NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT
BIOLOGICAL OPINION

Agency: Army Corps of Engineers, New York District

Activity Considered: Ferry Landings Manufactured Gas Plant Waste Remediation
F/NER/2004/00473
GARFO-2004-00005

Conducted by: National Marine Fisheries Service
Northeast Region

Approved by: ______________________

Date Issued: JUL 12 2004

This constitutes the National Marine Fisheries Service's (NOAA Fisheries) biological opinion (BO) on the effects of the Army Corps of Engineer's (ACOE) approval of a permit for the removal of approximately 2800 cubic yards (cy) of Manufactured Gas Plant (MGP) Wastes, a dense non-aqueous phase liquid, at a site in the Hudson River near Tarrytown, New York on threatened and endangered species in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). This BO is based on information provided in the Biological Assessment (BA) submitted by ACOE, correspondence with ACOE staff, and other sources of information. A complete administrative record of this consultation will be kept at the NOAA Fisheries Northeast Regional Office. Formal consultation was initiated on April 22, 2004.

CONSULTATION HISTORY

In December 2003, the applicant, Ferry Landings LLC, contacted Diane Rusanowsky of NOAA Fisheries Habitat Conservation Division (HCD) requesting information on the presence of listed species in the vicinity of the proposed remediation project in Tarrytown, New York. Ms. Rusanowsky responded to the request and indicated that the federally endangered shortnose sturgeon (*Acipenser brevirostrum*) is present in the Hudson River and is likely to be present in the action area. The ACOE initiated informal consultation with NOAA Fisheries on the proposed project in a letter dated January 14, 2004. Included with this letter was a BA analyzing the effects of the proposed project on shortnose sturgeon. In this letter the ACOE made the preliminary determination that the project was not likely to directly affect shortnose sturgeon and requested that NOAA Fisheries concur with this determination. In a letter dated February 9, 2004, NOAA Fisheries responded to the January 14 letter and indicated that because the project was likely to require the handling of shortnose sturgeon, NOAA Fisheries was not able to concur with the ACOE's determination. NOAA Fisheries requested additional information on how shortnose sturgeon would be handled when encountered as part of this project. The ACOE responded in a letter dated March 29, 2004, which included a shortnose sturgeon handling plan. In the March 29 letter the ACOE made the determination that the proposed project would not adversely affect shortnose sturgeon. Also, the ACOE indicated that all handling of shortnose sturgeon would be done by Normandeau Associates and that this work was authorized under Incidental Take Permit (ITP) No. 1254 issued under Section 10 of the ESA.

However, ITP No. 1254 is held by Dynegy Inc., a power producing company, and was issued for specific research activities on the Hudson River. While Normandeau Associates routinely works under contract with Dynegy under the provisions of ITP No. 1254, the work proposed by Ferry Landings is not authorized under that permit. As such, in a letter dated April 22, 2004, the ACOE requested that NOAA Fisheries initiate formal consultation for the proposed project, including the handling of shortnose sturgeon as part of the handling plan. As all information necessary for formal consultation was available at that time, April 22, 2004 serves as the date of initiation of formal consultation.

DESCRIPTION OF THE PROPOSED ACTION

The Tarrytown Former Manufactured Gas Plant site is a 20 acre site located on West Main Street in the Village of Tarrytown, New York. Ferry Landings LLC, Ferry Investments LLC, and consolidated Edison Company of New York, Inc (ConEd) entered into a Voluntary Cleanup Agreement with the New York State Department of Environmental Conservation (NYSDEC) to accomplish the remediation of site contamination in order to re-develop the site for mixed residential and commercial/industrial uses. The main activities on the site are an asphalt batch plant in the northwest portion and a trucking terminal and a maintenance facility in the southeast portion. The central portion of this site includes a former manufactured gas plant (MGP), reportedly operated between 1873 and 1938. The MGP was last operated by the Westchester Lighting Company, which has been succeeded in ownership by ConEd. Several areas of the site have been impacted by MGP waste and petroleum products. The waste, commonly referred to as dense, nonaqueous phase liquid (DNAPL), has caused significant areas of soil contamination on-site and sediment contamination in the Hudson River adjacent to the site. A Conceptual Remedial Action Work Plan has been developed that includes several remedial activities. Most of the remediation work will occur in upland sites. However, some clean up activities will occur in the Hudson River. The ACOE plans to issue a permit pursuant to Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act for the excavation work that will occur in the River. As this excavation work is the only work with the potential to affect listed species under the jurisdiction of NOAA Fisheries, it will be the subject of this BO.

Dredging

The proposed remediation of the Tarrytown former MGP site involves the dredging of approximately 2,800 cubic yards (CY) of Hudson River sediment contaminated with MGP waste. The area to be dredged is located on the east side of the Hudson River just north of the Tappan Zee Bridge (River Mile (RM) 27). The area of contaminated river sediment extends about 160 feet along the shore (along an existing retaining wall) and outward into the river by varying distances, up to about 120 feet. The proposed dredging effort will require approximately 14 weeks.

The proposed work consists of installing a new 160 foot long water-tight bulkhead and dredging 2,800 CY of contaminated sediments within the existing connecting channel adjacent to the new bulkhead wall. Where river sediment is to be excavated, the work area will be defined by a double silt curtain. Recent bathymetric surveys provide adequate understanding of bathymetry affecting the construction of the silt curtain. Turbidity monitoring will be performed to insure that turbidity outside the silt curtain is maintained within acceptable limits. If turbidity levels are unacceptable, operations will be suspended or modified until acceptable ranges can be achieved. The river spoils will be transported to land where dewatering will be performed by gravity, geotubes, filter presses or other technologies. The methods to be used will be approved by NYSDEC. The dewatered sediment will be taken off site for treatment at a permitted facility. As has been approved by NYSDEC, water draining from the site will be collected and sent through a carbon treatment system prior to discharge back to the Hudson River. The NYSDEC approval has established stringent water quality requirements for this discharge.

Shortnose sturgeon handling plan

Shortnose sturgeon will be excluded from the dredging area during the period of active dredging by a barrier net which will be deployed around the entire periphery immediately outside of the outer silt curtain. The barrier net will have 3/4 inch stretch mesh. The barrier net will be constructed in 100 foot panels which will allow for removal of a section for repair in the event of a tear. The net will be 30 feet deep to allow extra slack to ensure it is not lifted off the bottom by tidal currents. The leadline of the net will be modified with a double 3/8 inch chain to form a tight seal between the bottom of the net and the river bottom. The net will be securely attached to the shoreline bulkhead on the north and south sides of the dredging area enclosed by the silt curtain. The barrier net will be set by field biologists and divers. After the barrier net is deployed, divers will swim the entire length of the net to ensure the chain lead lines are sealed against the river bottom. Divers will check the barrier net once every four weeks after this initial set to monitor net integrity.

After the barrier net has been set and divers have verified that the net anchor line is sealed against the river bottom, the field crew will conduct a series of seine hauls along the shoreline to clear small fish from within the enclosed dredging area. The beach seine is 100 foot long and has two 40 foot long wings that are 8 feet deep with 3/4 inch stretch mesh. The beach seine bag is 20 feet long, 10 feet deep with 3/8 inch stretch mesh. Fish collected with the seine will be placed in a container with ambient river water and transported off site outside the barrier net where they will be released alive. Gill nets will be used to clear larger fish from deeper water where seining is not possible. The field crew will set six 100 foot long gill nets with four 25 foot panels of different mesh sizes to catch any fish trapped inside the barrier net. The proposed mesh sizes in the gill net panels will be 7 inch, 5 inch, 3 inch and 1 inch stretch mesh. The crew will initially fish the gill nets in two hour sets after which the nets will be hauled, the fish removed alive and relocated outside of the barrier net. Once the gill nets are cleared, they will be reset in different locations within the barrier for another 2 hour set. If catches prove to be low after several two hour sets, the gill nets will be set to fish for a four hour period beginning at dusk. If any sturgeon are captured, the gill nets will be set for another 4 hour period and this will continue until none are captured. The seine and gill nets will only be used after the initial setup. If at any point in the project a large hole is discovered in the net or the lead line comes off the bottom, the gill nets will be redeployed to clear the area of fish that may have entered.

The barrier net will be set up after the double silt curtain has been deployed. Net set up and fish clearing is expected to take 4 to 5 days. After the initial setup the barrier net will be checked from a boat for tears and gilled fish will be cleared twice a week on non-consecutive days. If any tears are discovered, the net will be repaired on site when possible. Once a month divers will swim the length of the barrier net, remove gilled fish, check for tears, and verify that the chain lead line is sealed with the river bottom. After dredging is complete the divers will disconnect and pull the net, anchors and head rope. All species collected in the gill nets and beach seines will be identified, counted, and released alive outside the barrier net.

