APPENDIX I

Essential Fish Habitat Assessment

ESSENTIAL FISH HABITAT ASSESSMENT

ISLANDER EAST PIPELINE PROJECT

August 2002

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
Algonquin	Algonquin Gas Transmission Company
CFR	Code of Federal Regulations
cm	centimeter
cm/s	centimeter per second
CTDEP	Connecticut Department of Environmental Protection
DO	dissolved oxygen
Drill Plan	directional drill contingency plan
ECL	Environmental Conservation Law
EFH	Essential Fish Habitat
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
Islander East	Islander East Pipeline Company, L.L.C.
lb/in^2	pounds per square inch
m	meter
MAB	mid-Atlantic Bight
MBC	marine benthic communities
mg/l	milligram per liter
mm	millimeter
MP	milepost
MAFMC	Mid-Atlantic Fishery Management Council
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1998
NEFMC	New England Fishery Management Council
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
ppm	parts per million
ppt	parts per thousand
ROW	right-of-way
SAFMC	South Atlantic Fishery Management Council
SNE	southern New England
SPCC Plan	Spill Prevention Containment and Countermeasures Plan
TL	total length
USDOC	United States Department of Commerce
USDOT	United States Department of Transportation
YOY	young-of-year

1.0 INTRODUCTION

The purpose of this document is to present the findings of the Essential Fish Habitat (EFH) Assessment conducted for the proposed Islander East Pipeline Project as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1998 (MSFCMA). This EFH Assessment is based on the regulations implemented in the United States Department of Commerce (USDOC), National Oceanic and Atmospheric Administration (NOAA) EFH Final Rule, 50 Code of Federal Regulations (CFR) Part 600 (Federal Register, 2002). The objective of this EFH Assessment is to describe how the actions proposed as part of the Islander East Pipeline Project may affect EFH and EFH-managed species for the area of influence of the project. According to the National Marine Fisheries Service (NMFS), EFH within the Long Island Sound includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The area of influence of the project would be the Long Island Sound from the Town of Branford, Connecticut to the Town of Brookhaven, New York.

The contents of this report meet the requirements described by the NMFS to comply with the MSFCMA. The EFH Assessment includes a description of the proposed action; an analysis of the direct, indirect, and cumulative effects on EFH, EFH-managed species, and their major food sources; our views regarding the effects of the proposed action; and proposed mitigation measures selected to minimize expected project effects if applicable.

2.0 PROJECT DESCRIPTION

The Islander East Pipeline Project (Project) would involve actions by two separate pipeline companies: Algonquin Gas Transmission Company (Algonquin) and Islander East Pipeline Company, L.L.C. (Islander East). Algonquin proposes to construct a new compressor station and upgrade existing interstate natural gas pipeline facilities in Connecticut, and Islander East proposes to lease pipeline capacity on facilities owned by Algonquin and construct new interstate natural gas pipeline facilities in Connecticut and New York (see Figure 2-1).

Algonquin would retest and upgrade its existing C-1 (10 inches in diameter) and C-1 L (16 inches in diameter) system pipelines in New Haven County, Connecticut from current maximum allowable operation pressure of 750 pounds per square inch (lb/in^2) to a new maximum allowable operating pressure of 814 lb/in^2. The pipelines parallel each other and each are approximately 13.7 miles long. In total, 27.4 miles of pipeline would be retested and upgraded. Algonquin would also expose, inspect, and repair, as necessary, two 25-foot-long segments of its C-1 pipeline [near milepost (MP) 3.8] in New Haven County, Connecticut.

Algonquin would construct a new 12,028 horsepower compressor station in Cheshire, Connecticut. The compressor station would be installed at the beginning of the C-1 and C-1 L pipelines (near MP 0.1) and include aboveground piping, launchers, buildings, fencing, and pavement. Algonquin would remove two launchers from an existing mainline valve and interconnect facility at MP 0.6 in New Haven County, Connecticut, and relocate the launchers to the proposed Cheshire Compressor Station.

Islander East would construct approximately 44.8 miles of new 24-inch-diameter pipeline from the terminus of the existing Algonquin C-1 and C-1 L pipelines in North Haven, Connecticut, through the towns of North Haven, East Haven, North Branford, and Branford, Connecticut, across Long Island Sound, through the town of Brookhaven, New York, to a planned power plant in Brookhaven. The new pipeline would be designed with a maximum allowable operating pressure of 900 lb/in^2.

Islander East would construct a new interconnect meter station and 24-inch-diameter launcher at the beginning of the Islander East Pipeline (MP 0.0 on the Islander East Pipeline) in North Haven, Connecticut. The meter station would be located within or adjacent to Algonquin's existing North Haven Meter Station and serve as a custody transfer point for gas from the existing Algonquin C-1 and C-1 L pipelines to the Islander East Pipeline.

Islander East would construct a new meter station and 24-inch-diameter receiver at the terminus of the Islander East Pipeline (MP 44.8 on the Islander East Pipeline) in Brookhaven, New York. This facility would contain two separate meters and would serve as a delivery point for gas from the Islander East Pipeline to an existing KeySpan Energy Delivery Long Island distribution pipeline and to a planned Brookhaven Energy Limited Partnership power plant.

Islander East would construct 5.6 miles of 24-inch-diameter pipeline to reach a new meter station and 24-inch-diameter receiver at the terminus of the Calverton Lateral (MP CA 5.6 on the Calverton Lateral) in Calverton, New York. This meter station would serve as a delivery point for gas from the Calverton Lateral to a planned AES Long Island power plant.

