PORTSMOUTH HARBOR AND PISCATAQUA RIVER
NEW HAMPSHIRE AND MAINE
NAVIGATION IMPROVEMENT STUDY
FEASIBILITY REPORT

APPENDIX Q
ENDANGERED SPECIES ASSESSMENT

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

December 9, 2013

Engineering/Planning Division
Evaluation Branch

John Bullard
Northeast Regional Administrator
NOAA Fisheries
Northeast Regional Office
55 Great Republic Drive
Gloucester, Massachusetts 01930-2276

Dear Mr. Bullard:

This letter is to conclude informal consultation under Section 7 of the Endangered Species Act (ESA) concerning the potential effects to listed species that could occur from the proposed Portsmouth Harbor and Piscataqua River Upper Turning Basin Expansion Navigation Improvement Project, in New Hampshire, and Maine. The project will require the dredging of approximately 728,000 cubic yards (cy) of mostly coarse sand and gravel in the Piscataqua River in Maine, and New Hampshire, in order to widen the upper turning basin from 800 feet to approximately 1,200 feet at a depth of 35 feet mean lower low water (MLLW). In addition, approximately 25,200 cy of bedrock ledge will need to be removed. The dredging will be accomplished using a mechanical dredge, with the ledge removal likely requiring blasting. The dredged material will be beneficially used as nourishment by placement at four nearshore areas off beaches in Wells, Maine; and Salisbury, Newbury and Newburyport, Massachusetts. The ledge rock removed will be placed at an ocean site located seaward of the three nautical mile limit of the territorial sea in Federal waters, just northeast of the Isle of Shoals (IOS-N, see Figure 1). This site is in water approximately 250 to 310 feet deep. The widening of the turning basin will allow vessels up to 800 feet in length to turn without the risk of grounding.

In addition to the material described that would be removed as part of the improvement project, approximately 7,800 cy of maintenance material within the existing turning basin limits and channel upstream of Frankfort Island could be removed concurrently if it meets the suitability requirement for placement at the nearshore placement sites. Testing of the maintenance material for suitability for placement in these nearshore areas would occur in the next project phase (Design Phase). All other maintenance material removed from the river over the several decades since the 35-foot deepening has been clean sandy material. It is anticipated that construction will take about six months to complete and is planned to be done during the months of mid-October to mid-April with all blasting completed no later than March 31 in the year that funding becomes available.

Please recall your letter of November 15, 2013 as well as letters from Peter Colosi (September 2, 2011) and from Louis Chariella (May 27, 2008) from your agency, concerning this project and its potential effects to listed species. As noted in your letters, several species protected under the ESA may be present in the proposed dredging and disposal areas at some time during the year and could be affected by the proposed project. These include the Federally endangered shortnose sturgeon (*Acipenser brevirostrum*), as well as the possibility of four Distinct Population Segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) which are listed as endangered (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS of Atlantic sturgeon listed as threatened (Gulf of Maine). Also, as stated in your letter of September 2, 2011, seaward migrating juvenile Gulf of Maine (GOM) DPS Atlantic salmon (*Salmo salar*) (listed as Federally endangered) have been recorded by acoustic telemetry moving southward toward the vicinity of the proposed Isles of Shoals Disposal area (IOS-N). In your letter of November 15, 2013, you state that consultation under Section 7 of the ESA would be required for this project, and that we should submit an effects assessment on listed species and mitigation strategies with our request for consultation.

The information presented in the following pages constitutes our assessment of effects which we believe will sufficiently show that the proposed navigation improvement project may affect, but not likely adversely affect the Federally endangered shortnose sturgeon; the Federally endangered Atlantic Bight DPS, Chesapeake Bay DPS, Carolina DPS, South Atlantic DPS, and the Federally threatened Gulf of Maine DPS of Atlantic sturgeon; the Federally endangered GOM DPS of Atlantic salmon; as well as listed whales or sea turtles that may occur in the vicinities of the proposed dredging and disposal areas. If you need any further information you may contact Ms. Catherine Rogers at catherine.j.rogers@usace.army.mil or phone (978) 318-8231.

Sincerely,

John R. Kennelly
Chief of Planning

Enclosure

Portsmouth Harbor and Piscataqua River Upper Turning Basin Expansion Navigation Improvement Project

Please find below our discussion of the Federally listed species that may occur in the proposed project dredge and placement areas. Figure 1 shows the location of the alternative placement locations mentioned above in relation to the dredge area.