Any sturgeon that are collected in either the barrier net, gill nets or beach seines will be identified, measured and handled according to the following standard operating procedures:

- Data records will be made for each sturgeon caught to verify the taxonomy (i.e., Atlantic vs. shortnose) and the status of the fish with respect to the presence or absence of tags
- Length (mm total length), weight (grams), condition at time of capture (alive or dead), and sex if readily apparent, are determined and recorded for each sturgeon caught
- Live sturgeon will be released and dead sturgeon will be frozen and cataloged
- Obvious abnormalities (e.g., fin rot) will be noted in the comments section of the field data sheet
- Each sturgeon caught will be examined for the presence of external tags or marks, and scanned with a hand-held PIT tag reader to determine the presence of internal PIT tags. Each sturgeon caught with a tag present will have the tag number or description of the mark recorded. A description of the condition of the tag insertion site will be made for each recaptured sturgeon caught.

Each sturgeon 250 mm or smaller and each sturgeon recaptured with one or more tags present will have three photographs taken. The three photographs (digital images) taken for each sturgeon will include:

- a side view of entire fish on measuring board,
- a close up of the mouth with mm ruler for scale, and
- a close up side view of base of anal fin to reveal presence or absence of -anal scutes.

Action Area

The action area is defined in 50 CFR 402.02 as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Any individual in the Hudson River population of shortnose sturgeon has the potential to be in the project area. Direct and indirect impacts should not extend beyond the area contained by the barrier net. Therefore, the action area for this biological opinion is the area contained within the barrier net and the immediate surrounding area.

The Hudson River is nearly 2.5 miles wide at the project site. Water depth across the Hudson River adjacent to the site ranges from 1 to 45 feet. The deepest portion of the river channel is closer to the east bank or Tarrytown side of the river and there are extensive shallow water flats from the channel to the west bank. Water depth near the existing waterfront bulkhead at the project site ranges from 7 feet near the bulkhead to about 20 feet deep at a distance into the river of 150 feet (the width of the Tarrytown Wharf Navigation Channel). There are no beds of Submerged Aquatic Vegetation (SAV) immediately offshore from the project site. The sub tidal zone of the action area is essentially unvegetated. Occasional strands of Eurasian milfoil, water celery (*Valisneria)* or *Potamogeton pectinatus* may occur here sparsely.

During much of the year, this area is a transitional zone where freshwater from the upper river mixes with saltwater from the Atlantic, producing a predominantly brackish water habitat with salinities varying from 0-10 parts-per-thousand (ppt). The bottom types are principally mud and fine sandy silt in the shallow areas, coarse grained sand and gravel on the scoured areas with the remains of old oyster beds with a hard, shell substrate in some places off shore. Data from environmental studies at the site (Haley & Aldrich 2003) indicate the substrate in the project work area is mostly silt, with some deposits of silt and clay and localized areas of gravel. The gravel is presumed to be the result of spills during off-loading of aggregate from barges at the operating asphalt batch plant.

STATUS OF AFFECTED SPECIES

This section will focus on the status of the listed species that are present within the action area, summarizing information necessary to establish the environmental baseline and to assess the effects of the proposed action. The only endangered or threatened species under NOAA Fisheries' jurisdiction in the action area is the endangered shortnose sturgeon (*Acipenser brevirostrum*). No critical habitat has been designated for shortnose sturgeon and therefore none will be affected by the proposed action.

Shortnose Sturgeon

Shortnose sturgeon were listed as endangered on March 11, 1967 (32 FR 4001), and the species remained on the endangered species list with the enactment of the ESA in 1973. A shortnose sturgeon recovery plan was published in December 1998 to promote the conservation and recovery of the species (see NOAA Fisheries 1998).

Although shortnose sturgeon are listed as endangered range-wide, in the final recovery plan NOAA Fisheries recognized 19 separate populations occurring throughout the range of the species. These populations are in New Brunswick Canada (1); Maine (2); Massachusetts (1); Connecticut (1); New York (1); New Jersey/Delaware (1); Maryland and Virginia (1); North Carolina (1); South Carolina (4); Georgia (4); and Florida (2). NOAA Fisheries has not formally recognized distinct population segments (DPS)[1] of shortnose sturgeon under the ESA. Although genetic information within and among shortnose sturgeon occurring in different river systems is largely unknown, life history studies indicate that shortnose sturgeon populations from different river systems are substantially reproductively isolated (Kynard 1997) and, therefore, should be considered discrete. While genetic information may reveal that interbreeding does not occur between rivers that drain into a common estuary, at this time, such river systems are considered a

1 The definition of species under the ESA includes any subspecies of fish, wildlife, or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature. To be considered a DPS, a population segment must meet two criteria under NOAA Fisheries policy. First, it must be discrete, or separated, from other populations of its species or subspecies. Second, it must be significant, or essential, to the long-term conservation status of its species or subspecies. This formal legal procedure to designate DPSs for shortnose sturgeon has not been undertaken.

single population compromised of breeding subpopulations (NOAA Fisheries 1998). Consequently, this BO will treat the nineteen separate populations of shortnose sturgeon as subpopulations (one of which occurs in the action area) for the purposes of this analysis.

Shortnose sturgeon occur in large rivers along the western Atlantic coast from the St. Johns River, Florida (possibly extirpated from this system) to the Saint John River in New Brunswick, Canada. Shortnose sturgeon are large, long lived fish species. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while northern populations are amphidromous (NOAA Fisheries 1998). Population sizes vary across the species' range. From available estimates, the smallest populations occur in the Cape Fear (~8 adults; Moser and Ross 1995) and Merrimack Rivers (~100 adults; M. Kieffer, United States Geological Survey, personal communication), while the largest populations are found in the Saint John (~100,000; Dadswell 1979) and Hudson Rivers (~61,000; Bain et al. 1998). No reliable estimate of the size of either the total species or the shortnose sturgeon population in the Northeastern United States exists. Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They feed on a variety of benthic and epibenthic invertebrates including molluscs, crustaceans (amphipods, chironomids, isopods), and oligochaete worms (Vladykov and Greeley 1963; Dadswell 1979 *in* NOAA Fisheries 1998).

Shortnose sturgeon have similar lengths at maturity (45-55 cm fork length) throughout their range, but, because sturgeon in southern rivers grow faster than those in northern rivers, southern sturgeon mature at younger ages (Dadswell et al. 1984). Shortnose sturgeon are long-lived (30-40 years) and, particularly in the northern extent of their range, mature at late ages. In the north, males reach maturity at 5 to 10 years, while females mature between 7 and 13 years. 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. Spawning begins from late winter/early spring (southern rivers) to mid to late spring (northern rivers) when the freshwater temperatures increase to 8-9°C. Several published reports have presented the problems facing long-lived species that delay sexual maturity (Crouse et al. 1987; Crowder et al. 1994; Crouse 1999). In general, these reports concluded that animals that delay sexual maturity and reproduction must have high annual survival as juveniles through adults to ensure that enough juveniles survive to reproductive maturity and then reproduce enough times to maintain stable population sizes.

Total instantaneous mortality rates (Z) are available for the Saint John River (0.12 - 0.15; ages 14-55; Dadswell 1979), Upper Connecticut River (0.12; Taubert 1980b), and Pee Dee-Winyah River (0.08-0.12; Dadswell et al. 1984). Total instantaneous natural mortality (M) for shortnose sturgeon in the lower Connecticut River was estimated to be 0.13 (T. Savoy, Connecticut Department of Environmental Protection, personal communication). There is no recruitment information available for shortnose sturgeon because there are no commercial fisheries for the species. Estimates of annual egg production for this species are difficult to calculate because females do not spawn every year (Dadswell et al. 1984). Further, females may abort spawning attempts, possibly due to interrupted migrations or unsuitable environmental conditions (NOAA Fisheries 1998). Thus, annual egg production is likely to vary greatly in this species.

At hatching, shortnose sturgeon are blackish-colored, 7-11mm long and resemble tadpoles (Buckley and Kynard 1981). In 9-12 days, the yolk sac is absorbed and the sturgeon develops into larvae which are about 15mm total length (TL; Buckley and Kynard 1981). Sturgeon larvae are believed to begin downstream migrations at about 20mm TL. Laboratory studies suggest that young sturgeon move downstream in a 2-step migration; a 2 to 3-day migration by larvae followed by a residency period by young of the year (YOY), then a resumption of migration by yearlings in the second summer of life (Kynard 1997). Juvenile shortnose sturgeon (3-10 years old) reside in the interface between saltwater and freshwater in most rivers (NOAA Fisheries 1998).

