activities permitted under this programmatic are not expected to overlap with PBFs. Any pH changes in the receiving waters are not expected to affect ocean currents, circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBF 1, 2, 3, and 4. Therefore, effects of pH on designated North Atlantic right whale critical habitat will not be considered further.

Total Suspended Solids/Turbidity
Total suspended solids (TSS) concentration is a measurement of total solid material per volume of water (milligrams per liter). Turbidity is an optical quality of light transmission through a fluid containing sediment particles most often measured as nephelometric turbidity units. Increased TSS increase turbidity near the outfall and also may reduce light penetration through the water column or form bottom deposits as it settles to the bottom in the receiving water. Levels of turbidity and TSS concentration can vary greatly based on the source (i.e., concentration of TSS in the effluent) and factors that influence the duration and intensity of increased TSS (e.g., sediment type and current speed/dilution in the receiving waters). EPA sets water quality criteria for facilities in MA and NH, which requires certain standards to be met upon effluent discharge. Narrative water quality criteria for TSS in MA states that receiving waters shall be "free from floating, suspended and settleable solids in concentrations that would impair any use assigned to this class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom." NH has similar criteria which states "all surface waters shall be free from substances in kind or quantity that: a. Settle to form harmful benthic deposits; b. Float as foam, debris, scum or other visible substances". MA and NH establish a mass-based TSS limit to meet water quality standards in receiving waters that is calculated based on a facility's design flow. When applicable, facilities in MA and NH are required to maintain a minimum of 75 percent removal of TSS. In both MA and NH, water quality criteria for the discharge of TSS is determined by waterbody type based

on designated class and TSS effluent limits are established by EPA based on expected dilution and adequate mixing in the receiving waters.

According to the best available data, 250 mg/L is the maximum daily effluent for TSS from municipal and industrial facilities that are expected to seek coverage under the EPA NLAA Programmatic. A majority of the facilities in the survey (mainly municipal wastewater treatment facilities) have TSS effluent limits of 45 mg/L average weekly and 30 mg/L average monthly. Given the dynamic nature of TSS plumes, the length of the zone of initial dilution is a function of current speed. Therefore, the size of the area where increased TSS will occur as a result of the action will vary greatly based on the characteristics of the receiving waterbody. In an EPA study of mixing zones, results demonstrated that plumes are generally expected to dissipate in the nearfield and under low current conditions (e.g. 0.1 m/sec) and initial dilution is completed before the plume is carried downstream (e.g., within 30 meters based on multiple variable factors) (1994). In a strong current, the plume can extend downstream a distance 300 meters at a current speed of 1 m/sec (Baumgartner 1994). In coastal environments, TSS plumes are influenced by ocean currents and wave action and are expected to mix rapidly. Therefore, for facilities expected to seek coverage under the EPA NLAA Programmatic, elevated TSS levels of up to 250 mg/L maximum daily may be present up to 300 meters from a facility's outfall(s).

The amount of TSS in stormwater discharges is highly variable and based on a number of factors. Stormwater is untreated water runoff, often from industrialized and/or urbanized areas, therefore, TSS in effluent varies greatly based on the site specific characteristics in addition to the size and intensity of the storm event. However, to establish a general understanding of the impact of stormwater, a USGS study of stormwater runoff states that the median TSS concentration for 16 stormwater-runoff samples collected from locations in the Columbia River Basin from 2009 to 2010 was 21 mg/L (Morace 2012). An EPA study of stormwater analyzed multiple facilities around the United States and calculates the median TSS concentration at 91 mg/L. The report also states that TSS from stormwater in receiving waters (< 1% of TSS is produced from stormwater) is negligible compared to the TSS produced from total flow processed at wastewater treatment plants (33% from treated wastewater) (2004). Similar to stormwater, concentrations of TSS in CSO effluent are minimal (10% of TSS is produced from CSOs) (EPA 2004). Median TSS concentrations in receiving waters due to CSOs is 127 mg/L (EPA 2004). Therefore, we expect TSS from stormwater to reach 91 mg/L and 127 mg/L from CSOs.

PDC 5 requires that passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity) must be maintained. Therefore, biological stressors such as turbidity or effluent plume must not create a barrier to passage and must not extend from bank to bank or surface to bottom. In addition, PDC 12 specifies that increased TSS should not reach levels that may adversely affect adhesion of sturgeon eggs on hard bottom substrate, sturgeon ELS, or spawning.

Effects of increased total suspended solids/turbidity on whales:
No information is available on the effects of TSS on whales. Whales breathe air, and thus are not subject to the same potential respiratory effects of high TSS as anadromous fish. TSS is

most likely to affect whales if a plume causes a barrier to normal behaviors; however, PDC 5 requires that any project eligible for consultation under this programmatic maintain a zone of passage with suitable habitat. Whales in the action area during project operations may avoid interacting with a sediment plume by swimming around it, and any such avoidance would be so minor a movement as to be too small to be meaningfully measured or detected, and is therefore insignificant. However, if whales do interact with a plume, the TSS levels (≤250 mg/L) are below those shown to have an adverse effect on fish (typically up to 1,000.0 mg/L), so it is reasonable to assume that these levels would also be below those that would cause adverse effects to whales (Burton 1993). Furthermore, the high degree of dilution provided by the high energy, tidally influenced receiving water where large whales would be present would ensure that TSS discharged would be well-mixed within a short distance from the discharge outfalls. Furthermore, any exposure to effects is expected to be of short duration due to the high mobility of large-bodied whales. We also do not expect increased TSS associated with projects under this programmatic consultation to affect whale prey items (i.e., copepods, small schooling fish, krill), and PDC 6 excludes any project that has an effect on the PBFs of North Atlantic right whale critical habitat. Based on this information, any effects of TSS or turbidity resulting from NPDES discharge activities on whales will be too small to be meaningfully measured or detected, and therefore, insignificant.

Effects of increased total suspended solids/turbidity on sea turtles:
Limited information is available on the effects of increased TSS on juvenile and adult sea turtles. Sea turtles breathe air, and thus are not subject to the same potential respiratory effects of high TSS as anadromous fish. Increased TSS is most likely to affect sea turtles if a plume causes a barrier to normal behaviors or if sediments settle on the bottom affecting sea turtle prey. However, to be eligible for consultation using the verification form, PDC 5 requires that any project eligible for consultation under this programmatic maintain a zone of passage with suitable habitat. As sea turtles are highly mobile, they are likely to be able to avoid any plumes caused by the NPDES activities authorized by this programmatic consultation and any exposure to effects is expected to be of short duration. Any minor movement to avoid plumes with potentially elevated TSS will be too small to be meaningfully measured or detected, and is therefore, insignificant.

Any far field effects of sedimentation will be minimal, and elevated TSS levels will only likely affect benthic resources if they reach above 390 mg/L (EPA 1986). However, most NPDES discharges are not expected to reach above 250 mg/L per day, based on a survey of possible facilities expected to seek coverage under the programmatic. Leatherback's primary prey item is jellyfish, which occur in the water column; we do not expect jellyfish to be affected by any of the NPDES discharge activities mentioned above. Increased turbidity associated with TSS can reduce primary productivity of algae as well as growth and reproduction of submerged vegetation (Jha and Swietlik 2003). However, any project included in the EPA NLAA Programmatic is not expected to adversely affect SAV (green sea turtles' primary forage source) because increased concentrations of TSS (less than 250 mg/L) in coastal environments where sea turtles may be present is expected to dissipate quickly with high mixing and flows/currents present in those areas. Kemp's ridley and loggerhead sea turtles feed on benthic shellfish or crustaceans and these species are expected to avoid or uncover themselves from any elevated

TSS. Therefore, any effects from TSS or turbidity to sea turtle and their forage items will be too small to be meaningfully measured or detected, and are therefore, insignificant.

Effects of increased total suspended solids/turbidity on sturgeon:
High concentration of TSS or turbidity may affect fish through many pathways (Johnson 2018, Kjelland *et al.* 2015). Increased TSS and turbidity can affect fish directly by reducing the gill's ability to take up oxygen, causing acute toxic reactions, resulting in physiological stress, and reducing foraging efficiency and/or predator avoidance. Suspension of sediment with high organic content can affect fish indirectly by reducing dissolved oxygen levels.

Literature reviews of the consequences of increased TSS on fish show that consequences varies greatly among species and suggest that concentrations of TSS can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993, Kjelland *et al.* 2015, Wilber and Clarke 2001). Studies reviewed by Kjelland *et al.* (2015) found that, depending on the species, reported mortality ranged from 10 to 100 percent when exposed to TSS levels ranging from 300 to 300,000 mg/L after exposure periods ranging from 24 to 48 hours. Wilber and Clarke (2001) found that for adult estuarine species, TSS effects ranged from "no effect" when exposed to 14,000 mg/L for a duration of three days for two species to the lowest observed concentration that caused mortality at 580 mg/L after one day of exposure for Atlantic silverside. The concentration of TSS is not the only factor determining consequences but also the duration at which a fish is exposed. Most studies report response after exposure ranging from 24 to 48 hours.

Kjelland *et al.* (2015) noted that benthic species in general are more tolerant to TSS than pelagic species. Shortnose and Atlantic sturgeon juveniles and adults are often documented in turbid water and Dadswell *et al.* (1984) reports that shortnose sturgeon are more active under lowered light conditions, such as those in turbid waters. As such, sturgeon are assumed to be at least as tolerant to TSS as other estuarine fish. Studies on other anadromous fish, striped bass, showed that pre-spawners did not avoid TSS concentrations of 954 mg/L to 1920 mg/L to reach spawning sites (Summerfelt and Moiser 1976, Combs 1979 in Burton 1993). Based on this information, we regard sublethal and lethal consequences on juvenile, subadult, and adult Atlantic sturgeon and shortnose sturgeon to occur when exposed to 24 hours of concentrations of TSS at or above 1,000 mg/L. The TSS concentrations expected for facilities seeking coverage under the EPA NLAA Programmatic (250 mg/L maximum daily) are below concentrations shown to have adverse effects on fish when exposed for 24 hours (1,000 mg/L) (Wilber and Clarke 2001, Johnson 2018). The concentration of TSS is not the only factor determining consequences but also the duration at which a fish is exposed. Most studies report response after exposure ranging from 24 to 48 hours. Furthermore, laboratory studies (Niklitschek 2001, Secor and Niklitschek 2002) have demonstrated shortnose sturgeon are able to actively avoid areas with unfavorable water quality conditions and that they will seek out more favorable conditions when available. PDC 14 will ensure that outfalls do not discharge increased TSS in areas that are known overwintering grounds, which will ensure TSS discharges do not adversely affect areas where sturgeon may be less active during winter months (i.e., less likely to avoid areas with increased TSS). Given these factors, any exposure of highly mobile sturgeon to effects is expected to be of short duration. Therefore, juvenile, subadult, and adult shortnose and Atlantic sturgeon are expected to be able to actively avoid areas with increased TSS and therefore, effects of increased TSS on these life stages of shortnose and Atlantic sturgeon are expected to be too small to be meaningfully measured or detected and are thus, insignificant.

Similarly, post-yolk sac larvae and young-of-year shortnose and Atlantic sturgeon are mobile and are expected to be able to actively avoid areas with increased TSS (up to 250 mg/L). In addition, as stipulated in PDC 5, post-yolk sac larvae and young-of-year sturgeon will have plenty of room in the waterway to swim and avoid any effects of the discharge because a zone of passage (~50% of water body) with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., biological stressors such as turbidity or effluent plume must not create barrier to passage nor extend from bank to bank or surface to bottom in a river) when ESA-listed species are expected to be present. Therefore, post-yolk sac larvae and young-of-year are expected to be able to actively avoid areas with increased TSS and therefore, effects of increased TSS on these life stages of shortnose and Atlantic sturgeon are expected to be too small to be meaningfully measured or detected and are thus, insignificant.

Atlantic sturgeon and shortnose sturgeon eggs and yolk-sac larvae (i.e., ELS) are expected to be less tolerant to increased TSS than juveniles, subadults, and adults and are not expected to be able to actively avoid areas with increased TSS. It is clear that eggs and larvae are the most sensitive to TSS and sediment deposition. The deposition of sediment can be harmful to eggs and larvae through burial or encasement of eggs in fine particles occupying interstitial spaces, and these earlier stages are unable to avoid this stressor because of their limited mobility. Hastings observed that larval populations in the Delaware River may be negatively affected when TSS settles out of the water column (1983). Auld and Schubel showed that striped bass larvae tolerated 50 mg/l and 100 mg/l TSS concentrations and that survival was significantly reduced at 1000 mg/l (1978). Similarly, in a study by the USACE on the effects of TSS on white perch and striped bass eggs and larvae, researchers found that sediment began to adhere to the eggs when sediment levels of over 1000 parts per million (ppm) were reached (1973). In a frequently cited review paper prepared by Newcombe and Jensen (1996), sublethal effects (e.g., increased respiration rate) were observed in eggs and larvae of fish when exposed to TSS concentrations as low as 55 mg/L for one hour. The TSS levels expected for facilities that seek coverage under the NLAA Programmatic (250 mg/L) are greater than the TSS thresholds described above that may cause adverse effects to ELS. However, PDC 2 specifies that no project will occur in Atlantic or shortnose sturgeon spawning grounds in the Merrimack River, Piscataqua River, Connecticut River, and/or any additional river where spawning grounds are identified[1] unless:

a. effluent is compliant with state water quality standards at the end-of-pipe discharge point, and

b. an adequate dilution factor in the receiving water body is achieved.