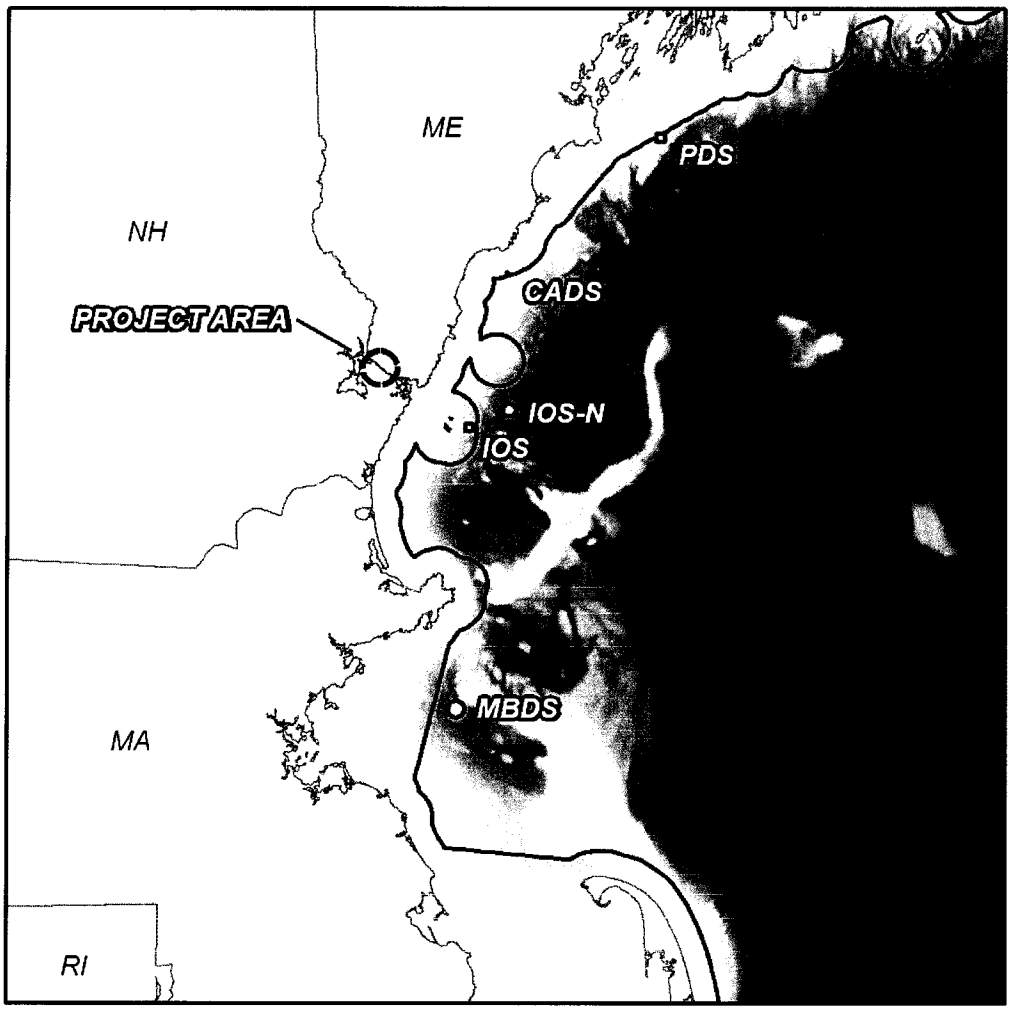
Shortnose Sturgeon

As stated in your letter of November 15, 2013, "federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occur along the U.S. Atlantic coast. It is thought that shortnose sturgeon were once historically abundant in the Piscataqua River; however, the river does not currently support a known spawning population of shortnose sturgeon. Available information indicates that shortnose sturgeon making coastal migrations within the Gulf of Maine (i.e. between the Merrimack and Kennebec Rivers) make at least occasional short visits to Great Bay. Species presence was recently confirmed through the detection of four tagged shortnose sturgeon by acoustic receivers placed in Great Bay (Micah Kieffer, personal conversation, 2013). Based on the pattern of detections it is thought that shortnose sturgeon visit Great Bay at least during the spring and fall. Detections in the Bay indicate that individual sturgeon may be spending several hours to a few weeks in the area; however the limited number of receivers and their arrangement in the Bay makes any assessment of sturgeon presence in the river or in proximity to the dredging and blasting area difficult. Habitat within the area to be dredged appears to be consistent with shortnose sturgeon foraging habitat; given that, combined with the detection of sturgeon in the Bay, it is reasonable to expect that at least some individual shortnose sturgeon will be present in the river from the spring through the fall and may be engaged in foraging. There is no recent targeted study investigating shortnose sturgeon habitat use and behavior in the Piscataqua River. Based upon the life history characteristics of shortnose sturgeon, the Piscataqua River could serve as an overwintering area. However, current detections in Great Bay have not indicated shortnose sturgeon overwintering behavior."

General Description of Shortnose Sturgeon/Life History - Although information on shortnose sturgeon in the Piscataqua River is limited, there is information on shortnose sturgeon populations in other river systems along the Atlantic coast, including the Kennebec and Merrimack Rivers which are located approximately 70 and 20 miles (respectively) from the Piscataqua River, as well populations in the Penobscot and Connecticut Rivers which are located 100 or more miles from the Piscataqua River. It is presumed that information on feeding, migratory, and overwintering behavior that is known from these rivers is applicable in determining the possibility of this species occurring in the proposed Piscataqua River dredging area. In addition, as noted in your letter, it is believed that the individual shortnose sturgeon detected in Great Bay may have been migrating between the Kennebec and Merrimack Rivers.

Shortnose sturgeon inhabit riverine, estuarine, and nearshore marine waters (Dadswell, et.al. 1984). They are most commonly found in productive mesohaline environments with salinities between 1‰ and 20‰ usually in and around the salt-wedge portion of estuaries. Shortnose sturgeon are considered anadromous; but spend

considerable amount of time in freshwater. The species appears to be estuarine anadromous in the southern part of its range, but in some northern rivers it is "freshwater amphidromous", i.e., adults spawn in freshwater but regularly enter saltwater habitats during their life (Kieffer and Kynard 1993 as cited in NOAA,



PDS=Portland Disposal Site; CADS=Cape Arundel Disposal Site; IOS-N=Isle of Shoals North; IOS=Isle of Shoals; MBDS=Massachusetts Bay Disposal Site

FIGURE -1. Location of Alternative Placement Sites for Dredged Material

1998). However, some shortnose sturgeon, such as the landlocked population in the Connecticut River, spend all their time in freshwater (Taubert and Reed, 1978). Another shortnose sturgeon population in the Connecticut River has been documented within the estuary and lower reaches of the Connecticut River throughout June, July, and into August as well as other additional sites further upstream (Savoy, 1989). Adult shortnose sturgeon in the Merrimack River, the Saint John River and the Connecticut River remain in freshwater for years, although some fish spend time in saline waters (Kieffer and Kynard, 1993). Generally, the within-river distributions of adult shortnose and subadult Atlantic sturgeon in Northeast Rivers are correlated with salinity, where shortnose sturgeon occupy freshwater reaches and subadult Atlantic sturgeon occupy saline reaches (Kieffer and Kynard, 1993).

Shortnose Sturgeon Spawning - Shortnose sturgeon populations spawn during the spring of each year, although this may not always be a yearly occurrence for every fish. Based on limited data, females spawn every three to five years, while males spawn approximately every two years. The spawning period is estimated to last from a few days to several weeks **(**NMFS, 2004**)**. Spawning begins in late winter/early spring in southern rivers along the east coast and in mid to late spring in northern rivers when the freshwater temperatures increase to 8-9^{0}C. Temperature is probably the major factor affecting spawning (Dadswell, et.al., 1984). Spawning has been reported to occur between 10^0 and 12^{0}C in the Saint John River in New Brunswick (Dadswell, 1979), between 12^0 and 15^{0}C in the Connecticut River in Massachusetts (Taubert, 1980) and between 12^0 and 15^{0}C in the Connecticut River in Connecticut (Buckly and Kynard (1985). An overall temperature range for shortnose sturgeon spawning as reported by Crance (1986) is between 10^0 and 15^{0}C. Shortnose sturgeon quickly leave the spawning grounds for summer foraging areas when temperatures exceed 15^{0}C (Squiers et al., 1982). Spawning habitat consists of gravel/boulder substrate in riverine habitat, as well as sand and gravel. As noted in your letter, although it is thought that shortnose sturgeon were once historically abundant in the Piscataqua River; the river does not currently support a known spawning population of shortnose sturgeon.

Overwintering - Shortnose sturgeon over-wintering sites are discrete and generally occur in deep areas of lakes and river channels or in halocline regions of the lower estuary (Dadswell, 1979). In the Saint John estuary in New Brunswick, overwintering sites are characterized by 20‰ salinity and water temperatures between 2^0 and 13^{0}C. These areas contained primarily non-ripening adults, stage IV males and large juveniles. The remaining portion of the population, including ripening adults, some non-ripening adults, and juveniles, overwintered in freshwater near the spawning grounds. Dadswell (1979) described a freshwater overwintering site in the Saint John River with water depths greater than 10 meters, moderate tidal currents, and water temperatures between 0^0 and 2^{0}C. This differs from the overwintering site in the Merrimack River where fish tend to aggregate in an area that narrows to 180 meters wide, with gently sloping banks and depths less than four meters (Kieffer and Kynard, 1993). It should be noted that this area of the Merrimack River is located approximately three miles upstream from the area of maximum saltwater penetration.

Migratory Behavior - In the northern extent of their range, shortnose sturgeon exhibit three distinct movement patterns, which are associated with spawning, feeding and overwintering activities (NOAA, 1998). In the Kennebec River system, general movement of shortnose sturgeon appears to be a composite of both the spawning migration and feeding migration (Squires, et.al., 1982). In addition, shortnose sturgeon seasonally move to and from overwintering areas (Squires, 2001). Water temperatures of 6^0 and 8^0 C appear to trigger a portion of the population that is ripe, and possibly some non-ripe fish to migrate upstream to the spawning grounds (in rivers where the overwintering sites are downstream from the spawning sites). The number of shortnose sturgeon peaks on the spawning grounds at water temperatures of 7.5^0 to 14.5^0 C (Squires, et.al., 1982). These water temperatures occur from mid-April to mid-May, depending on weather and river flows. In addition, although from previous studies shortnose sturgeon were not known to participate in coastal migrations (Dadwsell et al.1984, cited in NMFS, 2004 and NOAA, 1998), recent information has shown migration of acoustically tagged shortnose sturgeon moving between the Penobscot and Kennebec Rivers (Fernandes et al, 2008), and as noted in your letter above, the shortnose sturgeon tracked in the Piscataqua River were believed to be moving between the Kennebec and Merrimack Rivers.

Feeding/Foraging (Adults and Juveniles) – Shortnose sturgeon are benthic omnivores but have also been observed feeding off plant surfaces (Dadswell et al. 1984 in NMFS, 1998). Adult shortnose sturgeon in the Saint John estuary foraged on sand/mud or mud substrate with emergent macrophyte vegetation in 5-10 m depths in summer and overwintered in deep water with mud substrate. Adults captured in freshwater foraged in backwaters of estuarine lakes with aquatic vegetation or on mud substrate along river banks (Dadswell 1979). Kennebec and Androscoggin River adults foraged during the summer in Montsweag Bay, in tidal mud-flats with 18-25 ppt salinity, while tolerating rapid salinity changes (~ 10 ppt salinity/two hours) (McCleave et al. 1977). Other adult sturgeon in the estuary system used shallow and deep tidal channels (salinity of 0-21 ppt), some of which were surrounded by aquatic vegetation (Squiers and Smith 1979; Squiers et al. 1981).