In populations that have free access to the total length of a river (e.g., no dams within the species' range in a river: Saint John, Kennebec, Altamaha, Savannah, Delaware and Merrimack Rivers), spawning areas are located at the farthest upstream reach of the river (NOAA Fisheries 1998). In the northern extent of their range, shortnose sturgeon exhibit three distinct movement patterns. These migratory movements are associated with spawning, feeding, and overwintering activities. In spring, as water temperatures rise above 8ºC, pre-spawning shortnose sturgeon move from overwintering grounds to spawning areas. Spawning occurs from mid/late March to mid/late May depending upon location and water temperature. Sturgeon spawn in upper, freshwater areas and feed and overwinter in both fresh and saline habitats. Shortnose sturgeon spawning migrations are characterized by rapid, directed and often extensive upstream movement (NOAA Fisheries 1998).

Shortnose sturgeon are believed to spawn at discrete sites within the river (Kieffer and Kynard 1996). In the Merrimack River, males returned to only one reach during a four year telemetry study (Kieffer and Kynard 1996). Squires (1982) found that during the three years of the study in the Androscoggin River, adults returned to a 1-km reach below the Brunswick Dam and Kieffer and Kynard (1996) found that adults spawned within a 2-km reach in the Connecticut River for three consecutive years. Spawning occurs over channel habitats containing gravel, rubble, or rock-cobble substrates (Dadswell et al. 1984; NOAA Fisheries 1998). Additional environmental conditions associated with spawning activity include decreasing river discharge following the peak spring freshet, water temperatures ranging from 8 - 12° C, and bottom water velocities of 0.4 to 0.7 m/sec (Dadswell et al. 1984; NOAA Fisheries 1998). The eggs are separate when spawned but become adhesive within approximately 20 minutes of fertilization (Dadswell et al. 1984). Between 8° and 12°C, eggs generally hatch after approximately 13 days. The larvae are photonegative, remaining on the bottom for several days. Buckley and Kynard (1981) found week old larvae to be photonegative and form aggregations with other larvae in concealment.

Adult shortnose sturgeon typically leave the spawning grounds soon after spawning. Non-spawning movements include rapid, directed post-spawning movements to downstream feeding areas in spring and localized, wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Young-of-the-year shortnose sturgeon are believed to move downstream after hatching (Dovel 1981) but remain within freshwater habitats. Older juveniles tend to move downstream in fall and winter as water temperatures decline and the salt wedge recedes. Juveniles move upstream in spring and feed mostly in freshwater reaches during summer. Juvenile shortnose sturgeon generally move upstream in spring and summer and move back downstream in fall and winter; however, these movements usually occur in the region above the saltwater/freshwater interface (Dadswell et al. 1984; Hall et al. 1991). Non-spawning movements include wandering movements in summer and winter (Dadswell et al. 1984; Buckley and Kynard 1985; O'Herron et al. 1993). Kieffer and Kynard (1993) reported that post-spawning migrations were correlated with increasing spring water temperature and river discharge. Adult sturgeon occurring in freshwater or freshwater/tidal reaches of rivers in summer and winter often occupy only a few short reaches of the total length (Buckley and Kynard 1985). Summer concentration areas in southern rivers are cool, deep, thermal refugia, where adult and juvenile shortnose sturgeon congregate (Flourney et al. 1992; Rogers and Weber 1994; Rogers and Weber 1995; Weber 1996). While shortnose sturgeon are occasionally collected near the mouths of rivers and often spend time in estuaries, they are not known to participate in coastal migrations and are rarely documented in their non-natal river.

The temperature preference for shortnose sturgeon is not known (Dadswell et al. 1984) but shortnose sturgeon have been found in waters with temperatures as low as 2 to 3°C (Dadswell et al. 1984) and as high as 34°C (Heidt and Gilbert 1978). However, temperatures above 28°C are thought to adversely affect shortnose sturgeon. In the Atlamaha River, temperatures of 28-30°C during summer months create unsuitable conditions and shortnose sturgeon are found in deep cool water refuges.

Shortnose sturgeon are known to occur at a wide range of depths. A minimum depth of 0.6m is necessary for the unimpeded swimming by adults. Shortnose sturgeon are known to occur at depths of up to 30m but are generally found in waters less than 20m (Dadswell et al. 1984; Dadswell 1979). Shortnose sturgeon have also demonstrated tolerance to a wide range of salinities. Shortnose sturgeon have been documented in freshwater (Taubert 1980; Taubert and Dadswell 1980) and in waters with salinity of 30 parts-per-thousand (ppt) (Holland and Yeverton 1973; Saunders and Smith 1978). Mcleave et al. (1977) reported adults moving freely through a wide range of salinities, crossing waters with differences of up to 10ppt within a two hour period. The tolerance of shortnose sturgeon to increasing salinity is thought to increase with age (Kynard 1996). Shortnose sturgeon typically occur in the deepest parts of rivers or estuaries where suitable oxygen and salinity values are present (Gilbert 1989).

Status of Shortnose Sturgeon in the Hudson River

Shortnose sturgeon were first observed in the Hudson River by early settlers who captured them as a source of food and documented their abundance (Bain et al. 1998). Shortnose sturgeon in the Hudson River were documented as abundant in the late 1880's (Ryder 1888 in Hoff 1988). Prior to 1937, a few fisherman were still commercially harvesting shortnose sturgeon in the Hudson River, however, fishing pressure declined as the population decreased. Water pollution, overfishing, and the commercial Atlantic sturgeon fishery are all factors that may have contributed to the decline of shortnose sturgeon in the Hudson River (Hoff 1988).

In the 1930s, the New York State Biological Survey launched the first scientific analysis that documented the distribution, age, and size of mature shortnose sturgeon in the Hudson River

(Bain et al. 1998). In the 1970s scientific sampling resumed precipitated by the lack of biological data and concerns about the impact of electric generation facilities on fishery resources (Bain et al. 1998). The current population of shortnose sturgeon has been documented by tagging studies conducted throughout the entire range of shortnose sturgeon in the Hudson River.

From 1993 through 1997, researchers at Cornell University (Bain et al. 1998) completed the most recent population estimate of shortnose sturgeon in the Hudson River. Utilizing targeted and dispersed sampling methods, 6,430 adult shortnose sturgeon were captured and 5,959 were marked. Based upon the population sampled, the total population of shortnose sturgeon in the Hudson River is estimated to be 61,057. This estimate includes adults and an estimated 4,439 juveniles. Based upon size structure analysis of the sampling results, juveniles make up approximately 3% of the total population. Although fish populations dominated by adults are not common for most species, there is no evidence that this is atypical for shortnose sturgeon (Bain et al. 1998). This study provides the best information available on the current status of the Hudson River population and suggests that population is relatively healthy, large, and particular in habitat use and migratory behavior (Bain et al. 1998).

Shortnose sturgeon have been documented in the Hudson River from upper Staten Island (RM -3) to the Troy Dam (RM 155). In recent years (since 1999), shortnose sturgeon have been documented below the Tappan Zee Bridge from June through December. While shortnose sturgeon presence below the Tappan Zee Bridge had previously been thought to be rare, increasing numbers of shortnose sturgeon have been documented in this area over the last several years suggesting that the range of shortnose sturgeon is extending downstream. Shortnose sturgeon were documented as far south as the Manhattan/Staten Island area in June, November and December 2003. The project area is situated within the summer habitat of this species as well as within winter juvenile habitat. As such, during the time of year proposed for the project, there is the potential for juvenile and adult shortnose sturgeon to be present.

From late fall to early spring, adult shortnose sturgeon concentrate in a few overwintering areas. Reproductive activity the following spring determines overwintering behavior, spawning adults concentrate near Kingston (RM 87.5) while one group of non-spawning adults concentrates near Kingston and another group of non-spawners concentrates near Haverstraw Bay (RM 34-38) (Buckley and Kynard 1985; Dovel et al. 1992; Bain et al. 1998). Recent capture data suggests that these areas may be expanding. Tagging studies by Geoghehan (1992) provide additional earlier data confirming the presence of mature adults in the Kingston and Haverstraw Bay regions. Typically, movements during overwintering periods are localized and fairly sedentary. In approximately mid-April, when water temperatures are sustained at 8°C for several days, reproductively active adults begin their migration upstream to the spawning grounds that extend from below the Federal Dam at Troy to about Coxsackie (RM 150-119) (Bain et al. 1998). The maximum sizes of shortnose sturgeon reported for the Hudson River were a 94.5 cm fork length (FL, measurement to fork in caudal fin) female and a 89 cm FL male. The oldest recorded Hudson River specimen is 37.

In the Hudson River, males usually spawn at approximately 3-4 years of age while females spawn at approximately 6-8 years of age (Bain et al. 1998). The period between spawnings is estimated to range from 1-5 years (T.I.J. Smith 1985). Mature males feed only sporadically prior to the spawning migration, while females do not feed at all in the months prior to spawning. Spawning occurs over several days to several weeks, typically ending by the time water temperatures have reached 15°C, although shortnose sturgeon have been documented on the spawning grounds with water temperatures as high as 18°C. After spawning, adults disperse quickly downstream into their summer range, where feeding resumes. The broad summer range occupied by adult shortnose sturgeon extends from approximately RM 23 to RM 76 (NOAA Fisheries 1998). Like the overwintering areas, recent capture data suggests that these summer concentration areas may also be expanding.