Islander East would construct five new aboveground valves at intervals along the pipeline depending on population density and in accordance with the United States Department of Transportation (USDOT) regulations. The valves would be located at MPs 6.0, 9.9, 33.2, 34.3, and 42.0 on the Islander East Pipeline. The mainline valve site at MP 33.2 would contain a side tap valve for a possible future connection to potential customers. The mainline valve site at MP 34.3 would contain a 24-inch-diameter side tap valve and a 24-inch-diameter launcher for the Calverton Lateral.

The pipeline facilities proposed by Algonquin and Islander East are summarized in Table 2-1.

TABLE 2-1
Pipeline Facilities

Facility Name	Description	Diameter (inches)	Length (miles)	County, State
ALGONQUIN				
Algonquin Pipelines Retest	Upgrade C-1 and C-1 L Lines	10 and 16	27.4 (13.7 Each Line)	New Haven County, CT
Anomaly Investigations	Inspect C-1 Line	10	< 0.1	New Haven County, CT
ISLANDER EAST				
Islander East Pipeline	New Mainline	24	44.8 { 21.2[a]	New Haven County, CT
			23.6[b]	Suffolk County, NY
Calverton Lateral	New Lateral	24	5.6	Suffolk County, NY

[a] Includes 10.2 miles onshore and 11.0 miles offshore in Long Island Sound.
[b] Includes 12.0 miles onshore and 11.6 miles offshore in Long Island Sound.

Algonquin proposes to use between 25 and 110 feet of construction right-of-way (ROW) to conduct the Algonquin Pipelines Retest and the Anomaly Investigations. In general, Islander East proposes to use a 75-foot-wide construction ROW to construct its pipeline. In most areas, the construction ROW would comprise a 25-foot-wide area to be used for temporary storage of ditch spoil and a 50-foot-wide area (where a majority of the work would take place) to operate equipment and assemble the pipeline.

Long Island Sound is bounded by Connecticut on the north and by Long Island, New York on the south. The waterbody is approximately 113 miles long (east to west) and approximately 20 miles across (north to south) at its widest point. Mid-Sound depths vary between 60 and 130 feet.

The Islander East Pipeline traverses the central portion of the Long Island Sound for 22.6 miles between MPs 10.2 and 32.8 (Table 2-1). This includes 11.0 miles in Connecticut waters and 11.6 miles in New York waters. The pipeline would be installed at an nearshore depth of 0 to 12 feet from MPs 10.2 to 10.9 along the Connecticut shoreline and from MPs 32.7 to 32.8 along the New York shoreline. The pipeline would be installed at offshore depths of 12 feet to a maximum of 130 feet (at approximately MP 26.0) from MPs 10.9 to 32.7.

Pipeline Construction

Islander East would use the horizontal directional drill (HDD) technique to install an approximately 4,000-foot-long segment of the pipeline at the mainland approach to Connecticut (MPs 10.1 to 10.9) and an approximately 1,300-foot-long segment at the mainland approach to Long Island, NewYork (~MPs 32.7 to 33.0). The process would involve drilling a hole from a point on the mainland (entry side) to a point on the seafloor (exit side) and installing a prefabricated segment of pipe through the hole. The HDD exit hole would emerge at a depth of approximately 12.5 feet along the Connecticut coast and 10 feet along the Long Island coast. Where HDD would be conducted (*i.e.*, under the Connecticut and Long Island nearshore waters of the Long Island Sound), the primary work area is defined as being between 60 feet (for the onshore to offshore drill) and 80 feet wide (for the offshore conventional pipe lay). Ideally, HDD would involve no disturbance to the seafloor over the length of the drilled section, and the work area would not be disturbed.

The segment of the pipeline between MPs 10.9 and 12.0 and ~MPs 32.15 and 32.7 would be installed using mechanical dredging. The dredging technique would require excavation using a crane or hydraulic excavator positioned on a relatively small barge. The portion of the pipeline between MPs 12.0 and 32.15 would be installed by using the subsea plow trenching method. The pipeline would be installed using typical offshore construction techniques and the primary work area for laying and burying the pipe on the seafloor would be approximately 80 feet wide, roughly centered over the pipe.

The crossing of Long Island Sound would require deepwater construction techniques to install the pipeline. Deepwater construction typically uses two barges working in tandem to install the pipeline: the lay barge and the bury barge. The pipeline is welded together on the lay barge, then set on the seafloor. The lay barge is followed by the bury barge, which excavates a trench under the pipeline and buries the line to complete the installation. Alternatively, the lay barge may be used to perform both functions, first welding and laying the pipe and then returning along the pipeline to bury it.

The Long Island Sound mainline would be assembled and lowered onto the seafloor from a slow moving lay barge where an assembly line of welding, coating, and inspection stations would be set up on the lay barge deck. Lay barges are typically moored in place and propelled by winches attached by cable to an array of large anchors. The lay barges that would be used on the Islander East Pipeline Project may have between 8 and 12 anchors, each approximately 10 feet wide. The anchors are designed to penetrate several feet into seafloor sediments to gain hold when the cables are tensioned. The maximum extent of the mooring anchor array would be approximately 2,500 feet to the front and back of the barge, and approximately 2,000 feet to either side. As the lay barge advances, tugboats lift the anchors from the seafloor and reposition them at half-mile intervals in the direction of movement.