Feeding studies of shortnose sturgeon in the Connecticut River showed differences in feeding between cold and warmwater periods, with fish sampled during coldwater periods showing only trace amounts of food, supporting the life history strategy of decreased activity as temperatures approached winter conditions (Savoy and Benway, 2004 in NMFS Biological Assessment). In the Connecticut and Merrimack Rivers, the "concentration areas" used by fish were reaches where natural or artificial features cause a decrease in river flow, possibly creating suitable substrate conditions for freshwater mussels (Kieffer and Kynard 1993), a major prey item for adult sturgeon (Dadswell et al. 1984 in NMFS 1998).

In the summer, foraging adults in the Connecticut River prefer curved or island reaches, not straight runs. Connecticut River sturgeon appear to prefer gravel and rubble substrate in summer, but sand in winter. Most adult sturgeon occur in slightly deeper water during the day than at night. In daytime, sturgeon seek regions with

bottom water velocities of 0.25-0.5 cm/s, and illumination levels <2,555 lx (from NMFS, 1998).

Shortnose Sturgeon in Dredging Area - As noted in your November 2013 letter referenced above, shortnose sturgeon could potentially use the Piscataqua River as an overwintering area; however there have been no indications of overwintering activity in the river. Based upon the life history information presented above from other Northeast rivers in close proximity to the Piscataqua, it appears that shortnose sturgeon overwintering areas have generally been associated with deeper areas of the rivers, with reduced salinities, and moderate tidal currents. This does not appear to be the case for the dredging area in the Piscataqua River.

According to Jones (2000), the Piscataqua River is one of the fastest flowing tidal waterways among commercial ports in the northeastern United States. The average current velocity at full strength in the lower Portsmouth Harbor varies from about 2.6 to 4.0 knots. Strong tidal currents and mixing throughout the estuary limit vertical stratification during most of the year. Partial stratification may occur during periods of intense freshwater runoff, particularly at the upper tidal reaches of rivers entering the estuary. A horizontal gradient of decreasing salinity exists from the mouth of the harbor to the tidal reaches of the tributaries and the upper portions of Great Bay. The range of this salinity gradient (0-30 ppt) depends on tidal cycle, season and rainfall conditions (Jones, 2000). Therefore the areas of reduced salinity in the Piscataqua River would most likely occur in areas upstream, rather than in the proposed dredging area, which is relatively close to the mouth of the river compared to the upstream areas in Great Bay. Based upon the above flow and salinity characteristics of the Piscataqua River, it would appear that the actual dredging area would not likely be used by shortnose sturgeon for overwintering. Areas of Great Bay upstream from the dredging area would be more likely overwintering areas for this species. Therefore, as noted in your letter of 2013, the dredging area would only be considered a potential migratory corridor for both shortnose and Atlantic sturgeon.

Your letter also notes that habitat within the area to be dredged appears to be consistent with shortnose sturgeon foraging habitat, and that combined with the detection of sturgeon in the Bay it is reasonable to expect that at least some individual shortnose sturgeon may be present in the river from the spring to the fall and may be engaged in foraging.

Based upon foraging information noted above from the Merrimack and Connecticut Rivers, it appears that foraging shortnose sturgeon are more concentrated in areas of decreased river flow that possibly create suitable substrate conditions for freshwater mussels, which are a major prey item for sturgeon.

The proposed dredge area in the Piscataqua River is characterized by swift currents, which would less likely be used by shortnose sturgeon for foraging, and as noted previously salinities are assumed to be more saline than fresh. The area is also frequently used for turning large cargo vessels with tug assist, subjecting the turning basin and adjacent areas to heavy prop wash and vessel movement effects (wakes, drawdown, and currents). However, there are tidal flats along the shore in the vicinity of

the proposed dredge area that may provide suitable forage habitat for shortnose sturgeon and as noted above for the Kennebec and Androscoggin River, adult shortnose sturgeon foraged during the summer in tidal mud-flats with salinities ranging from 18-25 ppt while being able to tolerate rapid salinity changes (~10 ppt salinity/two hours) (McCleave et al. 1977). Therefore, the flats adjacent to the dredging area may be suitable forage habitat for shortnose sturgeon in the Piscataqua River. However, the information also notes that in the Kennebec River estuary, other adult sturgeon in the estuary system used shallow and deep tidal channels (salinity of 0-21 ppt), some of which were surrounded by aquatic vegetation (Squiers and Smith 1979; Squiers et al. 1981), so it may be possible that the actual dredging area (the expanded turning basin) could provide some forage habitat, particularly since shellfish have been found in this area.

From information noted above, it also appears that feeding/foraging activity of shortnose sturgeon is typically higher during the summer months than during the winter. As noted, studies of shortnose sturgeon from the Connecticut River showed that fish sampled during coldwater periods showed only trace amounts of food, compared to (those sampled in the summer). Since the dredging activities are proposed for the cooler months when feeding activity of shortnose sturgeon is reduced, it would appear that the likelihood of shortnose sturgeon actively feeding in vicinity of the proposed dredging area would be less than during the warmer months. It is more likely that shortnose sturgeon would be occupying overwintering areas during this time rather than foraging along the tidal flats of the Piscataqua River.

Effects of Dredging on Shortnose Sturgeon - The proposed dredging activities at the Portsmouth Harbor upper turning basin are planned to be conducted during the late fall/early winter and late winter/early spring, during the months of mid-October to mid-April. Drilling and blasting activities would occur during winter with all blasting completed no later than March 31. Information that you provided in your letter indicated that shortnose sturgeon were detected in the Piscataqua River during the spring and fall. Therefore it is not likely that shortnose sturgeon will be in the proposed dredging and blasting area during the bulk of the dredging and blasting activities. In addition, based upon the information noted above concerning overwintering, it is not likely that the actual dredging area would be an overwintering site for shortnose sturgeon. Also, due to the time of year that the construction will occur, it does not appear that shortnose sturgeon would be foraging in that area during the time of construction. However it is possible that shortnose sturgeon migrating to and from the Great Bay estuary during the early spring and late fall could encounter the construction activities and be affected by them.

Potential impacts that could occur from dredging and disposal include physical injury or death from direct contact with the mechanical dredge itself, burial from dredged material disposal, and injury to larvae or juveniles (if present) from dredging operations. In addition, lethal interactions have occurred between sturgeon and mechanical dredges (NMFS, 2004). Dredging could also have a beneficial impact on sturgeon by creating deeper channel regions which both juveniles and adults seem to prefer (Hastings, 1983).

Effects of Mechanical Dredge/Interaction with Dredging Equipment - A mechanical dredge is planned to be used for the Piscataqua River dredging project. Although both shortnose and Atlantic sturgeon have been reported to have been killed by mechanical dredges (NMFS, 2004), the fact that mechanical dredges move more slowly than other types of dredging equipment (allowing any fish that may be in the direct path of the dredge bucket to avoid it) reduces the probability of lethal interaction between the fish and the dredge bucket. A Biological Opinion prepared by your agency for dredging of the Kennebec River at Bath Iron Works (BIW) with a mechanical dredge, states that: "Based on the best available information, the risk that a shortnose sturgeon would be captured in the slow moving dredge bucket is relatively low. This is evidenced by the small number of shortnose sturgeon captured during dredging operations at BIW since 1997, despite the occurrence of over 10 dredge events, with dredging happening nearly every year." (NMFS, 2009). Given the fact that shortnose sturgeon are less likely to be in the dredging area during the time of active dredging and lower risk of contact with a mechanical dredge, the likelihood of a lethal interaction between a sturgeon and the dredge in the Piscataqua River during the active time of dredging would appear to be low.