Shortnose sturgeon eggs adhere to solid objects on the river bottom for approximately 10 to 15 days until the larvae hatch (Bain et al. 1998). The Hudson River population of shortnose sturgeon larvae generally range in size from 15 to 18 mm TL at hatching (Bain et al. 1998). Larvae gradually disperse downstream after hatching, entering the tidal river. Larvae are found throughout the Hudson River estuary and are most commonly found in deep waters with strong currents (Bain et al. 1998; Dovel et al. 1992). The transition from the larval to juvenile stage generally occurs around approximately 2 cm TL and is marked by fully developed external characteristics (Bain et al. 1998).

Similar to non-spawning adults, most juveniles occupy the broad region of Haverstraw Bay (RM 34-40) (Dovel et al. 1992; Geoghegan et al. 1992) by late fall and early winter. Juveniles are distributed throughout the mid-river region during the summer and move back into the Haverstraw Bay region during the late fall (Bain et al. 1998; Geoghegan et al. 1992; Haley 1998).

The shortnose sturgeon is a bottom feeder and juveniles may use the protuberant snout to vacuum the river bottom. Curran & Ries (1937) described juvenile shortnose sturgeon from the Hudson River as having stomach contents of 85-95% mud intermingled with plant and animal material. Other studies found stomach contents of adults were solely food items, implying that feeding is more precisely oriented. The ventral protrusable mouth and barbells are adaptations for a diet of small live benthic animals. Juveniles feed on smaller and somewhat different organisms than adults. Common prey items are aquatic insects (chironomids), isopods, and amphipods. Unlike adults, mollusks do not appear to be an important part of their diet (Bain 1997). As adults, their diet shifts strongly to mollusks (Curran & Ries 1937).

Threats to shortnose sturgeon recovery

Shortnose sturgeon were originally listed as an endangered species by the US Fish and Wildlife Service on March 11, 1967 under the Endangered Species Preservation Act (32 FR 4001, Appendix 1). NOAA Fisheries later assumed jurisdiction for shortnose sturgeon under a 1974 government reorganization plan (38 FR 41370). Although the original listing notice did not cite reasons for listing the species, a 1973 Resource Publication (Appendix II in NOAA Fisheries 1998), issued by the US Department of Interior, stated that shortnose sturgeon were "in peril…gone in most of the rivers of its former range [but] probably not as yet extinct." Pollution and overfishing, including bycatch in the shad fishery, were listed as principal reasons for the species' decline.

The Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival.

Several natural and anthropogenic factors continue to threaten the recovery of shortnose sturgeon. Shortnose sturgeon continue to be taken incidentally in fisheries along the east coast and are probably targeted by poachers throughout their range (Dadswell 1979; Dovel et al.1992; Collins et al. 1996). Bridge construction and demolition projects may interfere with normal shortnose sturgeon migratory movements and disturb sturgeon concentration areas. Unless appropriate precautions are made, internal damage and/or death may result from blasting projects with powerful explosives. Hydroelectric dams may affect shortnose sturgeon by restricting habitat, altering river flows or temperatures necessary for successful spawning and/or migration and causing mortalities to fish that become entrained in turbines. Maintenance dredging of federal navigation channels and other areas can adversely affect or jeopardize shortnose sturgeon populations. Hydraulic dredges can lethally take sturgeon by entraining sturgeon in dredge dragarms and impeller pumps. Mechanical dredges have also been documented to lethally take shortnose sturgeon. In addition to direct effects, dredging operations may also impact shortnose sturgeon by destroying benthic feeding areas, disrupting spawning migrations, and filling spawning habitat with resuspended fine sediments. Shortnose sturgeon are susceptible to impingement on cooling water intake screens at power plants. Electric power and nuclear power generating plants can affect sturgeon by impinging larger fish on cooling water intake screens and entraining larval fish. The operation of power plants can have unforeseen and extremely detrimental impacts to water quality which can affect shortnose sturgeon. For example, the St. Stephen Power Plant near Lake Moultrie, South Carolina was shut down for several days in June 1991 when large mats of aquatic plants entered the plant's intake canal and clogged the cooling water intake gates. Decomposing plant material in the tailrace canal coupled with the turbine shut down (allowing no flow of water) triggered a low dissolved oxygen water condition downstream and a subsequent fish kill. The South Carolina Wildlife and Marine Resources Department reported that twenty shortnose sturgeon were killed during this low dissolved oxygen event.

Contaminants, including toxic metals, polychlorinated aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) can have substantial deleterious effects on aquatic life including production of acute lesions, growth retardation, and reproductive impairment (Cooper 1989; Sinderman 1994). Ultimately, toxins introduced to the water column become associated with the benthos and can be particularly harmful to benthic organisms (Varanasi 1992) like sturgeon. Heavy metals and organochlorine compounds are known to accumulate in fat tissues of sturgeon, but their long term effects are not yet known (Ruelle and Henry 1992; Ruelle and Kennlyne 1993). Available data suggests that early life stages of fish are more susceptible to environmental and pollutant stress than older life stages (Rosenthal and Alderdice 1976).

Although there is scant information available on the levels of contaminants in shortnose sturgeon tissues, some research on other related species indicates that concern about the effects of contaminants on the health of sturgeon populations is warranted. Detectible levels of chlordane, DDE (1,1-dichloro-2, 2-bis(p-chlorophenyl)ethylene), DDT (dichlorodiphenyl-trichloroethane), and dieldrin, and elevated levels of PCBs, cadmium, mercury, and selenium were found in pallid sturgeon tissue from the Missouri River (Ruelle and Henry 1994). These compounds were found in high enough levels to suggest they may be causing reproductive failure and/or increased physiological stress (Ruelle and Henry 1994). In addition to compiling data on contaminant levels, Ruelle and Henry also determined that heavy metals and organochlorine compounds (i.e. PCBs) accumulate in fat tissues. Although the long term effects of the accumulation of contaminants in fat tissues is not yet known, some speculate that lipophilic toxins could be transferred to eggs and potentially inhibit egg viability. In other fish species, reproductive impairment, reduced egg viability, and reduced survival of larval fish are associated with elevated levels of environmental contaminants including chlorinated hydrocarbons. A strong correlation that has been made between fish weight, fish fork length, and DDE concentration in pallid sturgeon livers indicates that DDE increases proportionally with fish size (NOAA Fisheries 1998).

Contaminant analysis was conducted on two shortnose sturgeon from the Delaware River in the fall of 2002. Muscle, liver, and gonad tissue were analyzed for contaminants (ERC 2002). Sixteen metals, two semivolatile compounds, three organochlorine pesticides, one PCB Aroclor, as well as polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated dibenzofurans (PCDFs) were detected in one or more of the tissue samples. Levels of aluminum, cadmium, PCDDs, PCDFs, PCBs, DDE (an organochlorine pesticide) were detected in the "adverse affect" range. It is of particular concern that of the above chemicals, PCDDs, DDE, PCBs and cadmium, were detected as these have been identified as endocrine disrupting chemicals. While no directed studies of chemical contamination in shortnose sturgeon in the Delaware River have been undertaken, it is evident that the heavy industrialization of the Delaware River is likely adversely affecting this population. As the lower Hudson is also heavily industrialized, it is likely that shortnose sturgeon in the Hudson River experience similar contaminant loads.

During summer months, especially in southern areas, shortnose sturgeon must cope with the physiological stress of water temperatures that may exceed 28°C. Flourney *et al.*(1992) suspected that, during these periods, shortnose sturgeon congregate in river regions which support conditions that relieve physiological stress (i.e., in cool deep thermal refuges). In southern rivers where sturgeon movements have been tracked, sturgeon refrain from moving during warm water conditions and are often captured at release locations during these periods (Flourney *et al.*1992; Rogers and Weber 1994; Weber 1996). The loss and/or manipulation of these discrete refuge habitats may limit or be limiting population survival, especially in southern river systems.

Pulp mill, silvicultural, agricultural, and sewer discharges, as well as a combination of non-point source discharges, which contain elevated temperatures or high biological demand, can reduce dissolved oxygen levels. Shortnose sturgeon are known to be adversely affected by low oxygen levels (below 5 mg/L). Shortnose sturgeon may be less tolerant of low dissolved oxygen levels in high ambient water temperatures and show signs of stress in water temperatures higher than 28°C (Flourney *et al.*1992). At these temperatures, concomitant low levels of dissolved oxygen may be lethal.