In general, the pipeline would be concrete coated and buried three feet below the seafloor. Where the pipeline crosses foreign utilities or undetected submerged bedrock outcrops, the pipeline would be laid on the surface of the seafloor and armored with stone rip-rap or concrete mats. Islander East proposes to primarily use a subsea plow for trenching and burial of the pipeline. The subsea plow would be positioned over the pipeline and would ride along the seafloor on pontoons and would physically cut the seafloor and cast excavated spoil on the side of the trench.

3.0 ESSENTIAL FISH HABITAT

The MSFCMA set forth several new mandates for the USDOC, NOAA, NMFS, New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. Although the concept of EFH is similar to "critical habitat" under the Endangered Species Act of 1973, measures recommended to protect EFH are advisory, rather than prescriptive.

The councils, with assistance from NMFS, are required to delineate "essential fish habitat" for all managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; and, areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle. Prey species are defined as being a food source for one or more designated fish species, and the presence of adequate prey is one of the biological properties that can make a habitat essential.

EFH-designated species and life history stages in the Islander East Pipeline Project area were identified based on a list in the NOAA's *Guide to EFH Designations in the Northeastern United States* (USDOC 1999a). The guide lists EFH-designated species in selected 10-minute by 10-minute squares of latitude and longitude along the coast and provides a geographic species of EFH designations completed by the NEFMC, MAFMC, SAFMC, and the NMFS in the Northeastern United States pursuant to the MSFCMA (Table 3-1).

TABLE 3-1
Ten Minute Square Coordinate Designations
Along the Islander East Pipeline Project in Long Island Sound

	North	East	South	West
Connecticut Coastline	41°20' N	72°40' W	41°10' N	72°50' W
Long Island Sound	41°10' N	72°40' W	41°00' N	72°50' W
Long Island Sound	41°10' N	72°50' W	41°00' N	73°00' W
Long Island Coastline	41°00' N	72°50' W	40°50' N	73°00' W

Source: USDOC, 1999a.

A total of 16 finfish, three shark species, and one squid species are currently designated as EFH-managed species along the proposed route of the Islander East Pipeline Project in state and Federal waters. Table 4-1 lists these species and their life-stage designations.

4.0 MANAGED FISH SPECIES

TABLE 4-1
Summary of Essential Fish Habitat Designation (All Four Ten Minute Squares)

Fish Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
Atlantic mackerel (*Scomber scombrus*)	x	x	x	x
Atlantic salmon (*Salmo salar*)			x	x
Atlantic sea herring (*Clupea harengus*)			x	x
American plaice (*Hippoglossoides platessoides*)			x	x
black sea bass (*Centropristus striata*)			x	x
bluefish (*Pomatomus saltatrix*)			x	x
cobia (*Rachycentron canadum*)	x	x	x	x
king mackerel (*Scomberomorus cavalla*)	x	x	x	x
pollock (*Pollachius virens*)			x	x
red hake (*Urophycis chuss*)	x	x	x	x
scup (*Stenotomus chrysops*)	x	x	x	x
Spanish mackerel (*Scomberomorus maculatus*)	x	x	x	x
summer flounder (*paralicthys dentatus*)			x	
whiting (*Merluccius bilinearis*)				x
windowpane (*Scopthalmus aquosus*)	x	x	x	x
winter flounder (*Pseudopleuronectes americanus*)	x	x	x	x
longfin inshore squid (*Loligo pealeii*)	x		x	x
Shark Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
blue shark (*Prionace glauca*)				x
sandbar shark (*Charcharinus plumbeus*)		x		x
sand tiger shark (*Odontaspis taurus*)		x		

Source: USDOC 1999a.

4.1 ECOLOGICAL NOTES ON THE EFH FISHERIES AND SPECIES

Available information on the life history and habitat requirements for each EFH -managed species is summarized in this section. For most species, the primary source was one of a series of EFH source documents prepared by the NMFS in 1999 and cited once at the beginning of each species summary. Several other primary sources are also identified. Conclusions regarding the likelihood of occurrence of each species and life history stage along the Islander East Pipeline Project route are presented at the end of each species assessment. In reaching these conclusions, emphasis was given to the depth and water quality preferences of eggs, larvae, juveniles, and adults, and their association with bottom substrates. Information on depth and substrate preferences is important because the Long Island Sound varies in depth and the predominant bottom substrate along the pipeline route consists of fine-grained deposition. Another important factor is whether the bottom sediments along the pipeline route provide suitable habitat for invertebrates that are preyed upon by the bottom feeding EFH species.

4.1.1 Coastal Demersal Fishery

American Plaice: Juveniles and Adults

Primary source: Johnson *et al.* (1999)

Juvenile and adult American plaice have similar habitat preferences. Both can be found in inshore and shoal areas over fine-grained sediments or sand or gravel bottom habitats, and largely use the open ocean as a nursery. Juveniles prefer water temperature < 17 degree Celsius (°C), salinity around 33 parts per thousand (ppt), and depths from 45 to 150 meters (m). Adults prefer water temperatures < 17°C, salinity between 20 to 34 ppt, and depths from 45 to 175 m.

Project area: The American plaice is an arctic-boreal pleuronectid flatfish with the Project area being the southern temperature limit for this species, therefore an occasional juvenile and adult may occupy the Project area during the spring and fall.