Water Quality Effects - Dredging operations cause sediment to be suspended in the water column. This results in a sediment plume in the water, typically radiating from the dredge site and decreasing in concentration as sediment falls out of the water column as distance increases from the dredge site. Suspended sediments can clog and harm the gills of fish, degrade or eliminate spawning and rearing habitats, and impede feeding which negatively affects the growth and survival of anadromous species (US EPA 2003 in NMFS, 2010). Elevated suspended sediments have also been shown to disrupt the schooling behavior of migratory fish (Wildish and Power 1985; Chiasson 1993). In addition dredging can result in mortality of benthic species through direct impact with the dredging equipment; egg and larval stages of fish may be most susceptible to such impacts (Newcombe and Jensen 1996, as cited in NMFS, 2011 Letter for Middletown, CT). In addition, your letter of November 15, 2013 (referenced above) notes the following potential dredging related impacts on fishery resources, which will need to be addressed in our assessment:

a) displacing benthic organisms during dredging and after disposal;
b) interference with respiration;
c) decreased feeding in finfish and invertebrates;
d) temporary dispersal of benthic prey;
e) burial of habitat that serves as foraging and shelter sites;
f) potential burial of demersal and benthic species;
g) interrupted or delayed migration; and
h) mortality of species at vulnerable life stages, such as eggs, larvae, and juveniles.

You also note that total suspended solids (TSS) are most likely to affect sturgeon if a plume causes a barrier to normal behaviors or if a thick sediment layer settles on the bottom affecting their prey. In addition, since the proposed dredging is expected to take several months to complete, the suspended sediment is likely to persist throughout each working day. While the river is nearly 3000 feet wide at the upper turning basin,

two miles downstream it narrows to under 700 feet at Atlantic Heights near the I-95 Bridge. Therefore our impact assessment will need to consider how far downstream the sediment plume will extend, how persistent it will be and what impact it may have on individuals present in this narrower region of the river.

The following is excerpted from the Portsmouth Harbor and Piscataqua River Upper Turning Basin Expansion Navigation Improvement Project, New Hampshire and Maine, Draft Environmental Assessment Finding of No Significant Impact (FONSI) and Clean Water Act Section 404 (B)(1) Evaluation, Section VII A.1, Environmental Consequences Section, as well as from the Environmental Assessment for the Kennebec River Federal Navigation Project, in order to address the above potential impacts of turbidity and TSS on fisheries resources.

Water Quality - Ward (1994) measured the suspended sediment concentrations in the lower estuary (Portsmouth Harbor) and near the mid-estuary (Dover Point) over a number of tidal cycles in July, 1992. The concentrations were low and varied little across the channel and with depth in Portsmouth Harbor. The total suspended sediment concentrations ranged from 1.1 to 3.7 mg/l over a complete tidal cycle at the mouth of the Harbor and from 1.5 to 5.9 mg/l at a cross-section near Seavey Island. Similarly, Shevenell (1974) found suspended sediment concentrations were generally less than 3 mg/l at a station in the mouth of the Piscataqua River in 1972-1973, except during winter when concentrations exceeded 6 mg/l. According to Shevenell (1974), the main sources of particulate matter in the coastal shelf waters adjacent to the Piscataqua River were biological productivity, resuspension of bottom sediments and estuarine discharge from the Piscataqua River. Shevenell (1974) also noted particulate matter concentrations fluctuated seasonally and spatially due to meteorological effects (e.g., storms, high river discharges). Total suspended sediment concentrations were higher in the mid-estuary, ranging from 2.4 to 12.7 mg/l over a tidal cycle at a cross-section at Dover Point in July, 1992 (Ward, 1994). The increase in total suspended sediments in the mid-estuary over the concentrations measured near the mouth reflects the impact of higher suspended sediment inputs from the upper estuary (e.g., Great Bay, upper Piscataqua River, tributaries). The spatial pattern of the total suspended sediment concentrations from the mouth of the estuary in Portsmouth to the upper estuary is reflected in the results of transects run in July, 1992 (Ward, 1994). The concentrations measured at about high tide or early ebb ranged from 1.3 mg/l at the mouth to 17.7 mg/l at the entrance to the Squamscott River. Concentrations along the same transect run at about low tide and during the early flood ranged from 2.4 mg/l to over 50 mg/l at the Squamscott River.

The amount of turbidity generated during dredging operations depends on the sediment characteristics, ambient currents and the skill of the dredge operators. Dredging operations will have no significant impact on turbidity levels or water column chemistry, since the material is mostly clean sand and gravel. The removal of material from the expanded turning basin in the Piscataqua River will resuspend sediments into the water column. This will result in slight localized increases in turbidity during the dredging operation.

Although suspended solid concentrations at the cutterhead are usually less than that of the clam shell, barge overflow reintroduces fine sediment to the water column and turbidity impacts are generally less localized. Because of the coarse nature of the sediment (<l% fines) turbidity impacts associated with dredging are not likely to be significant.

The majority of the material from the expanded turning basin consists of coarse sand, and any overflow would therefore settle rapidly. Most would settle out in a matter of minutes. Applying Stokes settling equation to grain size data it can be shown that the average (50%) of the material would settle to the bottom within 460 feet based on a worse-case four knot current. The small amount of suspended sediments that would remain in the water column would not be expected to exceed natural turbidity levels typical of estuaries (see section V.B.1 of Portsmouth Harbor Piscataqua River Upper Turning Basin Navigation Improvement Project, New Hampshire, Maine Draft Environmental Assessment). The strong currents of the Piscataqua River may carry the turbidity plume beyond the immediate vicinity of the dredging area, but because of the minor amount of material likely to be re-suspended, the impact of any turbidity plume would likely be minimal.

The effects of dredging on the water column chemistry are likely to be minor. The material to be dredged is considered to be uncontaminated because water quality in the area is high and because the shoal area is a relatively high energy sandy environment with a low percentage of fines. Therefore little release of sediment contaminants into the water column is expected. Any release of contaminants would be quickly diluted by the tidal flushing in the area. There should be no degradation of Class B waters.

Although the duration and concentration gradients of suspended sediment plumes from dredging are dependent on numerous factors, such as specific dredge plant, sediment characteristics, and environmental conditions (Collins, 1995) studies of dredging operations from other rivers have shown that the turbidity effects of dredging sand decreases rapidly with distance from the dredging areas. These effects would decrease even more rapidly if the material is coarse sand and gravel as in the Piscataqua River. Since the dredged material from the river is coarse sand, with low silt content, very little turbidity is expected. Also, sandy material is generally not associated with high levels organic carbon or considered a carrier of contaminants (40 CFR 230.60 (a)), and dredging the sandy material from the channel is not likely to result in the release of nutrients or decreases in dissolved oxygen levels. Therefore since the material is expected to rapidly settle, it is unlikely that there would be any elevated levels of suspended sediment two miles downstream near the Piscataqua River Bridge that would negatively affect any sturgeon that could be migrating through that area. In addition, since most of the dredging would be occurring during the time of year when sturgeon were not detected, it would be even less likely for them to be affected by the dredging activities.

Effects on Marine Organisms - Potential impacts of dredging to marine organisms is restricted to physical effects, as dredging operations are not likely to have

any effect on water column chemistry. Benthic organisms inhabiting the dredging area would be destroyed during the dredging process. Turbidity plumes from dredging may also impact adjacent habitat. The amount of impact would be dependent on the spatial and temporal size of the plume. As the material is generally coarse-grained sand and gravel, a large or substantial turbidity plume is not expected. Dredging is not expected to take longer than about five months and will occur during the colder months of the year when biological productivity is low. Recolonization following dredging should take place within a few months. Any temporary loss of fish foraging area would be extremely localized and short-lived.

The only commercial shellfish species of note that were recovered in the dredging area were the softshell clam and the blue mussel. This resource species would be impacted by direct removal of the individuals and their habitat. Softshell clams along the intertidal banks of the Piscataqua River would not be threatened by dredging operations as any increases in turbidity levels would be short-lived and extremely localized. Softshell clams spawn in the area during two periods, spring and late summer-fall (Jones, 2000). Blue mussels' peak spawning period is June through August (Jones, 2000). The new exposed substrate is expected to be similar to the existing substrate; thereby providing the same firm substrate for blue mussel settlement and softshell clam recruitment.