Furthermore, PDC 12 specifies that increased TSS should not reach levels that may adversely affect adhesion of sturgeon eggs on hard bottom substrate, sturgeon ELS, or spawning. Therefore, EPA would ensure and have to demonstrate that an adequate dilution rate is present in receiving waters where facilities outfalls are located in spawning areas and where ELS may be present. With adequate mixing of the effluent plume with increased TSS of up to 250 mg/L, it is likely that the highly diluted discharge of TSS from facilities in concentrations allowed by water quality standards will be too small to be meaningfully measured or detected and have an insignificant effect on shortnose and Atlantic sturgeon ELS.

High TSS levels can cause a reduction in dissolved oxygen (DO) levels. Atlantic and shortnose sturgeon may become stressed when dissolved oxygen fall below certain levels. An analysis of effects of DO on sturgeon can be found below.

Certain waterbody types are capable of recovering more quickly from events causing excess TSS and turbidity (e.g., high energy streams), whereas others may retain accumulated sediments for years (e.g., lakes and wetlands) (EPA 2009). Therefore, since streams and high energy offshore areas are expected to have only temporary impacts due to sufficient mixing, increased TSS is generally most likely to potentially affect older, mobile life stages of sturgeon if a plume causes a barrier to normal behaviors. The TSS levels expected for wastewater and stormwater outfalls (up to 250 mg/L) are below those shown to have adverse effect on fish, which are typically up to 1,000 mg/L and benthic communities (390.0 mg/L) (EPA 1986). Therefore, TSS plumes are expected to disperse rapidly in close proximity to an outfall and are expected to be below levels that will adversely affect mobile post-yolk sac larvae, young of year, juvenile, subadult, and adult sturgeon. However, the increase in TSS levels expected are so minor that any effect of sediment plumes caused by the proposed action on sturgeon movements or behavior will be undetectable; we expect sturgeon to either swim through the plume or make small evasive movements to avoid it. In addition, PDC 5 requires that all projects maintain a zone of passage with appropriate habitat for sturgeon to move around the plumes, therefore, any such avoidance would be so minor as to be too small to be meaningfully measured or detected and, therefore, insignificant. Furthermore, adequate dilution (PDC 2) will be required for any areas where ELS may be present in the vicinity of the outfall and where spawning may occur, thereby, reducing TSS levels within the vicinity of the outfall (within 300 meters) to undetectable levels (Baumgartner 1994).

PDC 2 and 3 provide restrictions that prevent discharges of increased TSS from affecting spawning sturgeon and ELS. Furthermore, PDC 4 and 10 will ensure no changes to water quality caused by increased TSS/turbidity that may adversely affect sturgeon surrounding facility outfalls. In addition, PDC 5 will ensure that all projects maintain a zone of passage with suitable habitat for sturgeon to avoid any plumes from facility discharges. PDC 12 specifies that increased TSS should not reach levels that may adversely affect adhesion of sturgeon eggs on hard bottom substrate, ELS, or spawning. As elevated TSS levels from facility discharges (including stormwater and CSOs) are anticipated to decrease rapidly with increasing distance from the outfall(s) due to mixing and based on the best available information, the effects of increased TSS and turbidity on sturgeon and their prey are too small to be meaningfully measured or detected and are thus, insignificant.

If the section 7 biologist reviewing a verification form believes the effects of increased TSS and turbidity to sturgeon may rise above levels that are insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Effects of increased total suspended solids/turbidity on designated Atlantic sturgeon critical habitat:

PDC 3 excludes any activity that will affect Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. Additionally, PDC 1 excludes any project that may adversely affect Atlantic sturgeon designated critical habitat, but it is possible that permitted activities under the NLAA Programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4. Projects may have minor effects on PBF 2 (see Table 4). TSS concentrations of up to 250 mg/L per day (max daily for facilities that are expected to seek coverage under the EPA NLAA Programmatic) may impact the soft bottom substrate that comprises PBF 2. However, effluent discharges with increased TSS comprise a small volume of freshwater compared the high-flowing rivers and is not expected to alter the salinity gradient or overall flow of the receiving water. Any effects from increased TSS/turbidity to the value of PBF 2 to the conservation of the species is too small to be meaningfully measured or detected and are, therefore, insignificant. Sturgeon may have to swim around discharge plumes with elevated TSS in rivers where designated Atlantic sturgeon critical habitat is present, but PDC 5 requires that all projects maintain passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.). Therefore, no project included under this programmatic will create barriers that would limit sturgeon's ability to migrate to or from areas within critical habitat rivers necessary for foraging, staging, spawning, rearing, etc., as specified in PBF 3 (see Table 4). Any effects from increased TSS/turbidity to the value of PBF 3 to the conservation of the species is too small to be meaningfully measured or detected and are, therefore, insignificant. PDC 4 excludes discharges that may change temperature, water flow, salinity, or dissolved oxygen to levels that may adversely affect ESA-listed species or designated critical habitat, in order to ensure protection of PBF 4 (see Table 4). PBF 4 may be subject to minor impacts due to increased TSS based on the potential for a reduction in DO in the water and an increase in surface water temperature (dependent on the specific characteristics of a facility's effluent). However, with the substantial amount of mixing expected in the receiving waters and adequate dilution of the effluent detailed in PDC 2, any effects from increased TSS/turbidity to the value of PBF 4 to the conservation of the species is too small to be meaningfully measured or detected and are, therefore, insignificant.

If the section 7 biologist reviewing a verification form believes the effects from increased TSS/turbidity to Atlantic sturgeon critical habitat may rise above insignificant, the biologist will require EPA to complete an individual consultation.

Effects of increased total suspended solids/turbidity on designated North Atlantic right whale critical habitat:

PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Discharges from activities permitted under this EPA NLAA Programmatic are not expected to overlap with North Atlantic right whale critical habitat PBFs due to the substantial mixing that is expected to occur in tidally influenced and dynamic ocean environments. Any plumes of increased TSS will disperse rapidly and are not expected to affect ocean currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBF 1, PBF 2, PBF 3, or PBF 4 (Table 5). Therefore, the effects from discharges of TSS authorized under the EPA NLAA Programmatic on North Atlantic right whales critical habitat will not be considered further.

Nutrients
Nutrients, specifically nitrogen and phosphorus, are essential nutrients for plant growth, but elevated concentrations can result in degradation of the waterbody. Eutrophication is one process that can occur when an overabundance of nutrients are present. This process starts when algae feed on the excess nutrients that grow and spread, which can, block sunlight, and even potentially release toxins. Many studies have demonstrated the link between phytoplankton toxin production and nutrient availability (Brandenburg et al. 2020, Van de Waal et al. 2013). In marine systems, the majority of documented algal bloom events are associated with fish mortalities, but other marine animal mortalities, such as of whales and sea turtles, have been linked to bacteria and toxins that may have been produced from harmful algal blooms (Geraci et al. 1989, Hokama et al. 1990, Anderson and White 1992, Landsberg 2002). Harmful algal blooms have been reported to affect zooplankton, macroinvertebrates, vertebrates (Landsberg 2002, Shumway et al. 2003). In addition, the timing of algal blooms and strandings of marine mammals may suggest that species that forage both inshore and offshore can be affected by algal blooms and subsequent toxins produced (Gulland and Hall 2007, de la Riva et al. 2009), which is another possible consequence of excess nutrients in the aquatic system.

In addition, blooms can further degrade water quality because decomposing and respiring cells deplete dissolved oxygen in the water. Algal blooms can occur naturally when elevated rainfall can increase nutrient loads, suggesting a link between eutrophication and the intensity and frequency of blooms (Phlips et al. 2010). However, they are frequently associated with elevated nutrient concentrations due to anthropogenic factors. Untreated wastewater effluent during operation of CSOs and untreated stormwater runoff can contain significant amounts of nitrogen and phosphorus from domestic and industrial sources (EPA 2004). Algal blooms often occur during the summer months in slow-moving water and with warm water temperatures and also can occur in coastal environments, similar to the bloom discussed in Fire et al. (2012). In coastal waters of New England, blooms of Alexandrium can produce toxins and have occurred most often during summer months. Freshwater cyanobacteria or blue-green algae blooms occur in rivers and have the potential to produce toxins that can harm wildlife and aquatic life.

Narrative water quality criteria for nutrients applicable to all surface waters in MA (i.e., Class A, B, C, SA, SB, SC) states that unless high nutrients are naturally occurring in the receiving waters "all surface waters shall be free from nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed the site specific criteria developed in a TMDL or as otherwise established by the Department pursuant to 314 CMR 4.00." Furthermore, it stipulates that "any existing point source discharge containing nutrients in concentrations that would cause or contribute to eutrophication, including the excessive growth of aquatic plants or algae, in any surface water shall be provided with the most appropriate treatment." Similarly, NH's narrative water quality criteria state that any discharges of nutrients "shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring. Existing discharges containing phosphorus or nitrogen, or both, which encourage cultural eutrophication shall be treated to remove the nutrient(s) to ensure attainment and maintenance of water quality standards" Env-Wq 1703.14(b) & (c). Therefore, MA and NH require adequate removal and treatment of excess nutrients from effluent discharged to receiving waters and establish that nutrients concentrations in effluent should not impair water quality (i.e., result in algal blooms). In addition to the narrative criteria above, EPA's NPDES permits establish numeric effluent limits for nutrients based on a facility's design flow in order to ensure that facilities attain and maintain narrative water quality criteria and are fully protective of designated uses of the receiving waters.

According to the best available data that was compiled during our survey of NPDES permits, the maximum daily effluent limit (calculated based on an individual facility's design flow) for nutrients in MA and NH facilities surveyed (both municipal and industrial facilities) is highly variable. For example, for a particular facility in NH, there was different numeric water quality criteria (allowable loads) based on the time of year. In summer, this NH facility (Town of Hampton WWTF) had a monthly average nitrogen limit of 1.1 mg/L, with a daily maximum of 7.4 mg/L. While the limit for winter is monthly average nitrogen of 2.7 mg/L and daily maximum of 17.9 mg/L. Some facilities in MA also had similar criteria. One facility in MA (Town of Marion WWTF) had criteria for ammonia nitrogen for May 1 to May 31 that was 2.6 mg/L (12.75 lb/d) monthly average and decreased to 1.74 mg/L (8.53 lb/d) monthly average June 1 to October 31. In addition, total nitrogen criteria was 4.0 mg/L (19.6 lb/d) average monthly and total phosphorus criteria was 200 mg/L (0.98 lb/d) average monthly. However, the average numeric criteria for total nitrogen load for MA facilities was 4 mg/L average monthly, while criteria for NH facilities surveyed (both municipal and industrial facilities) there are few facilities with numeric criteria for nutrients. Therefore, although nutrient criteria are highly variable and facility dependent, the maximum value for nutrient water quality criteria observed was a maximum daily value of 10 mg/L and 6 mg/L (ammonia nitrogen) average monthly. Based on this data, slightly elevated levels of nitrogen and phosphorus may be present in the immediate vicinity of a facility's outfall(s) that are eligible for inclusion in the EPA NLAA Programmatic, however, water quality criteria stipulates that no impairment should occur in receiving waters due to nutrients present in effluent.

Effects of excess nutrients on whales:
Few studies have been conducted to understand how increased nutrients, and the possibility of subsequent algal blooms, impact whales. Geraci et al. (1989) studied how toxins produced from harmful algal blooms can move up the food chain and subsequently may have caused a humpback whale mortality event. During a 5-week period beginning in late November 1987, 14 humpback whales deaths in Cape Cod Bay were thought to be caused by the whales ingesting Atlantic mackerel containing a toxin produced from harmful algal blooms (i.e., saxitoxin). However, Geraci calculated that the whales would have consumed 3.2 µg/kg of the toxin after ingesting the contaminated mackerel, which is below the minimum lethal dose for humans (7-16 µg/kg) (1989). Based on this data, it is highly unlikely that the calculated concentration of saxitoxin the whales received caused mortality. Given that the facilities that are expected to seek coverage under the EPA NLAA Programmatic will have a maximum nutrient concentration of maximum daily value of 10 mg/L, it is unlikely that highly diluted NPDES discharges will cause the large-scale algal blooms that have the potential to affect whales. Furthermore, water quality criteria stipulates that no facility effluent should degrade the waterbody, which would ensure that facilities do not discharge nutrients in concentrations that would cause large-scale algal blooms.