The Shortnose Sturgeon Recovery Plan (NOAA Fisheries 1998) identifies habitat degradation or loss (resulting, for example, from dams, bridge construction, channel dredging, and pollutant discharges) and mortality (resulting, for example, from impingement on cooling water intake screens, dredging and incidental capture in other fisheries) as principal threats to the species' survival. The recovery goal is identified as delisting shortnose sturgeon populations throughout their range, and the recovery objective is to ensure that a minimum population size is provided such that genetic diversity is maintained and extinction is avoided.

Anthropogenic impacts
The major known sources of anthropogenic mortality and injury of shortnose sturgeon include entrainment in dredges and entanglement in fishing gear. Injury and mortality can also occur at power plant cooling water intakes and structures associated with dams in rivers inhabited by this species. Shortnose sturgeon may also be adversely affected by habitat degradation or exclusion associated with riverine maintenance and construction activities and operation of power plants. Entanglement could include incidental catch in commercial or recreational gear as well as directed poaching activities. Shortnose sturgeon are most likely to interact with fisheries in and around the mouths of rivers where they are found. Thus, interactions are likely to occur in state or unregulated fisheries that occur in State waters. Interactions are also most likely to occur during the spring migration (NOAA Fisheries 1998b). According to information summarized by NOAA Fisheries (1998b), operation of gillnet fisheries for shad may result in lethal takes of as many as 20 shortnose sturgeon per year in northern rivers. Shortnose sturgeon may be taken in ocean fisheries near rivers inhabited by this species. No comprehensive analysis of entanglement patterns is available at this time, in part due to the difficulty of distinguishing between shortnose and Atlantic sturgeon with the similarity in appearance of these two species. For example, several thousand pounds of "sturgeon" were reported taken in the squid/mackerel/butterfish fishery in 1992. However, this information is not broken down by species.

ENVIRONMENTAL BASELINE

By regulation, environmental baselines for BOs include the past and present impacts of all State, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The environmental baseline for this BO includes the effects of several activities that affect the survival and recovery of shortnose sturgeon in the action area.

Threats to shortnose sturgeon in the Hudson River

Dredging
The construction and maintenance of Federal navigation channels and other maintenance dredging projects have been identified as a source of sturgeon mortality. Interactions between shortnose sturgeon and dredge operations have been fairly well documented. Lethal takes of shortnose sturgeon have been documented in hopper, pipeline and mechanical dredge operations in several rivers in the Northeastern US. The Hudson River Federal Navigation Channel is maintained by the ACOE. Maintenance dredging began September 10, 1987 and was completed

October 10, 1987. Bottom material lying above the plane of 32 feet below mean low water was removed in specified areas of Haverstraw Bay. A clamshell dredge was used and 346,706 cubic yards of material was removed during 1987 maintenance dredging. The ACOE also permits maintenance of the Tarrytown Federal Navigation Channel. This area was last dredged in 1992. Many other small scale dredging projects routinely occur in the Hudson River near the action area.

Since dredging requires the removal of material from the bottom of the River down to a specified depth, it causes severe disruption to the benthic community. Disruption of the benthos may affect shortnose sturgeon foraging and migration behavior given that they are benthic omnivores. Dredging has also been known to cause temporary displacement, injury and/or mortality, which may also affect the ability of shortnose sturgeon in the Hudson River to recover.

In 2002, the ACOE issued a permit for the construction of the Millennium Pipeline in the Haverstraw Bay region of the Hudson River. In a BO issued in 2002, NOAA Fisheries concluded that the project may adversely affect but was not likely to jeopardize the continued existence of shortnose sturgeon. In an accompanying Incidental Take Statement, the take of one shortnose sturgeon was authorized during the duration of the project. However, due to the denial of a Coastal Zone Management consistency appeal, this project is no longer likely to occur.

Contaminants and Water Quality

Historically, shortnose sturgeon were rare in the lower Hudson River, likely as a result of poor water quality precluding migration further downstream. However, in the past several years, the water quality has improved and sturgeon have been found as far downstream as the Manhattan/Staten Island area. It is likely that contaminants remain in the water and in the action area, albeit to reduced levels. Sewage, industrial pollutants and waterfront development has likely decreased the water quality in the action area. Contaminants introduced into the water column or through the food chain, eventually become associated with the benthos where bottom dwelling species like shortnose sturgeon are particularly vulnerable. Several characteristics of shortnose sturgeon life history including long life span, extended residence in estuarine habitats, and being a benthic omnivore, predispose this species to long term repeated exposure to environmental contaminants and bioaccumulation of toxicants (Dadswell 1979).

Principal toxic chemicals in the Hudson River include pesticides and herbicides, heavy metals, and other organic contaminants such as PAHs and PCBs. Concentrations of many heavy metals also appear to be in decline and remaining areas of concern are largely limited to those near urban or industrialized areas. With the exception of areas near New York City, there currently does not appear to be a major concern with respect to heavy metals in the Hudson River, however metals could have previously affected shortnose sturgeon.

PAHs, which are products of incomplete combustion, most commonly enter the Hudson River as a result of urban runoff. As a result, areas of greatest concern are limited to urbanized areas, principally near New York City. The majority of individual PAHs of concern have declined during the past decade in the lower Hudson River and New York Harbor.

PCBs are the principal toxic chemicals of concern in the Hudson River. Primary inputs of PCBs in freshwater areas of the Hudson River are from the upper Hudson River near Fort Edward and Hudson Falls, New York. In the lower Hudson River, PCB concentrations observed are a result of both transport from upstream as well as direct inputs from adjacent urban areas. PCBs tend to be bound to sediments and also bioaccumulate and biomagnify once they enter the food chain. This tendency to bioaccumulate and biomagnify results in the concentration of PCBs in the tissue concentrations in aquatic-dependent organisms. These tissue levels can be many orders of magnitude higher than those observed in sediments and can approach or even exceed levels that pose concern over risks to the environment and to humans who might consume these organisms. PCBs can have serious deleterious effects on aquatic life and are associated with the production of acute lesions, growth retardation, and reproductive impairment (Ruelle and Keenlyne 1993). PCB's may also contribute to a decreased immunity to fin rot (Dovel et al. 1992). Large areas of the upper Hudson River are known to be contaminated by PCBs and this is thought to account for the high percentage of shortnose sturgeon in the Hudson River exhibiting fin rot. Under a statewide toxics monitoring program, the NYSDEC analyzed tissues from four shortnose sturgeon to determine PCB concentrations. In gonadal tissues, where lipid percentages are highest, the average PCB concentration was 29.55 parts per million (ppm; Sloan 1981) and in all tissues ranged from 22.1 to 997.0 ppm. Dovel (1992) reported that more than 75% of the shortnose sturgeon captured in his study had severe incidence of fin rot.

In the Connecticut River, coal tar leachate was suspected of impairing sturgeon reproductive success. Kocan (1993) conducted a laboratory study to investigate the survival of sturgeon eggs and larvae exposed to PAHs, a by-product of coal distillation. Only approximately 5% of sturgeon embryos and larvae survived after 18 days of exposure to Connecticut River coal-tar (i.e., PAH) demonstrating that contaminated sediment is toxic to shortnose sturgeon embryos and larvae under laboratory exposure conditions (NOAA Fisheries 1998). The MGP waste found at the action area of this consultation may have had similar effects on any shortnose sturgeon present in the action area over the years.

Point source discharge (i.e., municipal wastewater, paper mill effluent, industrial or power plant cooling water or waste water) and compounds associated with discharges (i.e., metals, dioxins, dissolved solids, phenols, and hydrocarbons) contribute to poor water quality and may also impact the health of sturgeon populations. The compounds associated with discharges can alter the pH of receiving waters, which may lead to mortality, changes in fish behavior, deformations, and reduced egg production and survival.

Heavy usage of the Hudson River and development along the waterfront could have affected shortnose sturgeon throughout the action area. Costal development and/or construction sites often result in excessive water turbidity, which could influence sturgeon spawning and/or foraging ability. Industries along the Hudson River have likely impacted the water quality, as service industries, such as transportation, communication, public utilities, wholesale and retail trades, finance, insurance and real estate, repair and others, have increased since 1985 in all nine counties in the lower Hudson River.

The Hudson River is used as a source of potable water, for waste disposal, transportation and cooling by industry and municipalities. Rohman et al. (1987) identified 183 separate industrial and municipal discharges to the Hudson and Mohawk Rivers. The greatest number of users wer in the chemical industry, followed by the oil industry, paper and textile manufactures, sand, gravel, and rock processors, power plants, and cement companies. Approximately 20 publicly owned treatment works discharge sewage and wastewater into the Hudson River. Most of the municipal wastes receive primary and secondary treatment. A relatively small amount of sewage is attributed to discharges from recreational boats.