Therefore, it is unlikely that this would significantly affect shortnose sturgeon foraging habitat in the Piscatqua River in the vicinity of the dredging operations. In addition, based upon the preferred foraging habitat for shortnose sturgeon, it would appear that during the summer months (when most foraging/feeding activity occurs) the tidal flats adjacent to the dredging area would more likely be used by these fish. Since these areas will not be dredged, the only effects to benthic prey species potentially utilized by sturgeon would be from elevated turbidities or suspended solids associated with the previous dredging activity, which are expected to be insignificant. In addition, areas of the actual dredged site where these benthic species have been killed are expected to recolonize rapidly. Since relatively few shortnose sturgeon have been detected in the Piscataqua River, any impacts to their food supply would appear to be insignificant and minor, considering the overall productivity of the Great Bay estuary upstream and adjacent areas of Piscataqua River.

Effects of Dredging on Shortnose Sturgeon Spawning, Eggs and Larvae – Since shortnose sturgeon are not known to spawn in the Piscataqua River, there would not be any effects on these life stages of this species resulting from the dredging operations.

Effects of Disposal Operations on Shortnose Sturgeon - As noted, four nearshore disposal sites will be used to dispose of the coarse grained material dredged from the Piscataqua River. These include the Wells nearshore disposal site in Maine, located approximately 31 miles from the dredging area; and the Salisbury Beach, Newbury and Newburyport nearshore disposal sites, near the Merrimack River, all located approximately 30 miles from the Piscataqua River dredging area. In addition, the Isle of Shoals-N site which will be used for the rock disposal is located approximately 20 miles from the dredging area. As noted in your November 15, 2013

letter, shortnose sturgeon that were detected in the Piscataqua River were believed to be migrating between the Kennebec and Merrimack Rivers. Since all of these nearshore disposal areas as well as the Isle of Shoals-N site are located between the Kennebec River and the Merrimack River, any shortnose sturgeon migrating between these two areas could potentially be affected by the disposal activities at these sites. Effects of the disposal of the coarse grained sand and gravel dredged from the Piscataqua River include the direct burial of benthic organisms at the disposal site, as well as the burial or direct contact of any fish species that may be foraging along the bottom with the material as it descends through the water column. Therefore any shortnose sturgeon in the immediate path of the descending dredge plume could be directly affected by the material as it descends from the scow. Also if these sites were used for foraging, then food items could be buried.

Studies conducted on sub-adult white sturgeon (*Acipenser transmontanus*) in the lower Columbia River in Washington at dredged material disposal areas have shown that "the rates of movement, depths used, and diel movement patterns of the white sturgeon showed little change over all periods" (i.e. of disposal activities) "suggesting that natural behaviors were not altered during and immediately after hopper dredge disposal operations" (Parsley et al. 2011). It is assumed that shortnose sturgeon would similarly be unaffected, being a similar species. In addition, most of the migratory activity of shortnose sturgeon appears to be during the spring and fall, and since most of the dredging activity is planned to occur during mid-October through mid-April, the likelihood of sturgeon being in these areas at the time of dredging is reduced.

Rock removed from the site is planned to be disposed at the Isle of Shoals disposal area. As noted in the letter from Peter Colosi referenced above, although acoustic receivers (GoMOOS buoy E01) in the vicinity of the Isle of Shoals have detected tagged Atlantic salmon and Atlantic sturgeon, no shortnose sturgeon were detected in the receiver closest to the Isle of Shoals-N site (GoMOOS Buoy B01). Although the letter mentions that migrating shortnose sturgeon could be in the area of the proposed disposal site, the closest buoy to that site has not detected any shortnose sturgeon or Atlantic salmon. In addition, since shortnose sturgeon have been detected migrating between river systems in the spring and fall, it is not likely that they will be in the vicinities of the disposal areas during the bulk of the construction period between mid-October through mid-April. Therefore, based upon the time of year of the shortnose sturgeon migrations reducing the likelihood of their being in any of the disposal areas during the time of disposal, and the fact that shortnose sturgeon were not detected at the Isles of Shoals buoy, as well as the information that shows other sturgeon species to be unaffected by disposal material, it would appear that the disposal of the Piscataqua River dredged material at the proposed nearshore and Isles of Shoals-N disposal sites would not be likely to adversely affect shortnose sturgeon.

Effects of Blasting on Shortnose Sturgeon in the Piscataqua River - Approximately 25,200 cy of rock could be blasted to remove it from the expanded turning basin to achieve required depths. Potential aquatic impacts associated with blasting include noise, thermal energy release, increased turbidity, damage to structures, and effects on aquatic life, all of which are expected to be minor and

temporary in nature due to the precautions to minimize the shock wave. These impacts would be generated as a result of vibrations, explosion-induced surface water waves, or air overpressure. Measures to minimize impacts to resources during blasting operations will be employed and are noted below.

In your letter from November 15, 2013, you note that the use of explosives has the potential to result in injury or mortality of fish. Shortnose and Atlantic sturgeon within 500 feet of a detonation resulting in peak pressures of 120 psi and average pressure of 70 psi, would be exposed to noise and pressure levels that could cause adverse effects (see Moser 1999; Teleki and Chamberlain 1978; and Wiley *et al.* 1981). Based on studies completed by Moser (1999), peak pressure levels at, or below, 75.6 psi, and peak impulse levels at or below 18.4 psi-msec, will cause no injury or mortality to species of sturgeon, including Atlantic and shortnose sturgeon. You recommended that we design the blasting project to observe the above mentioned thresholds and also suggested the following mitigation techniques be used to facilitate the reduction of sound pressure:

1. Stemming and decking of individual charges;
2. Staggered detonation of charges in a sequential blasting circuit; and
3. Blasting during periods of slack tide and within a confined bubble curtain.

We concur with recommendations #1 and #2 above; due to the swift currents in the Piscataqua River, the use of a bubble curtain would not be practicable. We propose to further avoid and minimize potential blasting impacts to marine mammals and fish (i.e. shortnose sturgeon) by employing the methods discussed below:

a. Use of a fish detecting and startle system to avoid blasting when fish are present or transiting through the area, including placing the fish startle system on a separate boat;
b. Require the use of sonar and the presence of a fisheries and marine mammal observer;
c. Prohibiting blasting during the passage of schools of fish, or in the presence of marine mammals, unless human safety was a concern;
d. Using inserted delays of a fraction of a second per blast drill hole, and;
e. Placing material on top of the borehole (stemming) to deaden the shock wave reaching the water column.

In addition, blasting safety radii for marine mammals, sea turtles and Atlantic sturgeon were calculated for the Boston Harber Deep Draft Dredging project. These calculations were based upon peak pressure levels of less than 23 psi, which would avoid level B harassment of turtles and marine mammals, and would be more than protective of Atlantic and shortnose sturgeon (which as noted above is 75.6 psi). Using Coles equation (1948) modified for confined blasting (Hempen et al, 2007) safety radii were calculated based upon the total weight of the charges for blast. These same equations will be used to calculate safety radii for the Piscataqua River blasting. Since they are based upon the lower peak pressure of 23 psi which protects sea turtles and marine mammals, it is expected that they would be more than protective of shortnose

sturgeon (see letter to John Bullard, NOAA Fisheries from ACOE, November 7, 2012 for further discussion).

Based on these calculations and analysis of effects on listed species. and the low probability of whales, sea turtles and Atlantic and sturgeon occurring in the project area during the time of active blasting, we believe that the blasting in the Piscataqua River would not likely adversely affect listed species, particularly sturgeon.

Atlantic sturgeon

In your letter of November 15, 2013 you note that several listed DPSs of Atlantic sturgeon may occur in the proposed dredging and disposal areas. These include the possibility of four Distinct Population Segments (DPS) of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) which are listed as endangered (New York Bight, Chesapeake Bay, Carolina, and South Atlantic) and one DPS of Atlantic sturgeon listed as threatened (Gulf of Maine). The marine range for all five DPSs includes all marine waters, plus coastal bays and estuaries, from Labrador Inlet, Labrador, Canada, to Cape Canaveral, FL. The action area is within the range of all five DPSs; however, individuals in this area are most likely to originate from the GOM or NYB DPS.