A recent paper by Fire et al. investigated the exposure of marine mammals in New England waters to toxins produced by algal blooms (2021). Results demonstrate that no toxins were detected in the two North Atlantic right whales tested and toxins were present in one of the four fin whales tested (Fire et al. 2021). Marine mammals in Maine waters were almost two times more likely to contain toxins than mammals tested in MA waters, which is thought to be linked to annual, large-scale (~500km) algal blooms near the Bay of Fundy. The best available data demonstrates that nutrients in high concentrations that cause large-scale algal blooms (i.e., blooms in coastal Maine and Cape Cod Bay) are not expected to occur as a result of the highly diluted and relatively small-scale discharges of nutrients (maximum daily value of 10 mg/L and maximum average monthly value of 200 mg/L) expected from the facilities that are expected to seek coverage under the EPA NLAA Programmatic. In addition, increased nutrients caused by regulated wastewater outfalls is not expected to produce algal blooms to the size and extent and with the level of toxins that affect whales. Due to the highly mobile nature of whales, they are expected to avoid areas that may experience algal blooms and possible toxins resulting from increased nutrient levels in the water column. Therefore, effects from the facilities expected to seek coverage under this programmatic, with regulated nutrient input into receiving waters, where ESA-listed whales are present are too small to be meaningfully measured or detected and are thus, insignificant.

Reduced dissolved oxygen levels as a result of increased nutrients is the most likely route of effects to large-bodied whales. However, any possible changes in DO in nearshore areas where facility discharges occur are not expected to impact DO levels in the dynamic, coastal waters in which whales are present. Discharges of nutrients by facilities covered under the programmatic are expected to mix rapidly and be too small to be meaningfully measured or detected in the open ocean and any exposure to effects is expected to be of short duration. Furthermore, EPA water quality criteria requires that any discharges not degrade or impair water quality. PDC 4 states that there should be no changes in temperature, water flow, salinity, or dissolved oxygen to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 11 will ensure that no discharges of nutrients reduce DO in the receiving waters that may adversely affect ESA-listed species, particularly in the summer months when blooms are more likely to occur. Therefore, the effects of excess nutrients in receiving waters on whales are insignificant.

Effects of excess nutrients on sea turtles:
Capper et al. studied effects of algal blooms on green sea turtles (*Chelonia mydas*) in Florida and found that pathways of effects may include ingestion of toxins from the water column, inhalation from the air (released during wave action), and through prey contamination (2013). However, given that sea turtles expel water that they intake, sea turtles are unlikely to ingest toxins that may present in seawater as a result of algal blooms. Also, although it is possible that sea turtles may be exposed to toxins through inhalation (Capper et al. 2013), there is no available data on the effects of toxin inhalation to sea turtles. Although unlikely, any exposure that may occur is expected to be short in duration due to their highly mobility and contact would be infrequent because of their migratory nature. The most likely pathway of effects from excess nutrients to sea turtles is via trophic transfer of toxins through their prey (Capper et al. 2013). It is unlikely that excess nutrients would impact leatherback sea turtles prey items because any contact with excess nutrients would be limited and short in duration due to the highly mobile nature of leatherback prey (i.e., jellyfish). The diet of loggerhead and Kemp’s ridley sea turtles that contain shellfish may expose them to increased levels of toxins from algal blooms. Red tide intoxication (either through trophic transfer or inhalation) was determined as the cause of death

in over 90% of the 318 documented sea turtle strandings that occurred in Florida during a mortality event in 2005 to 2006 (Fauquier 2013). Increased nutrients can also impact seagrass beds, green sea turtle's main food source. Large-scale algal blooms can potentially block sunlight and damage seagrass beds. In Florida, blooms in 2009-2012 caused the loss of more than 32,000 acres of seagrass (Capper et al. 2013). A study by Flewelling et al. (2004) demonstrated that toxins from algal blooms can be found on the blades of grass themselves and in filter-feeding organisms in the same area. Thereby, potentially effecting sea turtles through seagrass (i.e., green sea turtles) and also through their invertebrate prey (loggerhead and Kemp's ridley). However, Hu et al. (2006) study of the algal bloom that occurred in Florida from 2005 to 2006 identified runoff and extremely heavy wet weather events as the reasons for the large-scale algal bloom. Therefore, the algal blooms discussed above that resulted in effects to sea turtles lasted a full year and the algal bloom regulated facilities discharging diluted amount of nutrients are not expect to result in the wide-spread effects caused by algal blooms discussed above. Furthermore, due to the temperature fluctuations in the Great Atlantic Region waters large-scale blooms (described above in Florida from 2005 to 2006) do not occur in the frequency nor the intensity in NH and MA waters as in Florida. The best available data demonstrates that nutrients in high concentrations that cause large-scale algal blooms (similar to those discussed above) are not expected to occur as a result of the highly diluted, relatively small-scale discharges of nutrients (maximum daily value of 10 mg/L and maximum average monthly value of 200 mg/L) expected from the facilities that may seek coverage under the EPA NLAA Programmatic. If sea turtles do encounter the areas that are impacted by effluent from facilities under this EPA NLAA Programmatic, highly mobile sea turtles are expected to avoid areas that many experience algal blooms due to increased nutrients and any exposure to effects is expected to be of short duration. Additionally, sea turtles are expected to have infrequent contact with toxins because of their migratory and opportunistic feeding habits. Therefore, the effects of increased nutrients on sea turtles are too small to be meaningfully measured or detected and are thus, insignificant.

Reduced DO levels as a result of increased nutrients may also affect sea turtles and their prey. However, effluent is expected to mix rapidly and will be too small to be meaningfully measured or detected in highly dynamic tidally-influenced areas of rivers and the open ocean where sea turtles and their prey are expected to be present. Furthermore, PDC 4 states that there should be no changes in temperature, water flow, salinity, or DO to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 11 will ensure that no discharges of nutrients reduce DO in the receiving waters that may adversely affect ESA-listed species, particularly in the summer months when blooms are more likely to occur. Therefore, effluent with excess nutrients is not expected to degrade water quality or impair DO levels that may adversely affect ESA-listed species of turtles and their prey, therefore, the effects of excess nutrients in receiving waters on sea turtles are too small to be meaningfully measured or detected and are thus, insignificant.

Effects of excess nutrients on sturgeon:
Similar to sea turtles, effects to sturgeon may occur if increased nutrients produce toxic algal blooms that might be ingested by sturgeon through prey items and through their gills also when toxins are present in the water column. Severe algal blooms have been linked to die-offs of sturgeon prey items, including polychaetes, amphipods, and gastropods (Simon and Dauer 1972,

Roberts 1979, Landsberg et al. 2009) and other filter feeding organisms (Flewelling et al. 2004). When filter-feeding shellfish consume toxic microalgae and accumulate the toxins, this transfers toxins up to higher trophic levels, which can negatively impact sturgeon (Landsberg 2002). Fire et al. (2012) studied algal bloom impacts on adult shortnose sturgeon in New England waters and results suggested that sturgeon mortality occurred due to saxitoxin exposure through trophic transfer. Fire (2012) concluded that the level of toxins that the sturgeon were exposed to were three times higher than the federal regulatory limit for seafood and may have led to the shortnose sturgeons death. However, algal blooms of this magnitude are extremely rare in New England waters. Concentrations of Alexandrium observed during the event described by Fire et al. (2012) exceeded the highest density of a bloom ever reported for the Gulf of Maine (D. Couture unpublished data, as cited in Fire et al. 2012). Uptake of toxins through fish gills is also a potential pathway for effects from algal blooms to sturgeon (Pierce et al. 2008, Fire et al. 2008). Fire et al. examined toxins present in fish collected from Florida waters during a toxic algal bloom (2008). Toxins were found in 91% of gill samples (n = 35) (Fire et al. 2008). However, Pierce et al. notes that fish have the ability to detoxify toxins and may recover if removed from contaminated waters (2008). Therefore, if sturgeon do come in contact with toxins in the water column, exposure would be limited and short in duration due to the transient nature and high mobility of sturgeon.

Furthermore, blooms may impact DO, which is another pathway for effects of excess nutrients to sturgeon. However, adult, sudadult, and juvenile sturgeon are highly mobile and are known to avoid hypoxic areas and preferentially select suitable habitat (Niklitschek and Secor 2010) and exposure is expected to be short in duration. Given that algal blooms of the size and scale are extremely unlikely, and also that sturgeon are expected to avoid areas with low DO and forage in areas with more suitable habitat, effects to adult, subadult, and juvenile sturgeon are extremely unlikely to occur from increased nutrients as a result of effluent from facilities that may seek coverage under the EPA NLAA Programmatic. If sturgeon do encounter areas with low DO caused by effluent from facilities under this EPA NLAA Programmatic, adult, subadult, and juvenile sturgeon are expected to avoid areas with algal blooms and any contact would be limited and short in duration, given high mobility of sturgeon and their foraging behavior.

There is no available data on effects of nutrients and possible subsequent algal blooms on ELS. However, the best available data demonstrates that nutrients in high concentrations that cause large-scale algal blooms (discussed above) are not expected to occur as a result of the highly diluted, relatively small-scale discharges of nutrients (maximum daily value of 10 mg/L and maximum average monthly value of 200 mg/L) expected from the facilities that may seek coverage under the EPA NLAA Programmatic. EPA water quality criteria requires that any discharges of nutrients be at levels that will not degrade or impair water quality. PDC 4 states that there should be no changes in temperature, water flow, salinity, or DO to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 11 states that nutrients in the receiving water must not reduce DO levels in a way that negatively affects ESA-listed species, particularly in summer months. Therefore, effluent discharges which increase nutrients in receiving waters are not expected to adversely affect ELS by degradation of water quality or impairment to DO levels, therefore, the effects of excess nutrients in receiving waters on sturgeon are insignificant.

Effects of nutrients on Atlantic sturgeon critical habitat:
It is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4 (Table 4). PDC 3 requires that any activity will have no effect on Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. Facilities with effluent that contains excess nutrients must have adequate dilution (as required by PDC 2) that will not contribute to excessive algal growth. In addition, discharges comprise a small volume of freshwater compared with the flowing rivers where PBF 2 may be present and is not expected to alter the salinity gradient, soft bottom substrate, nor overall flow of the receiving water (PBF 2) resulting from activities described in the EPA NLAA Programmatic. Effluent with increased nutrients will not impact the water depth or interfere with the unimpeded movement of adults to and from spawning sites, either temporarily or permanently (PBF 3). Sturgeon may have to swim around discharge plumes with excess nutrients in rivers where designated Atlantic sturgeon critical habitat is present, but PDC 5 requires that all projects maintain passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.). Therefore, no project will create barriers that would limit sturgeon's ability to migrate to or from areas within critical habitat rivers necessary for foraging, staging, spawning, rearing, etc., as specified in PBF 3. PBF 4 may be subject to minor impacts to DO, water temperature, and salinity due to the discharge of effluent. However, water quality criteria will ensure that the maximum nutrient levels allowed in discharge will be protective of water quality, including required dissolved oxygen levels of 5 mg/L in the receiving waters (PBF 4). This will ensure that DO levels are protective of spawning and rearing habitats, as described in PBF 4. In addition, with the substantial amount of mixing expected in the receiving waters and adequate dilution of the effluent detailed above and required as part of PDC 2, effects of nutrients discharges on the value of PBF 2, 3, and 4 to the conservation of the species are too small to be meaningfully measured or detected and are insignificant.

If the section 7 biologist reviewing a verification form believes the effects to Atlantic sturgeon critical habitat may rise above insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Effects of nutrients on designated North Atlantic right whale critical habitat:
PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Due to the substantial mixing that is expected to occur in tidally influenced and dynamic ocean environments where critical habitat is present, outfalls which discharge increased nutrients are not expected to overlap with North Atlantic right whale critical habitat. Increased nutrients in the receiving waters will disperse rapidly and are not expected to impact ocean currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBF 1, PBF 2, PBF 3, or PBF 4 (see Table 5) due to adequate dilution. Therefore, the effects from discharges of nutrients authorized under the EPA NLAA Programmatic on North Atlantic right whales critical habitat will not be considered further.