Power Plant Impingement
Historically, impingement of shortnose sturgeon at Hudson River power plants has been a major concern. For example, Hoff and Klauda (1979) reported the impingement of 39 shortnose sturgeon at power plants along the Hudson from 1969-1979. Approximately 160 shortnose sturgeon were estimated to be impinged on intake screens at the Albany Steam Generating Station in Albany between October 1982 and September 1983. In recent years, due to advances in technology, the number of shortnose sturgeon documented impinged at power plants has decreased dramatically. This is evidenced by the fact that no shortnose sturgeon impingements have been documented at the Albany station since 1985. Several power plants are located in the area surrounding the action area (Indian Point, Mirant Bowline, Roseton, Mirant Lovett, and Danskammer). The Roseton and Danskammer Plants have an ITP issued pursuant to Section 10 of the ESA (No. 1269) which authorizes a level of take of shortnose sturgeon incidental to the operation of the power plants and associated water intakes. Take levels of 2 shortnose sturgeon at Roseton and 4 at Danskamer Point are authorized each year (evaluated as a 5-year running average to account for inter-annual variation). Mirant Lovett and Mirant Bowline each employ a Gunderboom system in front of their intakes to prevent aquatic life from becoming impinged or entrained in these intakes. No estimate exists for the number of shortnose sturgeon taken annually at the two Indian Point intakes as monitoring of the intakes ceased in the early 1970s. However, these intakes historically impinged shortnose sturgeon and this take likely still occurs.

Scientific Studies
The Hudson River population of shortnose sturgeon have been the focus of a prolonged history of scientific research. In the 1930s, the New York State Biological Survey launched the first scientific sampling study and documented the distribution, age, and size of mature shortnose sturgeon (Bain et al. 1998). In the early 1970s, research resumed in response to a lack of biological data and concerns about the impact of electric generation facilities on fishery resources (Hoff 1988). In an effort to monitor relative abundance, population status, and distribution, intensive sampling of shortnose sturgeon in this region has continued throughout the past forty years. Sampling studies targeting other species also incidentally capture shortnose sturgeon. As a result of techniques associated with these sampling studies, shortnose sturgeon have been subjected to capturing, handling, and tagging. For example, 45 shortnose sturgeon were captured during one study in 2003. The same study captured 50 shortnose sturgeon in 2000. It is possible that research in the action area may have influenced and/or altered the migration patterns, reproductive success, foraging behavior, and survival of shortnose sturgeon. There are currently two active Incidental Take Permits, issued pursuant to Section 10 of the ESA, for research activities in the Hudson River, including the action area. These permits have been issued to Dynegy and the NYSDEC. These permits are issued for a period of five years and authorize varying levels of incidental take. The Dynegy permit (ITP No. 1254) authorizes annually the lethal take of 40 larval shortnose sturgeon and the non-lethal take of 13 juvenile and

82 juvenile and adult shortnose sturgeon. The NYSDEC permit (ITP No. 885) authorizes the annual non-lethal take of 5,000 shortnose sturgeon and the lethal take of two shortnose sturgeon.

Fisheries
Unauthorized take of shortnose sturgeon is prohibited by the ESA. However, shortnose sturgeon are taken incidentally in other anadromous fisheries along the East coast and may be targeted by poachers (NOAA Fisheries 1998). In the Hudson River, American shad, river herring, and blue crab are the target of commercial fishing operations (Kanhley 2001, pers. comm.) Seasonal restrictions apply to the American shad and river herring gillnet fisheries that operate in the spring (Kahnley 2001, pers. comm.). In Haverstraw Bay, recreational fisherman target a number of species such as bluefish, weakfish and white codfish. The incidental take of shortnose sturgeon on the Hudson River has been documented in commercial shad fisheries as well as recreational hook and line fisheries (Clancy 2000).

Status of shortnose sturgeon in the action area
The project area is situated within the summer habitat of this species as well as within winter juvenile habitat. As such, during the time of year proposed for the project, there is the potential for juvenile and adult shortnose sturgeon to be present. Larval shortnose sturgeon are unlikely to be present in the action area, as they are more likely to occur in the channel than in the project area and the occurrence of larvae this far downstream is unlikely. Trawling surveys in the action area have confirmed the presence of shortnose sturgeon from May through October and shortnose sturgeon have been captured in the area surrounding the action area through December. As no trawling has been done from January – April, no shortnose sturgeon have been documented by survey during these months. As the project is located in both summer and overwintering habitats, it is reasonable to assume that shortnose sturgeon may be present in the action area year-round. No estimates on the number of shortnose sturgeon that would typically occur in the action area is known; however, as the action area is near a major concentration area, a percentage of the Hudson River shortnose sturgeon population may be present in the action area at any time. Based on the best available information, adult and juvenile shortnose sturgeon are likely to be present in the action area when the project occurs.

Shortnose sturgeon and their habitat in the Hudson River may be affected by several different factors including: impaired water quality from both point and non-point sources; incidental take in scientific studies and commercial and recreational fisheries; impingement at power plants; and dredging activities. NOAA Fisheries has collaborated with various federal action agencies conducting work in the Hudson River to minimize the potential for these activities to adversely affect shortnose sturgeon.

EFFECTS OF THE ACTION
This section of a BO assesses the direct and indirect effects of the proposed action on threatened and endangered species or critical habitat, together with the effects of other activities that are interrelated or interdependent (50 CFR 402.02). Indirect effects are those that are caused later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

The purpose of this assessment is to determine if it is reasonable to expect that the ACOE's proposed action will have direct or indirect effects on threatened and endangered species that will appreciably reduce their likelihood of both survival and recovery in the wild by reducing the reproduction, numbers, or distribution of that species [which is the "jeopardy" standard established by 50 CFR 402.02].

As outlined above in the description of the proposed action, all dredging will occur within a double walled silt curtain. Surrounding the silt curtain will be a barrier net. The goal of these systems is to prevent any fish, including shortnose sturgeon, from being present in the area to be dredged. This will not only eliminate the likelihood of shortnose sturgeon being injured or killed by the dredge but will also eliminate the potential for shortnose sturgeon to be impacted by any contaminants released during excavation.

Effects to forage base

Information on preferred prey items and habitat use of shortnose sturgeon in the Hudson River is limited; however, some data does exist. Carlson and Simpson (1987) examined the food habits of juvenile shortnose sturgeon impinged on power plant intake screens in the Hudson River Estuary. For all sizes of shortnose sturgeon collected, midge larvae and amphipods were the most important food items, occurring in 76% of all stomachs sampled. Midge larvae contributed 51% of all organisms found and amphipods 43% (Carlson and Simpson 1987). Yearling and juvenile sturgeon were found to have consumed the amphipods *Gammarus spp.* and the isopod *Cyathura.* The increased use of amphipods as food items appears to be in response to their peak abundance during the late summer (Carlson and Simpson 1987). Preferred foraging grounds for shortnose sturgeon in the Hudson were found to be sandy-mud bottom (Carlson and Simpson 1987). Observations in other river systems support these results (Dadswell 1979; Pottle and Dadswell 1979; Dadswell 1984).

Only recently have new techniques allowed gut contents to be sampled without sacrificing the fish (Haley 1998). Using a gastric lavage technique, the gut contents of sturgeon in the Hudson River were sampled (Haley 1998). Identifiable prey was recovered from 39 out of the 48 sturgeon. Based upon the results of this sampling effort, preferred food items of shortnose sturgeon in the Hudson Estuary include: amphipods *Gammarus,* chironomids, isopods *Cyathura polita*, zebra mussels, and snails.

Given that dredging will likely destroy all benthic resources in the action area, most sedentary organisms associated with the bottom sediments would be destroyed. Most motile organisms, such as crabs, would probably be able to avoid the dredge. Recolonization of the dredged area is expected to be rapid; studies have indicated that pre-dredging conditions in a channel can be reestablished in as little as one month after dredging ceases. In addition to relatively rapid recovery of certain species, sturgeon have extensive foraging habitat outside the action area. Thus, the temporary reduction in foraging habitat should not adversely affect shortnose sturgeon. In addition, as the area to be dredged is largely unvegetated and has been contaminated for many years, it is not thought to be a primary foraging area for shortnose sturgeon.

Sedimentation

Dredging operations can also cause large amounts of sediment to be suspended in the water column. Numerous studies have assessed the impact of turbidity/suspended sediment on fish. While not all of the studies have focused exclusively on shortnose sturgeon, the results demonstrate that suspended sediment may have an adverse impact on fish. Elevated levels of suspended sediment can cause displacement, disruption of spawning migrations and foraging behavior, and mortality.