Like shortnose sturgeon, the available information on the presence of Atlantic sturgeon in the Piscataqua River is extremely limited and is based only on the detection of Atlantic sturgeon by acoustic receivers in Great Bay. An Atlantic sturgeon tagged and released in the Merrimack River was detected by telemetry receivers in the Great Bay as recently as June 2012. The best available information indicates that suitable habitat for Atlantic sturgeon spawning and rearing does not occur in the lower Piscataqua River because of relatively high salinities. If suitable forage was present, it would be expected that occasional subadult Atlantic sturgeon could be present in the River while foraging between the spring and fall. Because of the lack of spawning and rearing habitat, the action area should only be considered a migratory corridor for both sturgeon species; but, since Atlantic sturgeon do not overwinter in their natal streams they may occur in the action area regardless of season or time of year.

General Description of Atlantic Sturgeon/Life History - Generally, the life history pattern of Atlantic sturgeon is that of a long lived, (approximately 60 years; Mangin, 1964; Stevenson and Secor, 1999), late maturing, estuarine dependent, anadromous species (in ASSRT, 2007). It can reach lengths of up to 14 feet (4.26 m) and weigh over 800 pounds (364 kg) (FR, 10/6/2010). Atlantic sturgeon are omnivorous benthic feeders and filter quantities of mud along with their food. The diets of adult sturgeon include mollusks, gastropods, amphipods, isopods and fish. Juvenile sturgeon feed on aquatic insects and other invertebrates (ASSRT, 2007).

Spawning - Atlantic sturgeon spawn in freshwater, but spend most of their adult life in the marine environment. Generally, spawning adults migrate upriver in the spring/early summer; February- March in southern systems, April-May in mid-Atlantic systems, and May-July in Canadian systems (Murawski and Pacheco 1977, Smith 1985, Bain 1997, Smith and Clugston 1997, Caron et al. 2002, in ASSRT, 2007). In addition, a fall spawning migration may occur in some southern rivers (Rogers and

Weber 1995, Weber and Jennings 1996, Moser et al. 1998). Atlantic sturgeon likely do not spawn every year, and multiple studies have indicated spawning intervals ranging from 1-5 years for males (Smith, 1985; Collins et al., 2000; Caron et al., 2002) and 2-5 years for females (Vladykov and Greeley, 1963; Van Eenennaam et al., 1996; Stevenson and Secor, 1999, in FR, 2010). Spawning is believed to occur between the salt front of estuaries and the fall line of large rivers, in flowing waters, with optimal flows ranging from 46-76 cm/s and depths from 11-27 m (Borodin, 1925; Leland, 1968; Scott and Crossman, 1973; Crance, 1987; Bain et al., 2000, in FR, 2010). Their highly adhesive eggs are deposited on the bottom substrate usually on hard surfaces such as cobble (Gilbert, 1989; Smith and Clugston, 1997, in FR, 2010). Eggs hatch in approximately 94 and 104 hours after deposition at temperatures of 20°–18° C respectively and the larvae are demersal after hatching (Smith et al., 1980 in FR).

Larval Development and Migration - After hatching, Atlantic sturgeon larvae move downstream to their rearing grounds during the yolk sac larval stage, which is completed in about 8-12 days (Kynard and Horgan, 2002 in ASSRT, 2007). Downstream movement occurs only during the night in the first half of their migration (Kynard and Horgan, 2002), and in the latter half of their migration during both day and night. During the first half of their downstream migration, the larvae use benthic structure such as gravel matrix for refuge during the day. The larvae continue downstream movement toward the estuary, transitioning to juveniles in the process and developing a tolerance for increased salinity. They may reside in the estuary as juveniles for months or years before migrating to the open ocean as sub-adults (Holland and Yelverton, 1973; Doevel and Berggen, 1983; Waldman et al., 1996a; Dadswell, 2006; in ASSRT, 2007).

Subadult and Adult Migration - The subadults move to coastal waters once they reach a size of approximately 76-92 cm (Murawski and Pacheco 1977, Smith 1985 in ASSRT, 1997) where populations undertake long range migrations (Dovel and Berggren 1983, Bain 1997, T. King supplemental data 2006 in ASSTR, 2007). When at sea, the adults mix with populations from other rivers, but return to their natal rivers to spawn as indicated from tagging records (Collins et al. 2000a, K. Hattala, NYSDEC, pers. comm. 1998 in ASSTR, 2007) and population genetic studies showing relatively low rates of gene flow (King et al. 2001, Waldman et al. 2002 in ASSTR, 2007). In addition, migratory and sub-adult Atlantic sturgeon as well as adult sturgeon are normally captured in shallow (10-50 m) nearshore areas dominated by gravel and sand substrate (Stein et al. 2004; from ASSRT 2007). Feeding Atlantic sturgeon are benthic feeders and typically forage on "benthic" invertebrates (e.g. crustaceans, worms, mollusks). (http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm)

The following information concerning habitat and depths at sea has been excerpted from Greene et al. (2009), Atlantic States Marine Fisheries Commission Atlantic Coast Diadromous Fish Habitat: A Review of Utilization, Threats, Recommendations for Conservation, and Research Needs concerning migration during non spawning season and depths at sea:

"Little is known about the habitat use of adult Atlantic sturgeon during the non-spawning season, particularly when the sturgeon return to marine waters (Bain 1997; Collins et al. 2000b). While at sea, adult Atlantic sturgeon have been documented using relatively shallow nearshore habitats (10 m to 50 m) (Laney et al. 2007; Stein et al. 2004). It is possible that individual fish select habitats in the same areas, or even possibly school to some extent (Bain et al. 2000; Stein et al. 2004; Laney et al. 2007)."

"Down-river/down-estuary migrations peak at the end of October in the Hudson (River) system. At this time, many juveniles overwinter in deep holes, while others leave the Hudson River and move south along the Atlantic coast (Dovel and Berggren 1983). In contrast, Moser and Ross (1995) found that juvenile sturgeon in the Cape Fear River, North Carolina, kept the same center of distribution near the saltwater freshwater interface year round. However, these fish were unable to move upriver because of the location of the Cape Fear Lock and Dam No. 1, just above the estuary (0.5 ppt interface) (P. Brownell, NOAA Fisheries, Southeast Regional Office, personal communication).

Depths at Sea - The greatest depth in the ocean at which Atlantic sturgeon have been reported caught was 75 m (Colette and Klein-MacPhee 2002). Collins and Smith (1997) report that Atlantic sturgeon were captured at depths of 40 m in marine waters off South Carolina. Stein et al. (2004) investigated data collected by on-board fishery observers from 1989-2000 to determine habitat preferences of Atlantic sturgeon. They found that Atlantic sturgeon were caught in shallow (<60 m) inshore areas of the Continental Shelf. Sturgeon were captured in depths less than 25 m along the Mid-Atlantic Bight, and in deeper waters in the Gulf of Maine (Stein et al. 2004). The Northeast Fisheries Science Center bottom trawl survey caught 139 Atlantic sturgeon from 1972-1996 in waters from Canada to South Carolina. They found the fish in depths of 7 m to 75 m, with a mean depth of 17.3 m. Of the fish caught, 40% were collected at 15 m, 13% at 13 m, and less than 5% at all the depth strata (NEFC, unpublished data, reviewed in Savoy and Pacileo 2003)." More recent information indicates that Atlantic sturgeon have been reported at depths of up to 300 m (Dave Bean, NMFS, personal communication).