Dissolved Oxygen/Biochemical Oxygen Demand

DO is a measure of how much oxygen is dissolved in the water, thereby; it is the amount of oxygen in-water available to ESA-listed species. DO conditions determine habitat suitability for species and also plays an important role in determining the rate at which biochemical reactions occur in a waterbody. BOD_5 is a measurement used to determine how much dissolved oxygen aerobic microorganisms are using in the water to decompose organic matter. DO dynamics are governed by physical and biological processes (i.e., the production and respiration of organic materials). When organic material is produced, DO is produced and when organic material is consumed, DO is consumed. When too much DO is consumed, there is the potential to decrease DO concentrations near an outfall. The effects of oxygen depletion (DO and BOD_5) in receiving waters on ESA-listed species are considered below. In the ocean and freshwater environments, hypoxia is low or depleted oxygen in a waterbody. Hypoxia is often associated with the overgrowth of certain species of algae, which can lead to further dissolved oxygen depletion when they die, sink to the bottom, and decompose.

In general, large rivers with rapidly moving water tend to contain higher levels of DO, whereas smaller, more stagnant streams generally contain less. In turbulent waters (i.e., coastal environments), DO is generally higher due to consistent aeration created by wave action. However, DO is highly variable and can change drastically due to seasonality, ambient temperature, and other water quality constituents. There are many water quality constituents that can reduce DO, including bacteria, nutrients, and TSS. Bacteria in water can consume oxygen as organic matter decays and excess nutrients can excel this process, which can cause eutrophic conditions and further deplete DO concentrations. The concentration of DO in water is highly influenced by water temperature. High temperatures reduce the solubility of oxygen in water, therefore, when the water temperature is low (i.e., winter and spring), DO concentrations are higher and when water temperatures are higher (i.e., summer and fall), DO concentrations are often lower.

EPA sets class-based criteria for DO applicable to facilities in MA. Each waterbody is a class and DO criteria are established to meet water quality standards and designated uses for that waterbody. In general, the average DO required for any class of waterbody that discharges to MA waters states that DO should not be less than 5.0 mg/L (Class A, Class B, Class SA, Class SB, Class SC), some even requiring DO of 6.0 mg/L. The criteria for Class C waters contains the lowest possible criteria, stating DO shall "not be less than 5.0 mg/L at least 16 hours of any 24-hour period and never less than 3.0 mg/L". However, Class C waters are not present in MA, therefore, this Class C criteria does not apply to any facility discharging to MA waters where ESA-listed species will be present and will not be considered. Similar to MA water quality standards, NH facilities also must comply with class-based criteria for DO. The average DO required for any class of waterbody that discharges to NH waters is at least 75% DO saturation (Class A and Class B). Percent of oxygen saturation is dependent on the water temperature. For example, in a river with a water temperature of 70°F, a 75% oxygen saturation level translates to a DO concentration of approximately 6.7 mg/l daily average. In the ocean, at a water temperature of 65°F, a 75% oxygen saturation level translates to a DO concentration of approximately 7.6 mg/l daily average. The minimum DO concentration required for NH facilities is 5 mg/L. Therefore, the minimum DO that is expected for MA and NH facilities is 5.0 mg/L.

MA and NH water quality standards establish mass-based BOD_5 criteria to meet ensure facilities meet water quality standards in receiving waters. BOD_5 criteria for MA facilities are calculated based on a facility's design flow. We completed a survey of water quality criteria for MA and NH and the average required BOD_5 observed was 30 mg/L average monthly and 45 mg/L average weekly. According to data published in by EPA (2004), facilities across the U.S. had an average BOD_5 concentration of 30 mg/L measured in wastewater facility effluent, which meets that water quality standards set above. CSOs and stormwater outfalls contribute to a relatively low percentage of the total municipal BOD_5 load (calculated using data from facilities throughout the U.S.) discharged annually, making up 9% and less than 1% of the total BOD_5 concentrations discharged to U.S. waters. Average BOD_5 concentrations from CSOs is 43 mg/L and average stormwater BOD_5 concentrations are 42 mg/L (EPA 2004).

Effects of dissolved oxygen and biochemical oxygen demand on whales:
North Atlantic right whales and fin whales breathe air from the surface and do not need to remove oxygen from the water to survive. DO levels that meet water quality criteria for BOD_5 and DO in MA and NH (average of 5.0 mg/L) are not known to directly impact the health of whales. Some seawater may be ingested by whales while feeding, but whales are expected to expel most of it while filter feeding and given the high mobility of large whales, is exposure is expected to be short in duration. In addition, North Atlantic right whales and fin whales have a wide habitat range, migrating from the tropical feeding waters up through Gulf of Maine waters. Oceanic surface water DO levels normally range from approximately 9 mg/l in the arctic to 4 mg/l near the equator; therefore, it is likely that these whales are capable of adapting to varying DO concentrations. Furthermore, any effluent with a DO level of 5.0 mg/L discharged to the ocean where whales will be present is expected to rapidly mix with the ambient ocean water and DO levels will rapidly reach background levels. Effluent discharges covered by facilities under the EPA NLAA Programmatic are expected to mix rapidly and be too small to be meaningfully measured or detected in the open ocean. Furthermore, PDC 4 states that there should be no changes in temperature, water flow, salinity, or DO to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 10 and 11 will ensure that no discharges reduce DO in the receiving waters that may adversely affect ESA-listed species, particularly in the summer months when low DO is more likely to occur. Given that DO levels of 5.0 mg/L are not known to have negative biological effect on highly mobile North Atlantic right whales and fin whales that ingest the water and that DO is expected to reach background levels rapidly due to adequate mixing in receiving waters where whales may be present, effects of changes to DO and BOD_5 concentrations encountered by whales are too small to be meaningfully measured or detected and are insignificant.

Distribution of whale prey items may be indirectly impacted by changes in DO (Craig et al. 2001). However, any effluent with a DO level of 5.0 mg/L discharged from outfalls nearshore is expected to rapidly mix with the ambient ocean water and is not expected to impact DO concentrations in the open ocean where whales feed. DO levels will rapidly reach background levels and are not expected to impact prey distribution in the ocean. Effluent discharges by facilities under the EPA NLAA Programmatic are expected to mix rapidly and be too small to be meaningfully measures or detected in the open ocean. Therefore, effects from DO and BOD_5 concentrations to whale prey availability are too small to be meaningfully measured or detected and are insignificant.

Effects of dissolved oxygen and biochemical oxygen demand on sea turtles:
Similar to whales, ESA-listed species of sea turtles breathe air from the atmosphere and hold their breath while underwater. They do not need to remove oxygen from the water to survive, therefore, DO levels of 5.0 mg/L is not expected to directly impact the respiration of sea turtles. Seawater may be inadvertently ingested by sea turtles while feeding and sea turtles will also ingest seawater directly in order to hydrate, although the majority of the ingested water is thought to be expelled. Sea turtle ingesting small amounts of water while feeding or drinking would be infrequent, intermittent, and of short duration. Therefore, effluent discharges covered by facilities under the EPA NLAA Programmatic are expected to mix rapidly and be too small to be meaningfully measured or detected in the open ocean and tidally influenced rivers where sea turtles may be present.

In addition, similar to whales, sea turtles have a wide habitat range, migrating from tropical waters up through Gulf of Maine waters. Oceanic surface water DO levels normally range from approximately 9 mg/l in the arctic to 4 mg/l near the equator. Based on this information, it is likely that sea turtles are capable of adapting to varying DO concentrations. Furthermore, PDC 4 states that there should be no changes in temperature, water flow, salinity, or DO to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 10 and 11 will ensure that no discharges reduce dissolved oxygen in the receiving waters that may adversely affect ESA-listed species, particularly in the summer months when low DO is more likely to occur. Given that DO levels of 5.0 mg/L are not known to have negative biological effect on sea turtles that ingest the water and that DO is expected to reach background levels rapidly due to adequate mixing in receiving waters where sea turtles may be present, effects of changes to DO and BOD_5 concentrations from effluent on sea turtles are too small to be meaningfully measured or detected and are thus, insignificant.

A potential indirect effect to sea turtles from impacts to DO and BOD_5 is changes to sea turtle prey distribution (Craig et al. 2001). The prey of leatherback, loggerhead, Kemp's ridley, and green sea turtles, (i.e., benthic invertebrates, jellyfish, seagrasses, and algae, respectively), may be limited in areas where and when there is low DO. However, bottom water hypoxia occurs at DO of 2.0 mg/L (Craig et al. 2001) and DO concentrations in effluent are expected to be 5.0 mg/L on average, thereby not expected to contribute to hypoxic bottom conditions. Furthermore, DO is expected to rapidly mix with the receiving water and is not expected to impact DO concentrations in the open ocean and tidally influenced areas where sea turtles prey are present. Given that DO levels will rapidly reach background levels and are not expected to impact benthic prey availability distribution, effects to highly mobile sea turtles and their prey from effluent discharges are expected to be too small to be meaningfully measured or detected. Therefore, effects from DO and BOD_5 concentrations to sea turtle prey availability are insignificant.

Effects of dissolved oxygen and biochemical oxygen demand on sturgeon:
Atlantic and shortnose sturgeon have been observed to be particularly sensitive to low DO and are known to have higher sensitivities to DO concentrations compared with many estuarine species (Niklitschek 2009a, Secor and Niklitschek 2001, Secor & Gunderson 1998). Sturgeon are known to be adversely affected by DO levels below 5 mg/l and several studies demonstrate

that juvenile shortnose sturgeon are intolerant of DO concentrations less than 4.0 mg/L (Jenkins et al. 1994, Niklitschek 2001). Jenkins et al. (1993) observed that younger shortnose sturgeon experienced high levels of mortality at low DO levels while older individuals tolerated those reduced levels for short time periods. In DO experiments conducted by Jenkins et al. (1993), shortnose sturgeon 22-77 days of age exposed to various DO levels in mostly freshwater at a mean temperature of 22.5°C experienced a significant decrease in percent survival between 3.5 and 3.0 mg/L DO. In addition, using various temperature, DO, and salinity combinations in a test of 24-hours of exposure, Campbell and Goodman (2004) estimated the concentration that kills 50% (LC50[7]) of 77 to 104 day old fish to be 2.7 mg/l (32% DO saturation, 22°C, 4% salinity), 2.2 mg/l (28% DO saturation, 26°C, 4.5% salinity), and 3.1 mg/l (42% DO saturation, 30°C, 2% salinity). The best available data demonstrates that sturgeon are more sensitive to low DO conditions than some other fishes and become stressed in hypoxic conditions (generally under 5 mg/L), which may limit growth, metabolism, activity, and swimming (Cech et al. 1984, Secor and Gunderson 1998, Secor and Niklitschek 2001, Secor and Niklitschek 2002, Cech and Crocker 2002, Campbell and Goodman 2004). Therefore, low DO for sturgeon has generally been defined as less than 5 mg/L (Shortnose Sturgeon Status Review Team 2010).

Wirgin and Chambers (2018) conducted DO tests with hatchery raised larval to juvenile (1.94 cm to 5.08 cm SL) Atlantic Sturgeon and found that DO may impact sturgeon prey consumption. Results showed that prey consumption was significantly reduced at 3 mg/l DO when compared to tests using higher DO conditions (i.e., 4 mg/l, 6 mg/l, 8 mg/l, and 10 mg/l DO at 15°C and 0.01 ‰ salinity). However, results also showed that percent survival did not decrease with decreased DO (Wirgin and Chambers 2018). Therefore, changes in DO may impact sturgeon fitness by reducing prey consumption.

As discussed above, temperature can also impact DO. Research demonstrates that instantaneous minimum DO concentrations of 4.3 mg/L protects shortnose sturgeon survival at temperatures greater than 29ºC (EPA 2003a). However, Atlantic sturgeon may be more sensitive to higher temperatures than shortnose sturgeon (Secor and Niklitschek 2001). Secor and Niklitschek study juvenile Atlantic and shortnose sturgeon physiological responses when exposed to 27ºC and 40% DO saturation (2.9 mg/L) waters (Niklitschek 2001, Secor and Niklitschek 2001). Atlantic sturgeon displayed higher reductions in growth (77%) and routine metabolism (28%) than shortnose sturgeon (69% and 21%, respectively) (Niklitschek 2001, Secor and Niklitschek 2001). Therefore, effluent DO concentrations of 5.0 mg/L average are not expected to adversely affect sturgeon. If receiving waters contain conditions (i.e., increased temperatures, increased nutrients and productivity that may result in algal blooms) that lower DO below 5.0 mg/L, possible impacts to sturgeon may include a disruption in normal behaviors. However, studies show Atlantic sturgeon avoid hypoxic areas and preferentially select suitable habitat (Niklitschek and Secor 2010) and furthermore any exposure will be of short duration, given high mobility of sturgeon. Therefore, while lower DO in warmer temperatures and where high levels of nutrients are present may cause highly mobile adult, subadult, and juvenile Atlantic and shortnose sturgeon to alter their movements to avoid the areas with lower DO and higher temperatures, these minor movements will be too small to be meaningfully measured or detected.