Pollock: Juveniles and Adults

Primary source: Cargnelli *et al.* (1999)

Juvenile pollock have been know to migrate inshore to inhabit subtidal and intertidal zones that serve as important nursery areas. Juveniles have been reported over sand, mud, rocky bottom, and aquatic vegetation. Juveniles undergo a series of inshore-offshore movements linked to temperature until near the end of their second year. They then move offshore where they remain throughout the adult stage. Juveniles are commonly caught inshore during bottom trawl surveys in summer and fall in the Gulf of Maine and on Georges Bank, but only a few are found south of Cape Cod. Juveniles in the northwest Atlantic prefer temperatures of 0 to 15.6°C and salinities of 29 to 32 ppt. Adult pollock have a temperature preference of 6 to 10°C and salinities ranging from 33 to 34 ppt.

Project area: The pollock is a gadoid species commonly found in colder water of the northern Atlantic Ocean (*i.e.,* Scotian Shelf, Georges Bank, and the Gulf of Maine), but are known to occur as far south as North Carolina. Based on the habitat utilization of this species, juvenile and adult pollock may occupy the Project area during the spring, but in low numbers.

Red Hake: All Stages

Primary source: Steimle *et al.* (1999b)

Red hake spawn offshore in the mid-Atlantic Bight (MAB) in the summer, primarily in southern New England (SNE). The distribution of eggs is unknown because they cannot be distinguished from other hakes. Larvae dominate the summer ichthyoplankton in the MAB and are most abundant on the mid- and outer-continental shelf. Red hake larvae prefer temperatures of 8 to 23°C and depths < 200 m. Larvae typically settle to the bottom in the fall and need shelter (including live sea scallop). Juveniles seek shelter and commonly associate with scallops, surf clam shells, and seabed depressions. Juveniles prefer depths from < 120 m to the low tide line and temperatures between 2 to 22°C. Adults prefer depths from 30 to 130 m and temperatures between 2 to 22°C. Adults are typically associated with sand-mud bottom in holes and depressions. Both juveniles and adults make seasonal migrations in response to changes in water temperatures.

Project area: Based on the habitat utilization of this species, hake eggs (including eggs of other species besides red hake) would be found in the water column of the Project area, but red hake larvae are less likely to occupy shallow coastal waters. Juvenile and adult red hake are attracted to deeper, cooler water, but can be expected to occupy the Project area in all seasons.

Summer Flounder: Juveniles

Primary source: Packer *et al.* (1999)

Summer flounder exhibit strong inshore-offshore movements. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. As long as other conditions are favorable, substrate preferences and prey availability are the most important factors affecting distribution. Some studies indicate that juveniles prefer mixed or sandy substrates, and others show that mud and vegetated habitats are used. Juvenile summer flounder prefer depths < 5 m (in estuary), salinities between 10 to 30 ppt, and temperatures > 11°C.

Project area: Given their association with sandy substrates and the fact that they feed on a variety of bottom-dwelling invertebrates and fish species, juvenile summer flounder are expected to occupy the Project area from spring to fall.

Whiting: Adults

Primary source: Morse *et al.* (1999)

Whiting, or silver hake, spawn on the outer-continental shelf. Eggs and larvae are distributed in mid- and outer-shelf waters, but not in coastal waters. Significant egg production occurs during May to October, with a peak in August. Primary spawning grounds apparently occur between Cape Cod and Montauk Point, New York, on the southeastern slope of Georges Bank, and in Massachusetts Bay. Adults occupy bottom habitats of all substrate types. In general, adults occur in a range of depths between 5 to 500 m and temperatures between 3 to 22°C.

Project area: Based on the habitat utilization of this species, adult whiting can be expected to occupy the Project area in all seasons.

Windowpane: All Stages

Primary source: Chang *et al.* (1999)

Windowpane is a shallow water mid- and inner-shelf species found primarily between Georges Bank and Cape Hatteras on fine sandy sediment. Spawning occurs on inner shelf waters, including many coastal bays and sounds, and on Georges Bank. Eggs and larvae are found in the water column at depths < 70 m and temperatures < 20°C. Juveniles and adults are similarly distributed and prefer bottom habitats with substrate of mud or fine grained sand. They are found in most bays and estuaries south of Cape Cod throughout the year at depths from 1 to 100 m, temperatures < 27°C, and salinities between 5.5 to 36 ppt. Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults occur primarily on sand substrates off SNE and MAB.

Project area: Juvenile and adult windowpane are commonly found on shallow, sandy substrates and are expected to occupy the Project area in all seasons. Because this species spawns in inner shelf and nearshore waters, eggs and larvae are expected be found in the Project area in all seasons except during the winter.

Winter Flounder: All Stages

Primary source: Pereira *et al.* (1999), Phelan (1992)

Winter flounder spawning occurs from late winter through early spring, peaking south of Cape Cod in February and March. Spawning is initiated when the water temperature is about 3°C. Eggs are found inshore in depths < 4.5 m, with salinities between 10 to 32 ppt and dissolved oxygen (DO) between 11.1 to 14.2 milligram per liter (mg/l). Eggs are adhesive and demersal and are deposited on a variety of substrates. Sand is the most common, however, they have been found attached to vegetation and on mud and gravel. Larvae are found inshore in depths < 4.5 m over fine sand and gravel substrates. Larvae are most abundant at temperatures between 2 to 15°C, salinities between 3.2 to 30 ppt, and DO between 10 to 16.1 mg/l.

Habitat utilization by young-of-year (YOY) is not consistent across habitat types and is highly variable among systems and from year to year, and have been associated with *Ulva*, eelgrass, and unvegetated adjacent areas. YOY juveniles are typically found inshore in depths < 12 m over mud to sand substrate with shell or leaf litter, with temperatures < 29.4°C and salinities between 23 to 33 ppt. Juveniles in Long Island Sound can be found at depths between 18 to 27 m, with water temperatures between 10 to 25°C and salinities between 19 to 21 ppt. Adult winter flounder prefer temperatures of 12 to 15°C, DO > 2.9 mg/l, and salinities > 22 ppt. Adults are found inshore at depths < 30 m over mud, sand, cobble, rocks, and boulders.