Overwintering areas - As also reported in Greene et al (2009), "overwintering areas for adult and late juvenile Atlantic sturgeon include the nearshore areas off the Atlantic coast from the Gulf of Maine south to at least Cape Lookout, North Carolina (Stein et al. 2004; Laney et al. 2007). These areas provide Atlantic sturgeon with foraging grounds and habitat for most of the year (Johnson et al. 1997). Winter habitat occurs in coastal nearshore waters, which is expected to not be as limited as spawning habitats and inlets." In the Hudson River, some juvenile Atlantic sturgeon moving down estuary during late October will overwinter in deep holes, while others while others leave the Hudson River and move south along the Atlantic coast (Dovel and Berggren 1983 in Greene, 2009). In addition, as reported in Gilbert (1989) "Adult sturgeon are generally found in areas of little or no current throughout much of their lives, specifically during times when they are living in the lower parts of rivers, in estuaries, or in the ocean. This is particularly true for Atlantic sturgeon, which tend to occupy more saline environments than those inhabited by the shortnose sturgeon".

Feeding/Foraging - Juvenile Atlantic sturgeon in the Chesapeake Bay were found to prey on annelid worms, isopod, amphipods, chironomid larvae and mysids (Secor et al, 2000b in Greene, 2009). Connectict and Merrimack River Atlantic sturgeon showed a mix of amphipods and polychaetes (Kynard et al. 2000 in Greene, 2009). Juvenile Atlantic sturgeon in freshwater ate plant and animal matter, sludgeworms, chironomid larvae, mayfly larvae, isopods, amphipods and small bivalve mollusks. It was also stated that in marine waters, Atlantic sturgeon fed on mollusks, polychaete worms, gastropods, shrimps, amphipods, isopods, and small fish (particularly sand lances) (Scott and Crossman, 1973 in Greene, 2009). In addition, foraging often occurs at or near areas with submerged aquatic vegetation (SAV) or shellfish resources (NMFS, 2012, Letter from Daniel Morris).

Atlantic Sturgeon in the Dredging Area - As noted in your November 15, 2013 letter, Atlantic sturgeon are not believed to spawn in the Piscataqua River, and due to the lack of spawning and rearing habitat, the action area should only be considered a migratory corridor for both sturgeon species. However the letter also notes that due to the fact that Atlantic sturgeon do not overwinter in their natal streams, they may occur in the action area regardless of season or time of year. As noted in the information presented above, Atlantic sturgeon overwintering areas include nearshore areas off the Atlantic coast from the Gulf of Maine south to Cape Lookout North Carolina. Also in the Hudson River, overwintering areas include deep holes. In addition, Adult sturgeon are generally found in areas of little or no current throughout much of their lives, specifically when they are living in the lower parts of rivers, in estuaries or in the ocean.

Since the dredging area of the Piscataqua River is located in an area of high velocity currents, it would not likely be an overwintering area for Atlantic sturgeon. In addition, based upon the above information, it would appear that most of the overwintering areas for adults and late juvenile Atlantic sturgeon would be in nearshore areas off the coast. Since the dredging will occur from mid-October through mid-April, during the times that Atlantic sturgeon would already be at these overwintering areas, it is not likely that an overwintering Atlantic sturgeon would be in the area of active dredging. However, since Atlantic sturgeon migrations occur during the spring and fall, it is possible that during the late fall or early spring that Atlantic sturgeon moving through the area to or from the Great Bay Estuary could be affected by the dredging activities. However, no or minimal impact would be expected as the material is mostly coarse grained and any suspended sediment would be expected to settle quickly.

The above referenced letter also notes that if suitable forage was present in the dredging area of the Piscataqua River, then occasional sub-adult Atlantic sturgeon could be present in the area while foraging between the spring and fall. Since Atlantic sturgeon juveniles are known to feed on a variety of freshwater, estuarine and marine organisms, it is likely that these food items would be present in either Great Bay, or the tidal flats in the vicinity of the proposed dredging area. However, as noted in your letter, this would be likely between the spring and the fall. In addition, the most recent Atlantic sturgeon detection from Great Bay occurred during June of 2012. Since most of the dredging will occur in the late fall through the early spring, then the chances of an Atlantic sturgeon being in the area and being affected by the dredging operations would

be assumed to be minimal. However, it is also possible that a late fall or early spring migrant through the river could come in contact with the dredging activities.

Effects of Dredging on Atlantic Sturgeon - The effects of dredging on Atlantic sturgeon would be similar to the effects of dredging on shortnose sturgeon discussed above, and include injury or mortality resulting from direct contact with the dredge, effects to all life stages of Atlantic sturgeon that could be in the vicinity from elevated levels of suspended sediment from re-suspension, as well as indirect effects to habitat and food supply resulting from the dredging and elevated suspended sediments. However, since Atlantic sturgeon are not believed to spawn in the Piscataqua River or areas upstream, there would not be any effects to spawning fish, eggs or larval forms, only on juveniles or adults that may be migrating through the area.

A mechanical dredge will be used for the dredging, which as noted above is less likely to take sturgeon than other types of dredges, particularly if these fish not expected to be present during the time of active dredging. The discussion of water quality effects on shortnose sturgeon resulting from dredging presented above would also address those same effects on Atlantic sturgeon. Generally, the levels of suspended sediments resulting from mechanical dredging of coarse grained sand and gravel would be expected to rapidly settle within short distance from the dredge and scow, therefore having minimal downstream effects. In addition, they would be unlikely to significantly raise the turbidities in the Piscataqua River and therefore not be expected to create a barrier to any up-migrating Atlantic sturgeon that could be in the area. Therefore, the proposed dredging activities would appear to not adversely affect any Atlantic sturgeon that may be migrating through the area. Furthermore, since most migratory activity occurs during the fall and spring, Atlantic sturgeon would not be expected to be in the area during period when most of the dredging will be done (i.e. winter).

Nearshore Disposal Areas - As noted above for shortnose sturgeon, the four nearshore disposal areas are located between river systems where known Atlantic sturgeon populations are known to exist (i.e. the Kennebec River, Maine, and the Merrimack River, MA, as well as the Hudson River in New York). Since Atlantic sturgeon are known to make long range coastal migrations, then it is possible that during some time of the year, migrating Atlantic sturgeon would be passing through the near shore areas in the vicinities of the disposal areas. In addition, they have been documented as using relatively shallow nearshore habitats, which would also suggest that the disposal areas could be used by them. Also, as noted above, overwintering areas include "areas off the Atlantic coast from the Gulf of Maine south to at least Cape Lookout North Carolina". Therefore it is possible that overwintering Atlantic sturgeon could be in the vicinities of the near shore disposal areas during the time of disposal operations, and be affected by them.

The effects of disposal operations on Atlantic sturgeon would be similar to those noted above for shortnose sturgeon. As noted above, studies of white sturgeon on the Columbia River in Washington have shown that dredge disposal operations did not alter the behaviors of the sturgeon in the area during and immediately after hopper dredge disposal operations. It would be assumed that this would also be true for Atlantic sturgeon, being a similar species. Also, since the material is consists mostly of coarse

sand and gravel, levels of suspended sediments in the vicinity of the nearshore placement areas and the ocean placement site would be expected to return to background levels within a short time period.

A letter from your agency to the USACE concerning Atlantic sturgeon in the vicinity of Wells Harbor, Maine (NMFS, 2012), states that "studies of the effects of turbid waters on fish suggest that concentrations of suspended solids can reach thousands of milligrams per liter before an acute toxic reaction is expected (Burton 1993). Fish eggs and larvae can be buried or smothered as suspended solids settle out of the water column". It continues "As Atlantic sturgeon are highly mobile they are likely to be able to avoid any sediment plume and any effect on their movements or behavior is likely to be insignificant. Additionally, the TSS levels expected (40.0-475.0 mg/L depending on the type of dredge used and site specific conditions during dredging and up to 500.0 mg/L for disposal) are below those shown to have an adverse effect on fish (580.0 mg/L for the most sensitive species, with 1,000.0 mg/L more typical; see summary of scientific literature in Burton 1993) and benthic communities (590.0 mg/L (EPA 1986)); therefore, effects to benthic resources that sturgeon may eat are extremely unlikely. Based on this information, it is likely that both the effect of the suspension of sediment resulting from dredging operations and the effects of the discharge of sediments at the disposal site will be insignificant." (NMFS Wells letter, 2012).