[7] LC50 means the lethal concentration expected to kill 50% of a group of test animals when administered as a single exposure (usually 1 or 4 hours).

Optimal DO for growth of young of year Atlantic sturgeon was found to be at 70% saturation (Niklitschek and Secor 2009a, b). The minimum BOD_5 criteria of 75% saturation for MA and NH facilities under the EPA NLAA Programmatic will ensure that oxygen in the receiving water is at levels that are required for sturgeon growth. This is because at 20°C, 70% DO saturation equates to 6.3 mg/l DO, therefore the criteria of 75% saturation will ensure that DO near facility outfalls does not fall to levels that may adversely affect sturgeon. Effluent DO concentrations of 5.0 mg/L average and BOD_5 criteria that meet water quality standards described above are not expected to adversely affect YOY sturgeon. If receiving waters fall below 5.0 mg/L due to other environmental factors (i.e., temperature, nutrients), impacts of low DO to YOY sturgeon may include a disruption in normal behaviors and sturgeon are expected to seek more suitable habitat in the case that DO temporarily falls below 5.0 mg/L. However, DO at lower levels is expected to be of short duration and given that facilities are required to maintain 5.0 mg/L DO in the effluent discharged to receiving waters, effects to YOY sturgeon are expected to be too small to be meaningfully measured or detected and are thus, insignificant.

ELS that are not mobile (eggs and yolk-sac larvae) may come in contact with effluent that contains a DO level of 5.0 mg/L or higher. However, PDC 2 states that no project will occur in Atlantic or shortnose sturgeon spawning grounds in the Merrimack River, Piscataqua River, Connecticut River, and/or any additional river where spawning grounds are identified[8] unless:

a. effluent is compliant with state water quality standards at the end-of-pipe discharge point, and
b. an adequate dilution factor in the receiving water body is achieved.

Therefore, adequate dilution must occur and compliance with water quality standards is required where discharges containing this level of DO occur where ELS and spawning habitat are present. Given that adequate dilution of effluents with 5.0 mg/L DO must be present, DO concentrations are expected to reach background levels rapidly due to adequate mixing in receiving waters where non-mobile ELS of sturgeon may be present. Similarly, post yolk-sac larvae may come in contact with areas where effluent with minimum DO levels of 5.0 mg/L are discharged, however, adequate dilution of effluent further reduces any possibility of impacts to DO in the receiving waters. Therefore, given that effluent will meet water quality standard upon discharge and that DO concentrations in effluent will be substantially diluted after discharge, any possible changes in DO are expected to be insignificant and will not adversely affect ELS and spawning sturgeon in the receiving waters. Additionally, PDC 4 states that there should be no changes in temperature, water flow, salinity, or DO to levels that may adversely affect ESA-listed species or designated critical habitat. PDC 10 and 11 will ensure that no discharges reduce DO in the receiving waters that may adversely affect ESA-listed species, particularly in the summer months when low DO is more likely to occur. Given that DO levels of 5.0 mg/L are expected to reach background levels rapidly due to adequate mixing in receiving waters where ELS may be present and that mobile sturgeon are expected to avoid areas where low DO may be present, effects of

[8] Best available information regarding spawning grounds for Atlantic sturgeon and shortnose sturgeon is located in the Species Tables at https://www.fisheries.noaa.gov/new-england-mid-atlantic/consultations/section-7-species-critical-habitat-information-maps-greater and the ESA Section 7 Mapper https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=a85c0313b68b44e0927b51928271422a

changes to DO and BOD_5 concentrations from effluent on sturgeon are too small to be meaningfully measured or detected and are thus, insignificant.

If the section 7 biologist reviewing a verification form believes the effects to Atlantic and shortnose sturgeon may rise above insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Effects of dissolved oxygen and biochemical oxygen demand on North Atlantic right whale critical habitat:

PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Changes in DO associated with outfalls permitted under the EPA NLAA Programmatic are not expected to overlap with PBFs given that facility discharges will occur nearshore where substantial mixing is expected. Any DO changes in the receiving waters are not expected to affect ocean currents, circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBFs 1, 2, 3, and 4. Therefore, effects of DO on designated North Atlantic right whale critical habitat will not be considered further.

Effects of dissolved oxygen and biochemical oxygen demand on Atlantic sturgeon critical habitat:

PDC 3 requires that any activity will have no effect on Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. It is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4 (Table 4). In the Atlantic sturgeon critical habitat designation, juvenile rearing habitat to support growth, development, and recruitment of sturgeon (PBF 2) requires 6.0 mg/l DO or greater (Federal Register 2017). Effluent with DO concentrations of 5 mg/L are expected to mix rapidly and not impair DO where PBF 2 is present. Furthermore, effluent is not expected to impact the soft bottom substrate, overall river flow characteristics, nor salinity gradient described in PBF 2 due to adequate mixing in the receiving waters. Effluent with DO concentrations of 5 mg/L will not impact the overall water depth in the receiving water nor interfere with the unimpeded movement of adults to and from spawning sites, either temporarily or permanently (PBF 3). Sturgeon may have to swim around outfall plumes in rivers where designated Atlantic sturgeon critical habitat is present, but PDC 5 requires that all projects maintain passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.). Therefore, discharges are unlikely to affect physical characteristics of the source water (*e.g.*, accessibility upstream). No project will create barriers that would limit sturgeon’s ability to migrate to or from areas within critical habitat rivers necessary for foraging, staging, spawning, rearing, etc., as specified in PBF 3. Receiving waters that make up PBF 4 may be subject to minor impacts to DO in the receiving water due to the discharge of effluent with a minimum DO of 5.0 mg/L. However, DO water quality criteria will ensure that DO levels upon discharge will be protective of water quality, including required dissolved oxygen levels (PBF 4). This will ensure that DO levels are protective of spawning and rearing habitats, as described in PBF 4. In addition, with the substantial amount of mixing expected in the receiving waters and adequate dilution of the effluent detailed above, any effects from DO and BOD_5 concentrations on the value of PBFs 2, 3, and 4 to the conservation of the species would be insignificant.

If the section 7 biologist reviewing a verification form believes the effects to Atlantic sturgeon critical habitat may rise above insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Escherichia coli, Fecal coliform, and Enterococci Bacteria

Escherichia coli (E. coli), fecal coliform, and *Enterococci* bacteria are indicators of the presence of fecal wastes from warm-blooded animals. These bacteria are not known to directly affect aquatic life; however, water quality may be impacted by increased concentrations of bacteria in the aquatic environments. High levels of bacteria may affect listed species by lowering DO levels in the receiving waters. Effluent limitations for bacteria are often standards that protect shellfishing uses in the receiving water and protect recreational uses, depending on the waterbody and designated use assigned to it.

Data collected for a 2004 EPA report demonstrates that CSOs are the most significant source of fecal coliform when compared to treated wastewater and stormwater effluent on an annual basis, contributing almost 76% of the total annual load for point sources sampled. Treated wastewater accounted for 1% and stormwater accounted for 2% of the annual load of fecal coliform (EPA 2004). Additionally, the data shows that both stormwater and CSO effluent contain extremely high concentrations of bacteria (500,000/100 mL and 215,000/100 mL, respectively), although they make up a small portion of the annual discharge volume.

Class-based numeric water quality criteria for E. coli, fecal coliform, and Enterococci are applicable to MA and NH facilities. According to MA water quality standards (Table 7), freshwater fecal coliform bacteria criteria for Class A waters stipulates that concentration should not exceed 20 fecal coliform organisms per 100 mL. For salt water, average fecal coliform concentrations cannot exceed most probable number (MPN) of 88 per 100mL (Class SB). There is also class-based numeric criteria for Enterococci concentrations for MA facilities. Water quality standards criteria states that depending on the designated class of a waterbody and the season (i.e., bathing versus non-bathing seasons), there should be no more than 104 colonies of Enterococci per 100 mL. While some criteria allows for higher bacteria concentrations in the receiving waters (Class C and SC), given that there are no Class C or SC waters present in MA, bacteria criteria for Class C and SC waters will not be considered further. Similarly, criteria for E. coli for Class C and SC waters is higher than allowable bacteria concentrations of other classes, however, given that Class C and SC waters are not present in MA, these criteria will not be considered. Class A and B MA water quality standards require E. coli concentrations to remain below 235 colonies/100 mL. Therefore, the maximum allowable bacteria concentrations that may be observed in MA facility effluents is expected to be 235 colonies/100 mL of E. coli.

Table 7. Summary of Class-based Numeric Water Quality Criteria for Bacteria in MA Receiving Waters

Bacteria	Class A Criteria	Class B Criteria	Class C Criteria	Class SA Criteria	Class SB Criteria	Class SC Criteria
Fecal coliform	water supply intakes in unfiltered public water supplies- not	N/A	N/A	waters for shellfishing - not exceed a geometric mean most	waters for shellfishing - not exceed median or geometric	N/A

	exceed 20 fecal coliform organisms per 100 mL in all samples taken in any six month period			probable number (MPN) of 14 per 100mL, nor shall more than 10% of samples exceed MPN of 28 /100mL	mean MPN of 88 per 100mL, nor shall more than 10% of samples exceed MPN of 260/ 100mL	
Enterococci	bathing beaches - geomean of 5 samples not exceed 33 colonies per 100 milliliters (mL) and no sample exceed 61 colonies per 100 mL; off season - geomean samples taken within 6 months not exceed 33 colonies/ 100 mL	bathing beaches - geomean of 5 samples not >33 colonies/ 100 mL & no sample >61 colonies/ 100 mL; off season - geomean mean of samples in 6 months not >33 colonies/ 100 mL & no sample >61 colonies/ 100 mL	N/A	bathing beaches - no sample >104 colonies/ 100 mL & geomean of 5 samples not >35 colonies/ 100 mL; non-bathing beaches & off season - no sample >104 colonies / 100 mL & geomean of samples in 6 months not >35 colonies/ 100 mL	bathing beaches - no sample >104 colonies/ 100 mL & geomean of 5 samples not >35 colonies/ 100 mL; non-bathing beaches & off season - no sample >104 colonies/ 100 mL & geomean of samples in 6 months not >35 colonies/ 100 mL	geomean of samples in 6 months not >175 colonies/ 100 mL & 10% of samples not >350 colonies/ 100 mL, but may be applied on a seasonal basis
E.coli	bathing beaches - geomean of 5 samples not >126 colonies / 100 mL & no sample >235 colonies/ 100 mL; off season - not >126 colonies /100 mL & no sample >235 colonies/ 100 mL	bathing beaches – geomean of 5 samples not >126 colonies /100 mL & no sample >235 colonies/100 mL; off season- geomean of 5 samples in 6 months not >126 colonies / 100 mL & no sample >235 colonies/ 100 mL	geomean of samples in 6 months not >630 colonies /100 mL & 10% of samples not >1260 colonies/ 100 mL	N/A	N/A	N/A

Similar to MA facilities, NH facilities have to adhere to class-based numeric water quality criteria for E. coli and Enterococci (Table 8). Criteria for Class B waters state that Enterococci concentrations should be no more than 104 colonies per 100mL. The criteria for E. coli is highly variable and specific criteria for a waterbody is based on beach versus non-beach areas, however, the maximum allowable concentration of E. coli for Class B waters is 406 colonies per 100mL. Therefore, MA and NH require adequate removal and treatment of bacteria from effluent discharged to receiving waters and establish that nutrients concentrations in effluent should not impair water quality (i.e., result in high bacteria concentrations in receiving waters), with the strictest criteria applying to summertime.

Table 8. Summary of Class-based Numeric Water Quality Criteria for Bacteria in NH Receiving Waters

Bacteria	Class A Criteria	Class B Criteria
Enterococci	N/A	tidal waters used for swimming – no more than either a geomean of at least 3 samples from a 60-day period of 35 / 100mL, or 104 / 100mL in any sample
E.coli	no more than either a geomean based on at least 3 samples from a 60-day period of 47 / 100mL, or > 153 / 100mL in any sample; designated beach areas - no more than a geomean based on at least 3 samples from a 60-day period of 47 / 100mL, or 88 / 100mL in any sample	no more than either a geomean based on at least 3 samples from a 60-day period of 126 / 100mL, or > 406 / 100mL in any sample; designated beach areas - no more than a geomean based on at least 3 samples from a 60-day period of 47 / 100mL, or 88 / 100mL in any sample

According to the best available data that was compiled during our survey of NPDES permits, the maximum daily criteria for bacteria concentration in effluent from MA and NH facilities surveyed (both municipal and industrial facilities) is 406 colonies per 100mL (E. coli). Although bacteria concentration criteria are highly variable and facility dependent, based on this data, slightly elevated levels of bacteria may be present in the immediate vicinity of a facility's outfall(s) that are eligible for inclusion in the EPA NLAA Programmatic, however water quality criteria stipulates that no impairment should occur in receiving waters due to bacteria present in effluent.