Project area: Winter flounder deposit eggs on sandy continental shelf substrates in depths as great as 120 m. The sandy habitat of the Project area may provide suitable spawning habitat for this species during the winter. In addition, winter flounder would also spawn on the neighboring shoal areas. Due to the strong correlation of spawning beds and nursery grounds, winter flounder larvae are expected to be found in the Project area during the spring and summer. Juveniles and adults can be expected to be common in the Project area in all seasons.

4.1.2 Coastal Pelagic Fishery

Atlantic Mackerel: All Stages

Primary source: Studholme *et al.* (1999)

Atlantic mackerel overwinter in deep water on the continental shelf from Sable Island Bank (Canada) to Chesapeake Bay and in spring move inshore and northeast. This pattern is reversed in the fall. In spring, adults form two spawning aggregations; the southern group spawns off New Jersey and New York and in the Gulf of Maine from mid April to June. Most spawning occurs in the shoreward half of the continental shelf. Spawning occurs when water temperatures are ≥ 7°C and peaks with salinities > 30 ppt. Eggs are pelagic, and found at depths ranging from 10 to 325 m. Eggs are typically collected at temperatures between 5 to 23°C in estuarine (18 to 25 ppt) to full (> 30 ppt) seawater.

Larvae are most abundant in offshore waters where salinities are > 30 ppt. The distribution of larvae is from 10 to 130 m, with preferences < 50 m, and at temperatures between 6 to 22°C. Juveniles are found in inshore bays and estuaries, as well as offshore where salinities are > 25 ppt and temperatures range from 4 to 22°C. Depth preference of juveniles varies with the season and ranges from 0 to 320 m, with a trend of moving into deeper waters as water temperature cools. Similar with the juveniles, depth preference of adults changes seasonally (10 to 340 m), possibly influenced by prey availability. Adults prefer salinities > 25 ppt and are intolerant of temperatures below 5 to 6°C or above 15 to 16°C.

Project area: Based on the habitat utilization of this species, juvenile and adult Atlantic mackerel are common from the spring to the fall and eggs and larvae are common from late spring to early summer.

Atlantic Salmon: Juveniles and Adults

Primary Source: NEFMC (1999)

Juvenile Atlantic salmon in rivers prefer bottom habitats with shallow gravel/cobble riffles interspersed with deeper riffles and pools. Salmon parr are found in clean, well-oxygenated fresh water in depths between 10 to 61 centimeter (cm) with temperatures < 25°C and water velocities between 30 to 92 cm per second (cm/s). Salmon parr grow and transform into smolts, and require access to the ocean to grow into adults. Adult salmon are primarily pelagic and range from the waters of the continental shelf off SNE north throughout the Gulf of Maine. Once at sea, salmon travel to distant feeding grounds and return to their natal stream to spawn in the fall. Spawning salmon are found to migrate to spawning grounds when water temperatures are < 22.8°C and DO levels are > 5 parts per million (ppm). Spawning beds (redd) are typically found in bottom habitats with gravel or cobble riffle above or below a pool in rivers with water temperatures < 10°C, depths between 30 to 61 cm, and water velocities around 61 cm/s.

Project area: Based on the habitat utilization of this species, juvenile and adult Atlantic salmon may occupy the Project area during the spring and fall, but in limited numbers.

Atlantic Sea Herring: Juveniles and Adults

Primary Source: Reid *et al.* (1999)

Adult Atlantic sea herring migrate south into SNE and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals. Juveniles and adult herring are abundant in coastal and mid-shelf waters from SNE to Cape Hatteras in the winter and spring. In the spring, adults return north, but juveniles do not undertake coastal migrations. Larvae typically metamorphose the following spring into YOY juveniles. Larval herring are limited almost exclusively to Georges Bank and the Gulf of Maine waters and have a preference for higher salinities with increasing age. Adult herring in the Long Island Sound have a springtime preference of temperatures between 9 to 10°C, depths of 10 to 30 m, and salinities of 25 to 28 ppt, and a fall preference of temperatures between 17 to 21°C, depths at 10 to 18 m, and salinities of 27 to 28 ppt. Adults spawn on stable materials (*i.e.,* small stones and gravel) in temperatures between 7 to 15°C and prefer salinities > 28 ppt.

Project area: Based on the habitat utilization of this species, juvenile Atlantic herring are likely to occupy the Project area during the spring and early fall, and adults are likely to occupy the Project area during winter and spring.

Bluefish: Juveniles and Adults

Primary source: Fahay *et al.* (1999)

Juveniles move inshore in early- to mid-June, arriving when temperatures reach approximately 20°C. They typically are found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fishes, which are commonly found in nearshore habitats. They remain inshore in water temperatures up to 30°C and return to the continental shelf in the fall when water temperatures reach approximately 15°C. Juvenile bluefish are associated mostly with sand, but are also found over silt and clay bottom substrates. They usually occur at salinities of 23 to 33 ppt, but can tolerate salinities as low as 3 ppt. Adults are generally oceanic but are found nearshore as well as offshore. Adults usually prefer warm water (at least 14 to 16°C) and full salinity. Both YOY juveniles and adults appear in the Long Island Sound during May/June and are found in depths < 18 m.