Backfilling, and bucket impact, penetration, and withdrawal, are the major factors that contribute to suspended sediment concentration (Collins 1995). Given that a closed bucket dredge will be used, sediment loss during withdrawal will be minimal. The amount of sediment entering the River will be further reduced by the use of the double walled silt curtains. High concentrations of suspended sediments also lead to reduced dissolved oxygen concentrations, which result when organic material in sediment is released back into the water column stimulating oxygen consuming bacteria (Burton 1993). While increased sedimentation could impact shortnose sturgeon, the presence of the double walled silt curtain will prevent any increase in sedimentation from entering the mainstem of the Hudson River.

Contaminant Release

The resuspension of contaminated sediments may pose a threat to shortnose sturgeon present in the action area. Sturgeon are particularly susceptible to repeated long term exposure due to their extended life span. As noted on page 15, PAHs, which are likely to be found in association with MGP waste, are known to affect shortnose sturgeon. However, as shortnose sturgeon will be excluded from the area to be dredged and sediment levels entering the River are expected to be minimal, no adverse affects to shortnose sturgeon from contaminant release are expected.

Disruption to migratory movements

Dredging and gill netting operations both have the potential to disrupt migratory behaviors. However, as the dredge operations are occurring in a concentrated area at the edge of the Hudson River and no sediment is expected to be released outside of the silt curtains, and, therefore, no sediment plume will be present, no shortnose sturgeon are expected to be deterred from migrating past this area in either an upstream or downstream direction. In addition, as the barrier gill net is also at the edge of the River and occupies a very small percentage (less than 1%) of the width of the River, this is not expected to act as a barrier to either up- or downstream migrating shortnose sturgeon. As such, the proposed action is not expected to affect the migratory movements of shortnose sturgeon in the Hudson River.

Direct Effects

The primary impacts to shortnose sturgeon from this project are the effects of being removed from the project area by either a beach seine or gill net and the potential for impacts from interactions with the barrier net.

Shortnose sturgeon are likely to be present and foraging in this region of the Hudson River during summer months. As shortnose sturgeon are likely to be in the project area when the silt curtain is deployed, some shortnose sturgeon may be captured inside the silt curtains. The noise of the workers installing the silt curtains may drive some shortnose sturgeon out of the area, decreasing the number that are present when the silt curtain is sealed. The number of shortnose sturgeon that will be directly affected by the action (i.e., captured behind the silt curtain and removed) is likely to be a small percentage of the total number of shortnose sturgeon in the Hudson River for several reasons: (1) the project is located several miles downstream of Haverstraw Bay, the primary concentration area for shortnose sturgeon in the summer; (2) the project is located along the shoreline and extends a maximum of 120 feet into the River where the river is 2.5 miles wide; (3) the project is located away from the main channel where shortnose sturgeon are most often captured; (4) the project area is not a known foraging area for shortnose sturgeon; and (5) the installation of the silt curtain is likely to drive some shortnose sturgeon away from the area. Evidence of take of shortnose sturgeon by dredges, however, indicates that not all sturgeon will be dispersed from the area by underwater activity and noise. As such, NOAA Fisheries anticipates that up to two shortnose sturgeon may be captured within the silt curtain. This is based on the magnitude of the project, thehigh likelihood of shortnose sturgeon presence in this region of the Hudson River and the likelihood that not all sturgeon will avoid the area despite the presence of the underwater activity and noise associated with deployment of the silt curtain.

As indicated in the description of the action, beach seines and gill nets will be used to remove fish from the area inside the silt curtain. Any shortnose sturgeon caught in these nets will only be handled briefly and will be returned to the mainstem River as soon as possible. This will minimize the potential for stress and/or injury. Small juvenile shortnose sturgeon may be taken in the beach seines. As soak times for the beach seines are relatively short, there is a low likelihood of mortality in the beach seines. Also, as the mesh size is relatively small (3/4 inch) there is a low likelihood of injury. There is an increased chance of injury and/or mortality for shortnose sturgeon caught in the gill nets as the mesh size is larger and the soak time longer. Shortnose sturgeon may be injured during the fish clearing process but provided that proper procedures are used, these injuries can be minimized and/or eliminated. If uninjured, shortnose sturgeon are expected to recover from capture and handling rapidly. However, despite adherence to best practices, shortnose sturgeon mortality may occur. Gill net sampling in the Delaware River (Hastings 1983) resulted in 4% mortality while Collins et al. (1996) reported that by-catch mortality in gill nets fishing for other species was 16% with another 20% of fish being injured. As the Collins et al. data reflects commercial and recreational fishing interactions with longer soak times, it is more appropriate to compare the proposed activity to the shorter sets documented in Hastings 1983. As only two shortnose sturgeon are anticipated to be captured behind the silt curtain and the soak times are even shorter than those cited in Collins et al. (1996), no shortnose sturgeon are expected to be killed in the gill net operations. The two shortnose sturgeon captured behind the silt curtain may be either adult or juvenile. These two fish are expected to be returned to the River unharmed. Due to the short length of the gill net soaks (2-4 hours) and the adherence to appropriate handling protocols, no injury and/or mortality is expected to occur as a result of this project.

Shortnose sturgeon are also likely to encounter the barrier gill net. However, as this net has ¾ inch mesh, it is unlikely that shortnose sturgeon will be gilled. Net sizes recommended for capturing shortnose sturgeon range from 2-8 inch stretch mesh, with the smaller sizes having poorer capture results (NOAA Fisheries 2000). Even small juvenile shortnose sturgeon are unlikely to become impinged on the net as the smallest mesh size documented to capture young juveniles was 2 inch stretch mesh (NOAA Fisheries 2000). Based on this information, it is not likely that shortnose sturgeon will be impinged on the ¾ inch-mesh barrier net and this net is likely to serve as an effective barrier preventing shortnose sturgeon from entering the area to be excavated.

CUMULATIVE EFFECTS

Cumulative effects are defined in 50 CFR §402.02 as those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation.

Contaminants and Water Quality

Contaminants found in the action area could be linked to some industrial development along the waterfront. Heavy metals, and waste associated with point source discharges are likely to be present in the future due to continued operation of industrial facilities. In addition, many contaminants such as PCBs remain present in the environment for prolonged periods of time and would not disappear even if contaminant inputs were to decrease. It is likely that shortnose sturgeon will continue to be affected by contaminants in the action area in the future.

Some industrialized waterfront development will continue to impact the water quality in and around the action area. Five power plants are present near the action area and are likely to continue to operate. Excessive water turbidity and water temperature variations are likely with continued future operation of these facilities. As a result, shortnose sturgeon spawning, foraging and/or distribution in the action area may be impacted.

Scientific Studies

It is likely that additional scientific studies will be conducted on shortnose sturgeon in the action area. Continued capturing, handling, tagging, and tracking of shortnose sturgeon may affect their migration, reproduction, foraging, and survival.

Fisheries

Incidental take of shortnose sturgeon has been documented in both commercial and recreational fisheries in the Hudson River (NOAA Fisheries 1998). The potential for incidental take to occur in the future is likely when fisheries are known to occur in the presence of shortnose sturgeon. Thus, the operation of these recreational and commercial fisheries in the action area could result in shortnose sturgeon injury and/or mortality.

INTEGRATION AND SYNTHESIS OF EFFECTS

The shortnose sturgeon is endangered throughout its entire range and can be divided into nineteen populations (NOAA Fisheries 1998). The shortnose sturgeon residing in the Hudson River form one of the nineteen sturgeon populations.

The most recent available estimate of the size of the population of adult shortnose sturgeon in the Hudson River is 61,057 individuals (NOAA Fisheries 1998). As indicated above, adult and juvenile shortnose sturgeon are likely to be present in the action area during the time the project is proposed. The presence of adults and/or juveniles in the action area during the proposed project is likely to lead to interactions with the fish clearing operation. However, the number of shortnose sturgeon expected to be directly affected by this project (2) is a very small percentage of the total shortnose sturgeon population in this River. Due to the short length of the gill net soaks (2-4 hours) and the adherence to appropriate handling protocols, no injury and/or mortality is expected to occur as a result of this project. No shortnose sturgeon are expected to be affected by the actual excavation work as shortnose sturgeon will be excluded from the area to be excavated. No indirect effects are expected as a result of this project.