Effects of bacteria on whales:
Seawater may be inadvertently ingested by whales while feeding. Whales ingesting seawater while feeding is expected to be an infrequent and intermittent occurrence of short duration. In addition, highly migratory whales are expected to briefly encounter areas with increased bacteria levels that may be above background levels due to effluent outfalls. Furthermore, PDC 10 states that bacteria levels in effluent should not be in excess of levels that will reduce dissolved oxygen levels in the action area. Any effects on whales from ingesting seawater with a maximum daily bacteria limit of 406 colonies per 100mL (E.coli) will be too small to be meaningfully measured or detected and are thus, insignificant.

Effects of bacteria on sea turtles:
Similar to whales, sea turtles may ingest seawater directly in order to hydrate. The expectation is that sea turtle exposure to effluent plumes with elevated bacteria levels would be brief, due to their highly migratory and mobile nature. Ingesting seawater while feeding or drinking would be infrequent, intermittent, and of short duration. Any effects on sea turtles from ingesting seawater with a maximum daily bacteria limit of 406 colonies per 100mL (E.coli) will be too small to be meaningfully measured or detected and are thus, insignificant. Furthermore, PDC 10 states that

bacteria levels in effluent should not be in excess of levels that will reduce dissolved oxygen levels in the action area. Any effects to DO from increased bacteria in effluent is expected to be too small to be meaningfully measured or detected, and therefore, insignificant.

Effects of bacteria on sturgeon:
The effects of bacteria to sturgeon (specifically, Russian sturgeon (*Acipenser gueldenstaedtii*) and Siberian sturgeon (*Acipenser baerii*)) has been studied in lab settings in the context of aquaculture/rearing (Stachnik et al. 2021, Kayis et al. 2017), however, no data is available for how bacteria present in wastewater effluent (i.e., E. coli, fecal coliform, and *Enterococci* bacteria) will impact sturgeon. In a lab setting, when exposed to bacterial pathogens that are common in aquaculture setting, Kayis et al. noted that sturgeon seem resistant to diseases after they reach a certain size (2017). Therefore, the most likely pathway of effects to sturgeon in the natural environment from increased bacteria in effluent is through prey items. When filter-feeding shellfish consume bacteria, the bacteria can transfer toxins up to higher trophic levels, which has the potential to negatively impact sturgeon. However, when adequate mixing is present in the receiving waters and effluent meets NH and MA water quality standards for bacteria, it is unlikely that sturgeon prey (i.e., benthic invertebrates) are consuming bacteria in levels high enough that may adversely affect sturgeon health and/or prey quality/quantity. Given that water quality standards are in place to limit extremely high levels of bacteria from occurring from NPDES discharges and that criteria are often times protective of shellfishing for human consumption, any exposure to slightly increased bacteria to sturgeon prey would be minimal and temporary. Furthermore, prey exposure to elevated levels of bacteria will be temporary and exposure is expected to be minimal due to adequate mixing in the receiving waters. Therefore, effects to sturgeon from bacteria in effluent are expected to be too small to be meaningfully measured or detected and are therefore, insignificant.

Increased bacteria in receiving waters may impact DO, which is another pathway for effects to sturgeon. However, PDC 10 states that bacteria levels in effluent should not be in excess of levels that will reduce dissolved oxygen levels in the action area. Therefore, we do not expected low DO to occur from increased bacteria as a result of effluent from facilities that may seek coverage under the EPA NLAA Programmatic and any effects to sturgeon will be too small to be meaningfully measured or detected and are thus, insignificant.

Effects of bacteria on North Atlantic right whale critical habitat:
PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Discharges of bacteria associated with outfalls permitted under the EPA NLAA Programmatic are not expected to overlap with PBFs given that facility discharges will occur nearshore where substantial mixing will occur. Any DO changes due to increased bacteria in the receiving waters are not expected to affect ocean currents, circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBF 1, 2, 3, and 4. Therefore, effects of bacteria on designated North Atlantic right whale critical habitat will not be considered further.

Effects of bacteria on Atlantic sturgeon critical habitat:

PDC 3 requires that any activity will have no effect on Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. It is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4 (Table 4). Effluent with elevated bacteria concentrations is expected to mix rapidly and not expected to impair DO where PBF 2 is present. Furthermore, effluent is not expected to impact the soft bottom substrate, overall river flow characteristics, nor salinity gradient described in PBF 2 due to adequate mixing in the receiving waters. Bacteria will not impact the overall water depth in the receiving water nor interfere with the unimpeded movement of adults to and from spawning sites, either temporarily or permanently (PBF 3). Sturgeon may have to swim around discharge plumes in rivers where designated Atlantic sturgeon critical habitat is present, but PDC 5 requires that all projects maintain passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.). Therefore, discharges are unlikely to affect physical characteristics of the source water (*e.g.*, accessibility upstream) and no project will create barriers that would limit sturgeon's ability to migrate to or from areas within critical habitat rivers necessary for foraging, staging, spawning, rearing, etc., as specified in PBF 3. Receiving waters where PBF 4 is present may be subject to minor impacts to DO in the receiving water due to the discharge of bacteria in effluent. However, DO water quality criteria (minimum of 5.0 mg/L) will ensure that the DO levels allowed in discharge will be protective of water quality, including required DO levels (PBF 4). Furthermore, PDC 10 states that bacteria levels in effluent should not reduce DO in the action area, which will ensure that levels of DO are protective of spawning and rearing habitats, as described in PBF 4. Therefore, any effects from bacteria on the value of PBF 2, 3, and 4 to the conservation of the species would be too small to be meaningfully measured or detected and are thus, insignificant.

If the section 7 biologist reviewing a verification form believes the effects to Atlantic sturgeon critical habitat may rise above insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Temperature

Water temperature can regulate biological processes and greatly influences the amount of biological activity and growth in a waterbody. Water temperatures in MA and NH are highly variable. Water temperature changes frequently based on a number of factors, including ambient atmospheric temperature and sun-strength, and gradually based on the seasons. Water temperature can also change dramatically due to natural events or by a human-induced events. Aquatic species, in general, and ESA-listed species, have a preferred temperature range. Therefore, water temperature can be one of the main drivers of the types of organisms that can survive in a given waterbody. In addition, water temperature can also impact DO. Warm water can hold less DO than cold water, and thereby, temperature is an important factor with respect to in-water DO levels.

MA facilities must adhere to class-based water quality criteria for temperature. Therefore, there is different criteria for allowable temperature of effluent based on the class designated for the receiving waters (a summary of class based temperature criteria is provided in Table 9). However, EPA states that the following general criteria are applicable to all classes of waterbody: "no change from natural background that would impair any uses assigned to this class including those conditions necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms". NH water quality standards specify narrative criteria for all facilities, which states that all facilities must "follow water quality requirements & recommendations of NH Fish and Game Dept., New England Interstate Water Pollution Control Commission (NEIWPCC), or EPA, whichever provides the most effective thermal pollution control". Only Class B waters in NH have to adhere to additional criteria for temperature, which states "any temperature increase associated with discharge shall not interfere with the uses assigned to this class". Therefore, EPA requires that effective thermal pollution control occur for NH facilities and MA waters shall not be impaired as a result of temperature changes due to effluent discharge.

Table 9. Summary of Class-based Numeric Water Quality Criteria for Bacteria in MA Receiving Waters

Class A Criteria	Class B Criteria	Class C Criteria	Class SA Criteria	Class SB Criteria	Class SC Criteria
cold water fisheries - not exceed 68° F (20° C) based on mean of daily max temperature over 7 days. warm water fisheries - not exceed 83°F (28.3°C) & temperature rise not exceed 1.5°F (0.8°C). all - natural seasonal and daily variations shall be maintained	cold water fisheries - not exceed 68° F (20° C) mean daily max over 7 days & temp rise not exceed 3°F (1.7°C). warm water fisheries - not exceed 83°F (28.3°C) & temp rise not exceed 5°F (2.8°C). other- temp rise not exceed 3°F (1.7°C) monthly average max daily temperature	not exceed 85°F (29.4°C) & temperature rise not exceed 5°F (2.8°C)	not exceed 85°F (29.4°C) nor max daily mean of 80°F (26.7°0C), & temperature rise shall not exceed 1.5°F (0.8°0C)	not exceed 85°F (29.4°C) nor a max daily mean of 80°0F (26.7°C), & temperature rise shall not exceed 1.5°F (0.8°C) during July through September nor 4°F (2.2°C) during October through June	not exceed 85°F (29.4C) & temperature rise not exceed 5°F (2.8°C)

Although most facilities must comply with the above criteria dependent on the receiving water class, some facilities have different temperature criteria approved by EPA. According to the best available data compiled during our survey of NPDES permits, one MA power plant facility has the maximum allowable temperature for effluent is 112°F in summer and 100°F for winter and the maximum change in temperature from ambient conditions in the receiving waters is 37°F in summer and 48°F in winter. However, as discussed above (Table 9), most MA facilities have a maximum allowable temperature for effluent of 85°F. Most NH facilities have a maximum allowable temperature of 95°F and allowable change in temperature from ambient conditions in the receiving waters of 25°F. Similar to MA, the maximum allowable temperature for one power plant facility in NH surveyed was 120°F and temperature change was 47°F from ambient conditions. Although criteria for temperature in effluent are occasionally facility dependent, based on this data, the average effluent temperatures expected, and the water quality criteria above, slightly elevated temperature may occur in the immediate vicinity of a facility's outfall(s) that are eligible for inclusion in the EPA NLAA Programmatic.

PDC 4 states that effluent discharges should result in no changes to temperature, water flow, salinity, or DO to a level that may adversely affect ESA-listed species or designated critical habitat. Furthermore, PDC 13 specifics that effluent temperature must meet water quality standards (i.e., 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities). If effluent may exceed the above temperature thresholds due to facility-specific criteria, an adequate dilution factor in the receiving water body must be achieved.

Effects of temperature on whales:

North Atlantic right whales occur at sea surface temperatures (SST) of 0.0-21.8°C (Kenney 2007) and fin whales at up to 28°C (NMFS 2010). North Atlantic right whales and fin whales show tolerance for changing temperatures as reflected by movements through varied water temperatures from the tropics to Northern latitudes (Kenney 2007). Right whales and fin whales could be present year-around in New England waters. Average SSTs in winter and spring[9] ranging from approximately 3 to 9°C (38 to 48°F) (DeLorenzo Costa *et al.* 2006) and from 11 to 20°C (52 to 68°F) in summer and fall. Assuming that effects to whales from a thermal plume could occur in areas where water could be heated to above 21.8°C for right whales and 28°C for fin whales, ocean waters where whales are present would on average need to be heated at least 1.8°C and 8°C above ambient temperatures during summer and fall. Any effluent with increased temperature (i.e., maximum of 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) discharged to the dynamic ocean environment where whales will be present is expected to rapidly mix due to ocean dynamics. Furthermore, PDC 13 specifics that effluent temperature must meet water quality standards (i.e., 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) and if effluent may exceed the above temperature thresholds due to facility-specific criteria, an adequate dilution factor in the receiving water body must be achieved. Therefore, temperature in the vicinity of the outfall will rapidly reach background levels and any exposure to whales will be intermittent and short in duration. Given that effluent discharges with increased temperatures are expected to mix rapidly, effects of temperature on whales will be too small to be meaningfully measured or detected in the open ocean and therefore, insignificant.

DO levels can also be affected by thermal plumes. Given that DO levels of effluent must remain above 5.0 mg/L and that DO is also expected to reach background levels rapidly due to adequate mixing in receiving waters where whales may be present, effects of changes to DO due to effluent temperature are too small to be meaningfully measures or detected. Furthermore, PDC 4 states that there should be no changes in temperature or DO to levels that may adversely affect ESA-listed species or designated critical habitat. If whales come into contact with the thermal plumes, right whales and fin whales will likely avoid thermal plumes above 21.8°C / 28°C by swimming under or around them. Given that plumes are expected to mix rapidly, whales are expected to make small, evasive movements to avoid any areas that experience a temporary increase in temperature; therefore, effects to whales will be too small to be meaningfully measured or detected and are thus, insignificant.

Temperature effects on sea turtles:

[9] Average sea surface temperatures from coastal waters around Boston used in this analysis were collected from https://www.seatemperature.org/ and https://www.weather.gov/gyx/water_temperature_normals.html. For the purposes of this analysis, winter is defined as December, January, and February. Spring is defined as March, April, and May. Summer is defined as June, July, and August. Fall is defined as September, October, and November.