Project area: Based on the habitat utilization of this species, YOY juvenile bluefish can be expected to occupy the Project area during the summer. Adults are typically pelagic and are expected to occupy the Project area during the summer.

Black Sea Bass: Juveniles and Adults

Primary Source: Steimle *et al.* (1999b)

Black sea bass are usually strongly associated with structured, sheltering habitats such as reefs and wrecks. When larvae reach 10 to 16 millimeters (mm) total length (TL), they tend to settle and become demersal on structured inshore habitats, such as sponge and eelgrass beds. The estuarine nursery habitat of YOY black sea bass is a relatively shallow, hard bottom with some kind of natural or man-made structure, with amphipod tubes, eelgrass, sponges, and shellfish beds, and salinities above 8 ppt. Black sea bass do not tolerate cold inshore winter conditions. Following an overwintering period presumably spent on the continental shelf, older juveniles return to inshore estuaries in late spring and early summer. They are uncommon in open, unvegetated, sandy intertidal flats or beaches. Juveniles in the Long Island Sound prefer temperatures of 14 to 19°C, depths of 5 to 50 m, and salinities of 23 to 32 ppt.

Project area: Based on their association with structured habitats, the potential to impact black sea bass would occur in the nearshore habitat off the coast of Connecticut. The pipeline construction would not directly impact any hard substrate but construction related turbidity and sediment deposition may impact some nearshore black sea bass habitat. No impacts to adult or juvenile black sea bass would be expected in the offshore portion of the pipeline due to the lack of structure along the proposed offshore pipeline route and winter construction schedule.

Cobia: All Stages

Primary source: Richards (1967), National Audubon Society (1983)

Cobia is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the mid-Atlantic states to spawn. Adults are rarely found as far north as Massachusetts. Cobia can be found in all coastal inlets and prefer water temperatures > 20°C and salinities > 30 ppt. Cobia can be found over sandy shoals of capes and offshore bars, and high profile rock bottoms and oceanside barrier islands from surf zone to the continental shelf. In general, cobia prefer high salinity bays, estuaries, and seagrass habitats.

Project area: Cobia is a pelagic, warm water species. The Project area is the northern temperature limit for this species, therefore an occasional adult cobia may occur in the water column of the Project area during the summer, but other life history stages of this species are not likely to be found at the Project area.

King and Spanish Mackerel: All Stages

Primary source: Godcharles and Murphy (1986), Collette and Nauen (1983)

King and Spanish mackerels are highly migratory epipelagic, neritic fish that migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and off the South Atlantic coast. Thus, only a few adults of this species would be expected to inhabit Long Island Sound. In contrast, Spanish mackerel spawn as far north as Sandy Hook and Long Island in late August to late September.

Project area: Due to the migratory and epipelagic nature of the Spanish and king mackerels, a few adult Spanish and king mackerels may pass through the Project area to feed during their annual northward migration and when they return south in the fall. Consequently, early life stages of these species would be rare in the Project area.

Scup: All Stages

Primary source: Steimle *et al.* (1999c)

Scup spawn along the inner continental shelf from Delaware Bay to SNE between May and August, primarily in bays and sounds in and near SNE. Spawning typically occurs in waters < 30 m deep, temperatures between 11 to 23°C, and salinities > 15 ppt. Larvae are also common in nearshore waters of MAB and SNE. Larvae will remain in the water column (< 20 m) until juvenile transition and prefer temperatures between 14 to 22°C and salinities > 15 ppt. Juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eelgrass beds. In the Long Island Sound, juvenile scup were collected at bottom temperatures between 7 to 22°C and salinities of 25 to 31 ppt. Adults move inshore during early May and June between Long Island and Delaware Bay. Adults are found inside bays and sounds, but like juveniles, do not penetrate low salinity areas. Adults are often observed or caught over soft, sandy bottoms and in or near structured habitats, such as rocky ledges, wrecks, artificial reefs, and mussel beds. Adults move offshore once water temperatures fall below 7.5 to 10°C in the fall.

Project area: Juvenile and adult scup are known to occupy sandy bottom areas, but are likely to occur on the shallower sandy shoal areas of Long Island Sound. Based on the habitat utilization of this species, juvenile and adult scup are expected to occupy the Project area during the spring, summer, and fall months.

Longfin Squid: Eggs, Juveniles and Adults

Primary Source: Cargnelli *et al.* (1999b)

Longfin squid are a pelagic schooling species that can be found in continental shelf and slope waters from Newfoundland to the Gulf of Venezuela. Current research suggest that they typically have a lifespan of less than 1 year. Juvenile squid pass through two stages; "juveniles" and "subadult." Juveniles inhabit the upper 10 m of the water column over water 50 to150 m deep. Off of Martha's Vineyard, the juvenile life stage of a longfin squid lasts about 1 month. During this time they shift from inhabiting surface waters to a demeral lifestyle and are considered subadults. The subadults are thought to overwinter along the edge of the continental shelf. Adult longfin squid inhabit the continental shelf and upper continental shelf to depths of 400 m. Adults migrate offshore during the late fall and overwinter in warmer waters along the edge of the continental shelf; they return inshore during the spring and early summer. Connecticut trawl surveys captured squid year round in the Long Island Sound, but they were much less abundant in the winter and spring.

Project Area: Juvenile and adult longfin squid are known to occupy the Long Island Sound throughout all seasons and based on their habitat requirements are likely to occupy the Project area during construction. Squid are highly mobile and would be able to avoid construction activities. A late fall to early spring construction schedule would help to minimize impacts to longfin squid because they migrate offshore during the winter.