CONCLUSION

After reviewing the current status of the species discussed herein, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NOAA Fisheries' biological opinion that while the proposed action may affect shortnose sturgeon in the Hudson River, the proposed action will not reduce the reproduction, numbers and distribution of the Hudson River shortnose sturgeon population in a way that appreciably reduces their likelihood of survival and recovery in the wild or that of the species as a whole. The temporary entrapment of two shortnose sturgeon in the area enclosed by the silt curtains and the subsequent removal of these fish and safe return to the Hudson River, will not affect the reproduction, numbers and/or distribution of shortnose sturgeon in the Hudson River. It is the opinion of NOAA Fisheries that the proposed remediation work at the Tarrytown site will adversely affect but likely will not jeopardize the continued existence of either the Hudson River shortnose sturgeon population or the species as a whole. The number of shortnose sturgeon likely to be directly affected by the action (2) represents a very small percentage of the Hudson River population and the species as a whole. While no reliable estimate of the shortnose sturgeon population as a whole exists, based on the best available information it is expected to be at least 170,000 fish. The two fish expected to be affected by this action represent less than 0.0001% of the total shortnose sturgeon population. The conclusion of this BO is based on the small number of shortnose sturgeon likely affected by this action, the lack of mortality, and the lack of any indirect effects expected as a result of this action.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. NOAA Fisheries interprets the term "harm" as an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §222.102). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Reasonable and prudent measures are non-discretionary, and must be undertaken by the ACOE so that they become binding conditions for the exemption in section 7(o)(2) to apply. The ACOE had a continuing duty to regulate the activity covered by this Incidental Take Statement. If the ACOE (1) fails to assume and implement the terms and conditions or (2) fails to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the ACOE was required to report the progress of the action and its impact on the species to NOAA Fisheries as specified in the Incidental Take Statement [50 CFR §402.14(I)(3)].

Extent of take

As outlined in the accompanying biological opinion, the number of shortnose sturgeon that will likely be directly affected by the action (i.e., captured behind the silt curtain and removed) is expected to be a total of two adult and/or juvenile shortnose sturgeon. This represents a very small (less than 0.01%) percentage of the total number of shortnose sturgeon in the Hudson River. Shortnose sturgeon are reasonably certain to be present in the Tarrytown area in the summer months as they have been documented in trawls in this area from May – October. As such, shortnose sturgeon will likely be present behind the silt curtains when fish clearing operations take place. Any shortnose sturgeon that are present behind the silt curtains will be taken by either the beach seine or a gill net. As outlined in the BO, up to two shortnose sturgeon are likely to be captured behind the silt curtains and removed during fish clearing operations. It is expected that these fish will be returned unharmed to the River. None of these fish are expected to die or suffer from injuries.

Based on the known distribution of shortnose sturgeon in the Hudson River, timing of the project, the location of the project (i.e., on the river bank), the number of shortnose sturgeon that will be directly affected by the action is a very small percentage of the total number Hudson River population of shortnose sturgeon. Take of shortnose sturgeon is likely to occur in the form of harassment (capture in a beach seine or gill net). Due to the short length of the gill net soaks (2-4 hours) and the adherence to appropriate handling protocols, no injury and/or mortality is expected to occur as a result of this project. As such, NOAA Fisheries anticipates that up to two shortnose sturgeon will be taken by harassment and neither of these fish will be subject to injury or mortality.

NOAA Fisheries believes this level of incidental take is reasonable given (1) the distribution and abundance of adult shortnose sturgeon in the immediate project area; (2) the distribution and abundance of juveniles in the immediate project area; (3) the time of year proposed for the project; (4) the duration of the project; (5) the type of gill net being employed and (6) the fish clearing schedule. In the accompanying BO, NOAA Fisheries determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and prudent measures

Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take of a listed species.

(1) ACOE must contact NOAA Fisheries within 24 hours of any interactions with shortnose sturgeon

(2) Personnel handling shortnose sturgeon must have appropriate training in identifying and handling shortnose sturgeon

(3) Gill net techniques to minimize the likelihood of mortality of shortnose sturgeon must be used

(4) Fish clearing procedures must be initiated as soon as practicable after any compromises in the barrier net are detected

(5) Post-dredge monitoring and sediment sampling should occur prior to the removal of the silt curtains and barrier nets

Terms and conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the ACOE must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline the required reporting requirements. These terms and conditions are non-discretionary.

(1) ACOE must contact Julie Crocker by email (julie.crocker@noaa.gov) or phone (978) 281- 9328 ext.6530 at least 24-hours before silt curtains are deployed and within 24-hours of the removal of the barrier net and the silt curtains.

(2) If any injured SNS are found, the licensee shall report immediately to NOAA Fisheries (see contact information on Appendix A). Injured fish must be photographed and measured and the reporting sheet must be submitted to NOAA Fisheries within 24 hours. Personnel shall be trained in shortnose sturgeon biology and should be able to recognize the severity of the shortnose sturgeon's injury If the fish is badly injured, the fish should be retained, if possible, until obtained by a NOAA Fisheries recommended facility for potential rehabilitation.

(3) If any whole shortnose sturgeon (alive or dead) or sturgeon parts are taken incidental to the project, ACOE must contact Julie Crocker (978) 281-9328 ext.6530 or Pat Scida (978) 281-9208 **within 24 hours** of the take. An incident report for shortnose sturgeon take (Appendix C) must also be completed by the observer and sent to Julie Crocker via FAX (978) 281-9394 within 24 hours of the take.

(4) Every incidental take (alive or dead) must be photographed and measured.

(5) At the end of the project, a report must be submitted to NOAA Fisheries which includes information on each shortnose take, including photographs and a copy of Appendix A for each take

(6) Personnel clearing fish from the silt curtains or the gill nets must be able to:
   a. identify shortnose sturgeon, including the morphological differences between shortnose and Atlantic sturgeon;
   b. handle live shortnose sturgeon and be knowledgeable of holding and release procedures;

c. acquire standard field measurements of samples (total length and fork length);
d. fill out a reporting form (Appendix A) when an incidental take occurs and submit the form to NMFS contact listed on the attached form within 24 hours;

(7) According to the NOAA Fisheries protocol for handling shortnose sturgeon, gill net soak times should never exceed two hours in water temperatures greater than 27°C. As such, four hour gill net sets should not occur until two consecutive two hour sets have resulted in the capture of no sturgeon, provided that water temperatures are not greater than 27C.

(8) As indicated in the project description, the barrier net will be checked twice a week for tears. If surveys indicate that the integrity of the barrier gill net has been compromised such that shortnose sturgeon may have entered the dredging area, the fish clearing schedule used at the initiation of the project must be repeated to ensure that no shortnose sturgeon are present in the silt curtain area before dredging recommences.

(9) The silt curtain should not be removed until the post-dredge monitoring and sediment sampling described in the proposed action is complete. This will ensure that all contaminated sediment is removed before fish are allowed to return to the area.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NOAA Fisheries has determined that the proposed project is not likely to jeopardize the continued existence of endangered shortnose sturgeon. NOAA Fisheries recommends that the ACOE implement the following conservation measures:

(1) If any lethal take occurs, appropriate personnel should take fin clips (according to the procedure outlined in Appendix B) to be returned to NOAA Fisheries for ongoing analysis of the genetic composition of shortnose sturgeon.

(2) If any lethal take occurs, the ACOE and/or the applicant should arrange for contaminant analysis of the specimen. If this recommendation is to be implanted, the fish should be frozen and NOAA Fisheries should be contacted immediately to provide instructions on shipping and preparation.

REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the BA for the Tarrytown MGP remediation project . As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

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APPENDIX A.

Incident Report of Shortnose Sturgeon Take
Tarrytown Remediation Project

Species___________ Date ____________ Time (specimen found) ______________

Location: Lat/Long ____

Sampling method ____
Location where specimen recovered ____
____

Weather conditions ____
____
Water temp: Surface ________________ Below midwater (if known)_______________

Species Information: *(please designate cm/m or inches.)*

Total length: ____________ Fork length: ____________ Weight: _____________
Condition of fish/description of animal ______________________________________
____
____

Fish tagged: YES / NO / DON'T KNOW
Please record all tag numbers. Tag # ___________________________

Photograph attached: YES / NO
(please label *species, date,* and *geographic site* on back of photograph)

Comments/other ____
____
____
____

Observer's Name ______________________________________
Observer's Signature ____

APPENDIX B

Procedure for obtaining fin clips from shortnose sturgeon for genetic analysis

Obtaining Sample

1. For any dead shortnose sturgeon, after the specimen has been measured and photographed, two one inch clips for the caudal fin shall be taken.

2. Each fin clip should be placed into a vial of 95% ethanol and the vial should be labeled with the species name, date, name of project and the fork length and total length of the fish along with a note identifying the fish to the appropriate observer report.

Storage of Sample

1. If it is not possible to immediately send the sample to NOAA Fisheries, the sample should be refrigerated or frozen.

Sending of Sample

1. All vials should be sealed with a lid and further secured with tape. Vials should be placed into Ziploc or similar resealable plastic bags. Vials should be then wrapped in bubble wrap or newspaper (to prevent breakage) and sent to:

   NOAA Fisheries
   Northeast Regional Office
   Protected Resources Division
   Attn: Endangered Species Coordinator
   One Blackburn Drive
   Gloucester, MA 01930

2. Upon sending a sample, contact Julie Crocker at (978) 281-9328 ext. 6530 or Pat Scida at (978) 281-9208 to inform NOAA Fisheries to expect a sample.