Sea turtles are found in tropical waters and leave New England waters when SST decreases in November. Sea turtles are known to regularly occur in waters of at least 28°C; however, temperatures above 40°C can result in stress for green sea turtles (Spotila *et al.* 1997). Excessive heat exposure can cause stress to sea turtles, but is a rare phenomenon when sea turtles are in the ocean (Milton and Lutz 2003) and hypothermia (i.e., cold stunning) is much more common, as discussed below. Therefore, assuming that water temperature greater than 28°C could be stressful for sea turtles, thermal discharges to ocean waters and tidal rivers would on average need to be heated at least 8°C above ambient temperatures during summer and fall. Any effluent with increased temperature (i.e., maximum of 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) discharged to the dynamic environments where sea turtles will be present (i.e., ocean and tidally influenced rivers) is expected to rapidly mix and water temperature in the vicinity of the outfall will rapidly reach background levels before reaching temperatures that may cause stress in sea turtles. If sea turtles come in contact with a thermal plume, highly mobile sea turtles could avoid the plume by swimming around or underneath it and any exposure will be intermittent and of short duration. Furthermore, as detailed in PDC 5, if sea turtles are likely to pass through the action area at the time of year when the activity occurs, a zone of passage (~50% of water body) with appropriate habitat (e.g., depth, water velocity, etc.) must be maintained (i.e., biological stressors such as turbidity or effluent plume must not create barrier to passage nor extend from bank to bank or surface to bottom in a river). PDC 13 further specifics that effluent temperature must meet water quality standards (i.e., 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) and if effluent may exceed the above temperature thresholds due to facility-specific criteria, an adequate dilution factor in the receiving water body must be achieved. Given that effluent discharges with increased temperatures will be adequately diluted, are expected to mix rapidly, and will not create an obstacle to sea turtle passage, effects of temperature on sea turtles will be too small to be meaningfully measured or detected and are therefore insignificant.

Thermal plumes may represent an attraction for turtles. If turtles are attracted by a thermal plume, they could remain in New England waters late enough in the fall to become cold-stunned. Cold stunning occurs when water temperatures drop quickly and turtles become incapacitated. The turtles lose their ability to swim and dive, lose control of buoyancy, and float to the surface (Spotila *et al.* 1997) and generally occurs below 10˚C (50˚F). However, during the winter, if water temperatures are low enough for cold stunning to occur, the area where the water temperature would be suitable for sea turtles is expected to be small and localized. Therefore, sea turtles would need to find areas where temperatures higher than at least 11°C consistently. Even when effluent with elevated temperatures is discharged year round, because of tidal influences in rivers and ocean dynamics, it is extremely unlikely that sea turtles would seek out and use the thermal plume for refuge as SST decreases. It is extremely unlikely that sea turtles would remain unseasonably in MA or NH waters due to thermal plumes in effluent, therefore, effects to sea turtles from increased temperature during cold stunning season are discountable.

DO levels can also be affected by thermal plumes. Given that DO levels of effluent must remain above 5.0 mg/L and that DO is also expected to reach background levels rapidly due to adequate mixing in receiving waters where sea turtles may be present, effects of changes to DO due to effluent temperature are too small to be meaningfully measures or detected. Furthermore, PDC 4 states that there should be no changes in temperature or DO that may adversely affect ESA-listed species or designated critical habitat. If sea turtles come into contact with a thermal plume, they will likely avoid it by swimming under or around it. Given that thermal plumes are expected to mix rapidly and that sea turtles will likely avoid any areas with stressful temperatures, effects to sea turtles will be insignificant.

Kemp's ridley, green, and loggerhead sea turtles are benthic feeders. Kemp's ridley and loggerhead sea turtles feed on benthic invertebrates and green sea turtles feed on seagrass. Considering that increased temperatures will be present at the water surface, effects to the benthic community are greatly reduced. Additionally, mobile invertebrates are likely to avoid the area where temperatures are above their thermal tolerance. Given that benthic prey species would avoid intolerant temperatures and be available within other areas within the action area, any effects to foraging sea turtles will be too small to be meaningfully measured or detected and are thus, insignificant. Leatherbacks foraging off MA primarily consume the scyphozoan jellyfishes, *Cyanea capillata*, and *Chrysaora quinquecirrha* (Dodge *et al.* 2011). The thermal tolerance of *Chrysaora quinquecirrha* is approximately 30°C (Gatz *et al.* 1973); *Cyanea capillata* experience mortality at temperatures of 34-36°C (Cargo and Schultz 1967). Therefore, it is unlikely that these prey items will be adversely affected by thermal plumes and effects to sea turtle prey are too small to be meaningfully measured or detected and are thus, insignificant.

Temperature effects on sturgeon:
Temperature influences many of the behaviors of sturgeon including spawning, development, and seasonal movement. Shortnose sturgeon spawning occurs at approximately 9°C (48°F) in the Connecticut River with spawning ceasing at 15°C (59°F) (Kynard 1997). Egg development seems to also be temperature dependent (Kieffer and Kynard 1993) and study results suggest that increased temperature also may improve overall fitness of sturgeon at 20°C (68°F) (Gradil et al. 2014). Atlantic sturgeon have been documented moving from coastal waters to Merrimack River when river temperatures increased to 14.8–19.0°C (approximately 58- 66°F) (Kieffer and Kynard 1993). Given this information, water temperature strongly influences sturgeon behaviors.

Several studies have demonstrated that sturgeon tolerance to elevated temperatures increases with age and body size (Jenkins *et al.* 1993, Ziegeweid *et al.* 2008). Furthermore, in southern rivers, male Atlantic sturgeon move from coastal areas to rivers in late summer when temperatures can be as high as 90°F (32°C). Therefore, data suggests that adult and subadult sturgeon are highly adaptable to a range of temperatures. Adult and subadult sturgeon may be more tolerant of increased temperatures due to their larger body sizes. Effluent with increased temperature (i.e., maximum of 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) will likely be warmer than ambient temperatures, and thereby less dense. Heated effluent will likely stay on the top of the water column and reduce the likelihood that the effluent plume will impact benthic-feeding adult and subadult sturgeon. Furthermore, heated effluent discharged to the dynamic riverine environments where adult and subadult sturgeon will be present is expected to rapidly mix with ambient water temperatures, therefore, any exposure of sturgeon to increased temperatures will be intermittent and short in duration. Heated effluent will likely remain on the top of the water column and then mix rapidly and dissipate into the water column, temperatures are expected to return to background levels before resulting in bottom water temperatures that may cause effects to sturgeon. In the unlikely event that sturgeon encounter waters with elevated temperatures, they are likely to avoid the area, because sturgeon are known to actively seek out cool deep waters during the summer months (ASSRT 2007, Damon-Randall *et al.*. 2010). Given that effluent discharges with increased temperatures will be adequately diluted, are expected to have minimal impacts to the benthos, mix rapidly, and will not create barrier to passage, effects of increased temperature on adult and subadult sturgeon are too small to be meaningfully measured or detected and are thus, insignificant.

In laboratory studies, juvenile Atlantic sturgeon showed negative behavioral responses (reduced food consumption and metabolism) after prolonged exposure to temperatures greater than 28°C (Niklitschek 2001). Behavioral selection of optimal habitat when presented with a range of water quality conditions has been documented for juvenile Atlantic sturgeon in a laboratory setting (Niklitschek and Secor 2010). Optimal growth for juveniles occurred at temperatures of 12-20ºC (Niklitschek and Secor 2009a). In tests with Connecticut River shortnose sturgeon juveniles (1 year old fish), Gradil et al. (2014) found that temperatures of 10°C delayed the onset of dispersal, but higher water temperatures (up to 20 °C) may result in increased growth and improved overall fitness. Therefore, some studies suggest that moderate water temperatures greatly influence fitness in juvenile sturgeon. Effluent with higher than ambient temperatures (i.e., maximum of 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities) will be less dense and will likely stay on the top of the water column. Juvenile sturgeon generally occur in deep (>9 m) channels of the river with strong currents (Able and Fahay 2010). Therefore, the impact of the effluent plume temperatures will be lessened as a result of the habitat requirements of juvenile sturgeon. In addition, any effluent plume discharged to the dynamic deep-water riverine environments where juvenile sturgeon will be present is expected to rapidly mix with ambient water temperatures. Given that any heated effluent will likely remain on the top of the water column and then dissipate rapidly into the water column, temperatures are expected to return to background levels before resulting in bottom water temperatures that may cause effects to juvenile sturgeon. If juvenile sturgeon do encounter plumes with increased temperatures, exposure is expected to be intermittent and short in duration.

Similar to effects discussed above to older life stages, Ziegeweid *et al*. found that survival of young-of-year shortnose sturgeon in freshwater declined as temperature increased, but temperature tolerance increased with body size (2008). The temperature lethal to 50% (LC50) of the young-of-year sturgeon after 48 hours ranged from 28.2°C to 30.7°C, therefore, research demonstrates that extremely high temperatures can impact young-of-year survival. Heated effluent is expected to mix rapidly in the dynamic riverine environment where sturgeon may be present, therefore any exposure of increased temperatures is expected to be intermittent and short in duration. Given that PDC 13 requires that effluent discharges with increased temperatures are adequately diluted in the receiving waters, effluent plumes with increased temperatures are expected to mix rapidly, will be of intermittent and short duration, and will not create a barrier to passage, effects of increased temperature on juvenile and young-of-year sturgeon are insignificant.

ELS are generally expected to be present in deep water portions of rivers where effluent is unlikely to impact overall water temperature to the extent that would have an adverse effect on young of year sturgeon. Sturgeon eggs are highly adhesive and are deposited on hard-bottom substrate. Yolk-sac larvae remain hidden on the bottom for approximately 8-12 days before swimming downstream (Kynard and Horgan 2002, Musick 2002) to rearing grounds. Although

ELS are expected to be present in deep water portions of rivers, overall river water temperature is an important environmental factor that influences fish development (Chambers and Leggett 1987, Hardy and Litvak 2004). However, PDC 2 specifies that no project will occur in sturgeon spawning grounds unless effluent is compliant with state water quality standards at the end-of-pipe discharge point and an adequate dilution factor in the receiving water body is achieved. PDC 13 further states that if effluent temperature may exceed water quality standard temperature thresholds, an adequate dilution factor in the receiving water body must be achieved. Therefore, based on the above, eggs and yolk-sac larvae of sturgeon are not expected to come in contact with the highly diluted effluent. Therefore, effects to sturgeon spawning, eggs, and yolk-sac larvae sturgeon from increased temperatures will not be considered further.

Post yolk-sac larvae sturgeon may also be affected by increased temperatures caused by outfall discharges. Allen *et al.* simulated elevated river temperatures and regimes in experiments with post-yolk-sac larval green sturgeon (*Acipenser medirostris)* (2006). Results showed that larval green sturgeon grew faster at warmer temperatures. Additionally, sturgeon had greater food consumption and activity rates at 24°C than at either 19–24°C or 19°C at 65 days post hatch (Allen *et al.* 2006). Therefore, we assume that post yolk-sac larvae sturgeon are at least tolerant of increased temperatures that may be experienced if sturgeon come into contact with discharge from outfalls included in the EPA NLAA Programmatic. PDC 13 states that if effluent temperature may exceed water quality standard temperature thresholds, an adequate dilution factor in the receiving water body must be achieved. Additionally, heated effluent is expected to mix rapidly in the dynamic riverine environment where post yolk-sac larvae sturgeon may be present, therefore any exposure of increased temperatures is expected to be intermittent and short in duration. Given that exposure of post yolk-sac larval sturgeon to increased temperatures will be of intermittent and short duration, and will not create a barrier to passage, effects of increased temperature are too small to be meaningfully measured or detected and are thus, insignificant.

PDC 4 states that effluent discharges should result in no changes to temperature, water flow, salinity, or DO to a level that may adversely affect ESA-listed species or designated critical habitat. Furthermore, PDC 13 specifics that effluent temperature must meet water quality standards (i.e., 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities). If effluent may exceed the above temperature thresholds due to facility-specific criteria, an adequate dilution factor in the receiving waterbody must be achieved.

Similar to sea turtles, sturgeon are benthic feeders. Considering that increased temperatures will likely be present at the water surface, effects to the benthic community are greatly reduced. If benthic prey are impacted by elevated temperatures, they are expected to redistribute to areas where cooler temperatures within the action are present. Therefore, any effects to foraging sturgeon will be limited only to the distribution of their prey away from the thermal plume, therefore, effects of increased temperature are too small to be meaningfully measured or detected and are thus, insignificant.

Effects of temperature on North Atlantic right whale critical habitat:
Right whales feed on copepods, primarily on C. *finmarchicus,* but also *Pseudocalanus* spp. and *Centropages* spp. Different populations of C. *finmarchicus* have variable thermal tolerances; this species has been documented temperatures ranging from 3.1 to 28.1 °C; this species was very

scare where temperatures are above 21°C (Kane 2005). Halcrow (1963) reported this species being found in waters of -2 to 22°C. A lab study indicated C. *finmarchicus* sampled from the Gulf of Maine, did not experience mortality upon exposure of temperatures of 18°C for 24 hours, but did have mortality when exposed to this temperature for up to 48 hours (Voznesensky *et al.* 2004). A lab study indicated survival of C. *finmarchicus* was unaffected by temperatures up to 13.5°C (Willis 2007).