4.1.3 Highly Migratory Species

Blue Shark: Adults

Primary source: Compagno (1984)

The blue shark is a wide-ranging species found primarily in open, oceanic waters, but also occasionally inshore. Blue shark is a pelagic species that inhabits clear, deep, blue waters, usually in temperatures of 10 to 20°C, and depths > 180 m. In temperate waters, they often venture to the edges of kelp forests and are sometimes caught in pound nets. Tagged blue sharks in the North Atlantic showed a regular clockwise trans-Atlantic migration route with the current system.

Project area: Based on the habitat utilization of this species, adult blue sharks may venture into nearshore waters of the Long Island Sound, but are not likely to occupy the Project area.

Sandbar Shark: Larvae and Adults

Primary source: Compagno (1984), USDOC (1999b)

The sandbar shark is an abundant, coastal-pelagic shark of temperate and tropical waters that occurs inshore and offshore. It is found on continental and insular shelves and is common at bay mouths, in harbors, inside shallow muddy or sandy bays, and at river mouths, but tends to avoid sandy beaches and the surf zone. Sandbar sharks migrate north and south along the Atlantic coast, reaching as far north as Massachusetts in the summer. Sandbar sharks bear live young in shallow Atlantic coastal waters between Great Bay, New Jersey, and Cape Canaveral, Florida. The young inhabit shallow coastal nursery grounds during the summer and move offshore into deeper, warmer water in winter. Late juveniles and adults occupy coastal waters as far north as SNE and Long Island.

Project area: Sandbar sharks are a migratory, coastal-pelagic species. The Project area is an unlikely nursery ground for this species, but late juvenile and adult sandbar sharks probably occupy the Project area during the summer.

Sand Tiger Shark: Larvae

Primary source: NMFS (2000)

Sand tiger sharks are coastal, littoral sharks with a broad inshore distribution, usually found from the surf zone down to depths of 23 m. Sand tiger sharks are also found in shallow bays, around coral reefs and to depths of 183 m on the continental shelf. In the western Atlantic, this shark occurs from the Gulf of Maine to Florida. Sand tiger sharks have been observed hovering above the seabed in or near deep sandy bottom gutters or rocky caves, usually in the vicinity of inshore rocky reefs and islands.

Project area: Based on the habitat utilization of this species, sand tiger shark larvae are likely to occupy the Project area.

4.1.4 Marine Benthic Communities

Many of the EFH-designated species are primary bottom feeders or feed on both benthic and pelagic organisms, and therefore have extensive interaction with marine benthic communities (MBC). The Long Island Sound contains a spatially heterogeneous mix of sea-floor environments which provide habitat for a diverse set of soft-sediment assemblages. Ocean Surveys, Inc. (2001) conducted an integrated geophysical survey in the Long Island Sound, between Branford, Connecticut and Wading River, New York, and categorized the bottom sedimentary environments along the proposed pipeline route as predominantly (98%) fine-grained deposition.

The fine-grained deposition environment is blanketed by muddy sands and/or mud, accumulating under weak bottom current conditions. This substrate comprises 50% of the Long Island Sound basin and occupies large areas of the central and western Long Island Sound. Typical MBC organisms along the proposed pipeline route associated with fine-grained deposition environments are Polychaeta (*Nephtys incisa* and *Cistenoides gouldii*) and Bivalvia (*Mulinia lateralis*, *Nucula annulata*, and *Pitar morrhuana*).

5.0 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

During the survey, several rocky subtidal habitats were found within about 2.5 miles of the Connecticut shoreline in the vicinity of the Thimble Islands. A variety of red and brown algae, and to a lesser extent green algae, are common in the rocky subtidal habitat of the Thimble Islands. The rocky, hard surface provides an attachment site for the algae species, as well as sponges, hydroids, bryozoans, mussels, oysters, and tunicates. It also provides a primary food habitat and shelter for foraging fish, crabs, urchins, snails, and other invertebrates.

In this section, potential impacts to managed species and EFH are examined. Identifiable impacts generated by the proposed action for the estuarine and marine components of the EFH are described below. Potential environmental consequences that may result from impacts to EFH are reviewed, as well as the mitigative measures that would be taken by Islander East to prevent or minimize impacts to EFH, when applicable.

The information is presented in the following order:

- Identification of Impacts to EFH components;
- Summary of Environmental Consequences of the Proposed Action; and
- Summary of Proposed Mitigative Measures and Guidelines for EFH Protection.

5.1 IMPACTS TO EFH

The proposed pipeline project would traverse approximately 22.6 miles of the Long Island Sound, including 11.0 miles of Connecticut state waters and 11.6 miles of New York state waters. EFH impacts along the proposed pipeline route of concern include disruption of the seafloor and associated disturbance to benthic prey species, effects of sedimentation and turbidity plumes from construction activities, and disturbance to nearshore shellfish lease beds near the Connecticut shoreline. Additional impacts to fish and shellfish species from activities associated with construction of the proposed Islander East Pipeline Project may result from temporary degradation of water quality due to trenching, pipeline installation, pipeline burial, the release of drilling fluids from HDD operations, and fuel spills, as described below.

Pipeline Trenching Impacts

The Long Island Sound has water quality characteristics at certain times of the year and in certain portions that fluctuate more extremely between estuarine conditions and marine conditions. As a generally enclosed coastal body of water, it shares some characteristics typical of other southern New England estuaries with salinity varying tremendously from strictly marine levels around 34 ppt to nearly freshwater in harbors with large coastal rivers during spring snowmelt. The Long Island

Sound has two openings instead of one with more through-flow of water induced by tidal forces and wind, and therefore the majority of the water volume in the Long Island Sound remains near marine salinity conditions or slightly lower.