It is estimated that there will be approximately two trips per day between the dredging area and the nearshore disposal sites, for a total of about 30 days for the entire dredging period. If any sturgeon were occupying these areas they could be in the direct path of the sand as it descends from the scow at which point they could be buried or injured. However, as noted above from the studies with tagged white sturgeon occupying these disposal areas, most of these species were unaffected by disposal operations. In addition due to the mobility of these fish, they would likely move to avoid the descending material. More likely if these fish are in the disposal areas, they would likely be in general areas (and not in the direct path of the descending material), and where they would be subjected to temporary increases in turbidity which would not be expected to significantly affect them (based on information presented above).

Isles of Shoals-N Disposal Area – In a letter from Peter Colosi referenced above (September 2, 2011) you note that Atlantic sturgeon were detected at GoMOOS Buoy B01 which is located in the vicinity of the proposed Isles of Shoals-N disposal area. However since 2005, there have been only nine Atlantic sturgeon detected, with most of them detected in March and one detected in June. It would appear from this information, that these would be detecting fish moving through the area, rather than occupying these areas for any length of time. The GoMOOS Buoy B01 is located in a water depth of approximately 62 meters (203 feet) (NERACOOS website http://gyre.umeoce.maine.edu/data/gomoos/buoy/php/buoy_realtime.php?mooring_id=B0101, accessed 11/26/2013). The nearby Isle of Shoals disposal area (IOS-N) proposed for the disposal of the rock is located in water depths ranging from 250 to 310 feet deep. As discussed above, Atlantic sturgeon have recently been reported at depths of 300 feet. Earlier information notes that the deepest record as 75 meters (246

feet) with the mean depth of 17.3 meters (approximately 57 feet), and only 5% of the sturgeon collected were from depth strata other than 15 and 13 meters (this could also be due to sampling bias from the higher frequency of shallower depths sampled). However, based upon the relatively few detections of Atlantic sturgeon from the GoMOOS Buoy B01, it appears that most Atlantic sturgeon are more likely to be found in shallower areas along coast than in the deeper areas near the proposed Isles of Shoals-N ocean placement site.

The disposal of rock at the IOS-N disposal area could affect any sturgeon that may be directly below the scow by either direct burial, or injury from direct contact with the rock as it descends through the water column. However, as noted above, Atlantic sturgeon are highly mobile and would be expected to avoid any material as it descends. In addition, detections of this fish from the vicinity of the disposal area are infrequent (nine since 2005), and most have been during March which would be near the end of the dredging period. The estimated disposal rate for this site would be approximately one trip per day for 11 days. Therefore, given the depths at the disposal area, the low frequency of Atlantic sturgeon detections in the area, the time of year of the detections, the relatively few disposal trips, and the ability of these fish to move from the area of disturbance, it would appear that it would be unlikely for these fish to be in the area at the time of active disposal and/or be adversely affected by the disposal operations.

Effects of Blasting on Atlantic Sturgeon - The effects of blasting on Shortnose sturgeon discussed above are also applicable to Atlantic sturgeon. As noted, methods will be employed to reduce the impacts to this species in the action area. It is expected that given the time of year that the blasting is planned to occur (late winter), the unlikelihood of Atlantic sturgeon using the area for overwintering or foraging, the low frequency of their occurrence in the Piscataqua River (being considered as mainly a migratory corridor for this species) as well as the methods proposed to reduce the blasting effects, that the proposed blasting operations would not likely adversely affect any Atlantic sturgeon.

Atlantic Salmon

As noted in the letter of September 2, 2011 from Peter Colosi, Atlantic salmon have been detected in the vicinity of GoMOOS Buoy E01, however they have not been detected in the Buoy closest to the disposal area, B01 since its deployment in 2005 (which is located approximately 10 miles south from E01). Therefore it is unlikely that this species would be in the vicinity of the IOS-N ocean placement site during the time of disposal operations. In addition, once out-migrating Atlantic salmon smolts have transitioned to saltwater, growth is rapid, and the postsmolts have been reported to move close to the surface in small schools and loose aggregations (Dutil and Coutu, 1988). Therefore given the fact that this species has not been detected in the area of the disposal area, as well its migratory behavior being close to the surface where it could avoid any vessel in the area, it is unlikely that the placement of rock or dredged material at the IOS-N will adversely affect the Gulf of Maine DPS of Atlantic salmon.

Sea Turtles

In your letter of November 15, 2013, you also note that there is a potential for four listed species of sea turtles to be in either the haul routes or placement sites during the warmer months, generally from June through the first week in November. These include the threatened Northwest Atlantic (NWA Distinct Population Segment (DPS) of loggerhead sea turtles (*Caretta caretta*), endangered Kemp's ridley (*Lepidochelys kempi*) green (*Chelonia mydas*) and leatherback (*Dermochelys coriacea*) sea turtles. Since the bulk of the dredging and disposal activities are planned occur during the late fall and winter months (mid-October through mid-April) it is unlikely for these species to be in the area during the construction activities. Therefore, the proposed dredging and disposal operations are not expected to adversely affect listed species of sea turtles.

Whales

The letter of November 15, 2013 referenced above states "While listed whales occur in the offshore waters of New Hampshire and Maine, due to the riverine nature of the dredging and demolition sites, the inshore location of the fill sites, and the water depth of the likely transit routes in between, no listed whales are expected to occur in the action area". Therefore it is not expected that dredging and blasting in the Piscataqua River, and disposal activities at the near shore disposal sites would adversely affect listed Whales. A letter from Peter Colosi dated September 2, 2011 (referenced above) concerning the IOS-N disposal area states "Listed Whales also occur in the waters off the coast of Maine. In the disposal area, North Atlantic right whales (*Eubalaena glacialis*) as well as occasional humpback whales (*Megaptera novaeangliae*) and fin whales (*Balaenoptera physalus*) could be present." Therefore it is possible that listed whales could be in the area of the IOS-N ocean placement site, or along the transit routes between the dredging area and the placement sites and potentially be affected by the disposal of the rock or transit of the scows.

In order to minimize the effects to listed whales, the following measures will be implemented.

- The Right Whale sightings Advisory system will be monitored as well as other communication media (i.e. NOAA weather radio, U.S. Coast Guard NAVTEX broadcasts, Notice to Mariner, and U.S. Coast Pilots) for general information regarding North Atlantic Right Whale sighting locations. In addition, the Contractor will be required to monitor the Right Whale Listening Network for information on Right Whales detected near the shipping lane.
- All project vessels will comply with voluntary speed restrictions (10 knots or less) to minimize the risk of ship strikes, as implemented in Dynamic Management Area (DMAs) that may be established by NOAA Fisheries Service. NOAA Fisheries Service will announce DMAs to mariners through its customary maritime communication.
- One or more NMFS-approved endangered species observers will be present on the vessel traveling to and from the disposal area to monitor for listed whales.

Therefore it is expected that the disposal operations at the IOS-N ocean placement site will not adversely affect any listed whale species that may occur in the along the disposal route or in the disposal area.

In conclusion, based upon the information discussed above for shortnose sturgeon, five DPSs of Atlantic sturgeon, the GOM DPS of Atlantic salmon, four listed sea turtles, and three listed whales, we believe that the dredging, nearshore or ocean placement, and blasting activities associated with the proposed navigation improvement project consisting of widening the upper turning basin at the Portsmouth Harbor and Piscataqua River Federal Navigation Project in New Hampshire and Maine, may affect but is not likely to adversely affect these listed species.

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2. (FR, 2010). Federal Register /Vol. 75. No 193/ Wednesday, October 6, 2010/ Proposed Rules. Department of Commerce, National Oceanic and Atmospheric Administration, 50 CFR Parts 223 and Part 224 RIN 0648-XJ00 [Docket No. 100903414-0414-02], Endangered and Threatened Wildlife and Plants; Proposed Listing Determinations for Three Distinct Population Segments of Atlantic Sturgeon in the Northeast Region. Agency National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.