PDC 6 states that any project in designated North Atlantic right whale critical habitat must have no effect on PBFs of North Atlantic right whale critical habitat (see Table 5). Discharges of heated effluent are not expected to overlap with North Atlantic right whale critical habitat PBFs given that facility discharges will occur nearshore where substantial mixing is expected. Any temperature changes in the receiving waters are not expected to affect ocean currents, circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, overall temperature regimes, as well as *C. finmarchicus* aggregations described in North Atlantic right whales critical habitat PBF 1, 2, 3, and 4. Therefore, effects of heated effluent on designated North Atlantic right whale critical habitat will not be considered further.

Effects of temperature on Atlantic sturgeon critical habitat:
PDC 3 requires that any activity will have no effect on Atlantic sturgeon critical habitat PBF 1, therefore, effects to PBF 1 will not be considered further. However, it is possible that permitted activities under this programmatic could overlap with Atlantic sturgeon critical habitat PBFs 2, 3, and 4 (Table 4). Heated effluent will likely remain on the top of the water column, thereby, it is not expected to impact the soft bottom substrate (PBF 2). In addition, overall river flow characteristics and salinity gradient described in PBF 2 due to adequate mixing in the receiving waters will not be impacted. Therefore, heated effluent with maximum temperatures of 85°F (29.4°C) for MA facilities and 95°F (35°C) for NH facilities is not expected to impair PBF 2. Heated effluent will not impact the overall water depth in the receiving water nor interfere with the unimpeded movement of adults to and from spawning sites, either temporarily or permanently (PBF 3). Sturgeon may have to swim around heated plumes in rivers where designated Atlantic sturgeon critical habitat is present, but PDC 5 requires that all projects maintain passage with appropriate habitat for ESA-listed species (e.g., temperature). Therefore, discharges are unlikely to affect physical characteristics of the source water (*e.g.*, accessibility upstream) and no biological barriers are expected to limit sturgeon's ability to migrate to or from areas within critical habitat rivers necessary for foraging, staging, spawning, rearing, etc., as specified in PBF 3. Receiving waters that make up PBF 4 may be subject to minor changes to temperature and impacts to DO in the receiving water due to the discharge of heated effluent. However, water quality criteria that establishes maximum temperature thresholds and DO requirements will ensure that the temperatures and DO levels allowed in effluent will be protective of water quality and temperature and DO requirements for sturgeon (PBF 4). This will ensure that temperatures and DO are protective of spawning and rearing habitats, as described in PBF 4. In addition, with the substantial amount of mixing expected in the receiving waters and adequate dilution of the heated effluent detailed above and required as part of PDC 2 and PDC 13, any effects from increased temperature on the value of PBFs 2, 3, and 4 to the conservation of the species would be too small to be meaningfully measured or detected and are insignificant.

If the section 7 biologist reviewing a verification form believes the effects to Atlantic sturgeon critical habitat may rise above insignificant/extremely unlikely, the biologist will require EPA to complete an individual consultation.

Habitat Modification PDC

14. No portion of the proposed action that may affect sturgeon will occur in areas identified as overwintering grounds, where dense aggregations are known to occur as follows:
- Connecticut River from November 15 to April 15
- Merrimack River from November 1 to March 31

Note: If river specific information exists that provides better or more refined time of year information, those dates may be substituted with NMFS approval (include reference in project description).

Habitat modification from water quality stressors
All of the project activities covered by this programmatic consultation have some potential to affect ESA-listed species' habitat mainly due to changes in water quality. As described in detail above, PDC are in place to limit disturbance of important habitat. PDC 5 states that if ESA-listed species are likely to pass through the action area at the time of year when the activity occurs, a zone of passage (~50% of water body) with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained. Therefore, an effluent plume must not create barrier to passage and will not extend from bank to bank or surface to bottom in a river. Therefore, effects to habitat from adequately mixed and highly-diluted water quality stressors are extremely unlikely to affect ESA-listed species or critical habitat.

Effects to sturgeon overwintering habitat
PDC 14 is designed to protect sturgeon overwintering aggregations and habitat. It is possible for an activity to occur in sturgeon overwintering areas when the habitat is not being used during the time specified in PDC 14; however, we do not expect any project under this programmatic to have a potentially adverse effect on sturgeon's overwintering. If EPA were to submit a verification form for a project that our section 7 biologist believed might adversely affects sturgeon's use of spawning habitat, the project would have the potential to violate PDC 1, and would therefore require individual consultation. With these protections in place, we expect all effects to sturgeon overwintering habitats to be extremely unlikely and are thus, discountable.

Effects to sturgeon spawning habitat
PDC 2, 3, 7, and 12 are designed to protect sturgeon spawning habitat and ELS development. PDC 2 and 3 exclude activities that have the potential to affect the PBFs necessary for Atlantic sturgeon spawning (PBF 1). It is possible for an activity to occur in sturgeon spawning habitat when the habitat is not being used for spawning; however, we do not expect any project under this programmatic to have a potentially adverse effect on sturgeon's spawning. If EPA were to submit a verification form for a project that our section 7 biologist believed might adversely affects sturgeon's use of spawning habitat, the project would have the potential to violate PDC 1, it would require individual consultation. With these protections in place, we expect all effects to sturgeon spawning habitats to be extremely unlikely and are thus, discountable.

Effects to foraging habitat
Effluent discharges have the potential to affect sturgeon, green, loggerhead, and Kemp's ridley sea turtle foraging habitat and Atlantic sturgeon critical habitat, PBF 2 (i.e., areas with a gradual downstream salinity gradient of 0.5-30 parts per thousand and soft substrate (e.g., sand, mud) downriver of spawning sites for juvenile foraging and physiological development). We do not anticipate any effects to whale foraging habitat (see PDC 6) or leatherback (jellyfish) foraging habitat, and therefore, the effects will not be considered further.

As described above, the highest levels of TSS expected in effluent discharges is 250 mg/L, which would likely only be experienced in the immediate vicinity of the outfall. TSS concentrations would be below the 390 mg/L threshold for benthic resources. We expect benthic invertebrates would quickly recolonize any foraging habitat temporarily lost due to turbidity (Wilber and Clarke, 2007). Furthermore, the habitat to be modified is small compared to the habitat available for foraging within the action area. Therefore, when water quality standards for TSS and other pollutants described above are attained, benthic prey and SAV exposure to effluent with the pollutant thresholds discussed above will be minimal due to adequate mixing in the receiving waters. Furthermore, given that effluent discharges are expected to mix rapidly, will not meaningfully impact bottom habitat, and that plumes will not create a barrier to passage, effects to foraging habitat will be too small to be meaningfully measured or detected, and therefore, insignificant.

With the PDC in place, reductions in habitat availability would be too small to be meaningfully measured or detected, and therefore, all effects of habitat modification will be insignificant. If our section 7 biologist believes a project may have an individual or cumulative effect that would adversely affect ESA-listed species foraging beyond levels that are insignificant or extremely unlikely, that project would have the potential to violate PDC 1, and would require individual consultation.

Aggregate Effects and Monitoring

The EPA NLAA Programmatic does not have an expiration date, but annual reporting is required, and both agencies will review the merits of the EPA NLAA Programmatic on an annual basis. Over the duration of the EPA NLAA Programmatic, authorizations of many activities will occur concurrently and possibly for extended periods (i.e., NPDES permits are often renewed by EPA on a 5 year basis). As such, we must assess the potential for effects that arise from concurrent and long-term activities, as well as assess the effects of all permitted activities consulted on under the EPA NLAA Programmatic for the potential of aggregate effects in the action area.

Effects from activities considered under the EPA NLAA Programmatic consultation may be both temporary and permanent. Permanent, long-term effects associated with numerous activities determined in this programmatic consultation as not likely to adversely affect are anticipated to have insignificant or discountable effects to Atlantic sturgeon, shortnose sturgeon, sea turtles, whales, Atlantic sturgeon critical habitat, and North Atlantic right whale critical habitat in the action area, individually and in aggregate. The general and stressor specific PDC greatly constrain projects eligible for inclusion under the EPA NLAA Programmatic via the verification form. Risk of impingement and entrainment to species will be insignificant because the PDC highly restrict where and when CWIS can operate (i.e., out of areas which life stages susceptible to these pathways for effects). Additionally, effects of water quality from multiple discharges occurring throughout the action area in the short and long term are not expected to increase the risk of negative effects from water quality in measurable ways in aggregate, as described above. PDC will ensure that all discharges meet water quality criteria, which were developed by EPA to be protective of aquatic life, therefore, any effects in the aggregate are insignificant. Activities that may generate short-term effects, such as CSO and stormwater discharges, are expected to be intermittent, rare events and are individually found to have insignificant effects. Projects that meet the PDC will ensure that effects to habitat will not measurably limit the availability of appropriate habitat for life functions of ESA-listed species, nor will it measurably limit prey for these species, and all aggregate effects will be insignificant. Based on our analysis of these activities, we do not expect that any of these activities, when taken together, will rise to a level where adverse effects may occur, thus any aggregate effects will also be insignificant and/or extremely unlikely.

Predicting the exact spatial and temporal occurrences of activities throughout the action areas is very difficult; however, to ensure that adverse effects do not occur as a result of ongoing authorizations of activities over the duration of the EPA NLAA Programmatic, you have designed a monitoring plan to track activities and the potential for aggregate effects in the future. Each activity that may affect ESA-listed species or critical habitat, as detailed throughout this programmatic consultation, must be reviewed by us via second tier consultation in the form of the streamlined verification form or individual section 7 consultation. The verification form will contain information about the proposed activity and location. We will then review the information provided and certify that a project is consistent with the EPA NLAA Programmatic. The approved and completed verification forms will also be used to create a log of activities that have been consulted on under the EPA NLAA Programmatic. The annual reporting cycle of each year will start on October 1 through September 30 of each year. EPA will provide us with the annual monitoring report on or before November 30. This report should include all projects reviewed under the NLAA Programmatic in the previous calendar year. Failure to meet the annual reporting requirement will result in reinitiation/revocation of concurrence on the EPA NLAA Programmatic. This programmatic concurrence does not apply to EPA activities that individually or in aggregate are likely to adversely affect a species through direct or indirect effects to either ESA-listed species or critical habitat. Thus, if information obtained through monitoring, or other sources, indicates that EPA activities consulted on under the EPA NLAA Programmatic may result, either individually or in aggregate, in adverse effects to listed species or critical habitat, this would represent new information and reinitiation of this consultation would be required.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the

2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Conclusion

Based on the analysis that all effects to listed species and critical habitat will be insignificant or extremely unlikely, we are able to concur with your determination that projects consulted on under the EPA NLAA Programmatic are not likely to adversely affect any ESA-listed species or critical habitat under our jurisdiction. Therefore, no further consultation pursuant to section 7 of the ESA is required. Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service, where discretionary Federal involvement or control over the project has been retained or is authorized by law and: (a) if new information reveals effects of the project that may affect listed species or critical habitat in a manner or to an extent not previously considered in the consultation; (b) if the identified project is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the consultation; or (c) if a new species is listed or critical habitat designated that may be affected by the identified project. No take is anticipated or exempted. If there is any incidental take of a listed species, re-initiation would be required. Should you have any questions about this correspondence please contact Meagan Riley at (978) 281-9339 or meagan.riley@noaa.gov.

Essential Fish Habitat

NOAA Fisheries Habitat and Ecosystem Services Division (HESD) is responsible for overseeing programs related to Essential Fish Habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act and other NOAA Fisheries trust resources under the Fish and Wildlife Coordination Act. EPA should continue to follow existing procedures for consulting with GARFO HESD. For questions related to Essential Fish Habitat, you can contact our Habitat and Ecosystem Services Division. Please contact Kaitlyn Shaw at (978) 282-8457 or kaitlyn.shaw@noaa.gov for projects in New Hampshire and in Massachusetts north of the Cape Cod Canal in Sandwich, MA and contact Sabrina Pereira at (978) 675-2178 or sabrina.pereira@noaa.gov for projects south of Cape Cod Canal in Sandwich, MA.

Sincerely,

Mark Murray-Brown

for Jennifer Anderson
Assistant Regional Manager
for Protected Resources

CC: Nagle, EPA; Shaw, NMFS HESD; Pereira, NMFS HESD; Boelke, NMFS HESD
ECO: GARFO-2022-02836
File Code: H:\Section 7 Team\Programmatic\EPA_Region1
Attachments: BA, SOPs, VF

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