The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (Cowardin *et al.* 1979). The marine system consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides with salinities exceeding 30 ppt and little or no dilution except outside the mouths of estuaries (Cowardin *et al.* 1979). Although the majority of the water volume in the Long Island Sound remains near marine condition or slightly lower, the entire Long Island Sound is considered a complex estuary that is home to numerous marine fish, shellfish, and macroinvertebrate species. Due to the consistency in the construction techniques for the pipeline project, impacts to the estuarine and marine EFH in the Long Island Sound would be similar.

Trenching and burial of the Islander East pipeline would directly impact at least 2,900 acres of Long Island Sound sea floor. Many EFH-managed species depend on Long Island Sound seabed for food, shelter, and growth to maturity. Most adult and juvenile demersal and pelagic finfish, and mobile macroinvertebrate species would avoid the construction areas and escape without injury. Nevertheless, some of these marine organisms could be injured or suffer mortality from trenching activities. Additionally, demersal fish eggs, larvae and small YOY juveniles that live in contact with the bottom and are poor swimmers could also be impacted by trenching. Infaunal communities, and sessile benthic epifaunal organisms, would also be impacted by the trenching process (*i.e.*, subsea plow and dredging). Winter flounder eggs and YOY juveniles, YOY juveniles of summer flounder, and windowpane are EFH-managed species most at risk from trenching activities. Demersal eggs of winter flounder are highly susceptible to burial and those present in the area of trenching would likely be destroyed. Winter Flounder eggs are generally found between February and June in waters < 5 m (16.4 feet) deep. Therefore if nearshore construction activities were completed before February impacts to winter flounder eggs would be avoided. Juvenile flounders are likely to be present on the bottom of the Project area throughout most of the year and would be most vulnerable in the spring and summer, just after they settle to the bottom and are still very small. A late fall to early spring construction schedule would minimize impacts to juvenile flounder.

The subsea plow and dredging would indirectly impact EFH-managed species by removing benthic infaunal and some epifaunal prey organisms designated. Any benthic organism that lives in the sediment (infauna) and the smaller, less motile organisms that live on the bottom (epifauna) and are not capable of avoiding the sled, plow, and dredge, would be dislodged from bottom substrates and likely suffer injury or mortality. Most of these organisms would be invertebrates, but a few small forage fish such as sand lance (*Ammodytes americanus*), which burrow into the sand, also would be affected.

The loss of benthic prey resources caused by construction of the Islander East Pipeline Project would not have any long-term adverse effects on EFH-managed species. Fish could relocate to other areas to feed. There is the potential that relocating fish would increase competition for resources in the areas that they moved into. However, due to the fact that Long Island Sound is commercially fished, there is likely to be nearby habitat that is not at its carrying capacity and could support the displaced EFH-managed species.

Those fish that feed primarily on more motile epifaunal organisms (*e.g.*, crabs, mysids, sand shrimp) or fish may be able to feed in the disrupted area relatively soon after construction, because some of the mobile benthic organisms could re-colonize the Project area after construction was completed. The negative effects of prey removal would be mostly short-term, lasting only as long as it takes for benthic community to recover from the impact. A review of dredging impacts on benthic communities by Newell et al. (1998) indicated that estuarine muds can recover within one year, while benthic communities in sand and gravel habitat may take 2 to 3 years to recover. Pellegrino (2002b) found that late stage successional communities were common in the silt, clay, and sand habitats found across the Long Island Sound central basin. These communities could be expected to recover within 5 years.

Shellfish lease beds in the Connecticut coastal waters would be directly impacted by trenching activities. No shellfish species indigenous to the Long Island Sound are classified/designated as EFH-managed species in the Project area. However, shellfish represent a potential food source for five EFH species, including winter and summer flounder, scup, American plaice, and sandbar shark and shellfish beds provide habitat for other species. Islander East has committed to using the HDD construction method that would avoid direct impacts to the majority of the town of Branford shellfish lease beds. After the HDD, mechanical dredging would be required to bury the pipeline from MPs 10.9 to 12.0. This dredging would directly impact shellfish habitat under the jurisdiction of the town of Branford and unleased shellfish beds under the jurisdiction of the State of Connecticut. The trench and spoil pile resulting from dredging would directly impact a 110-foot-wide corridor. Within this area most shellfish would suffer mortality. The trenching would also disturb sediment, which would not provide suitable shellfish habitat. Once the sediments reconsolidate, shellfish recovery would take at least 3 to 5 years which is the time needed for hard clams to reach marketable size. Therefore, some long-term impacts are expected for shellfish lease area directly impacted by pipeline construction activities.

Between MP 12.0 and 32.15 Islander East would utilize the subsea plow for trenching. Although plowing is the least destructive of the trenching methods, it would impact a 75-foot-wide corridor through 2,700 feet of an unlisted shellfish lease area and 2,498 feet of a leased area (lease L-555). In the unlisted lease area, approximately 4.6 acres of seafloor would be impacted whereas approximately 4.3 acres would be impacted in lease area L-555. As with dredging, most shellfish in the impact area would be destroyed and the area of impact would need several years to recover. Islander East proposes to seed the impacted area with hard clams, which may reduce the time to recovery and provide additional shellfish to nearby unaffected areas. Islander East also states that it would continue to work closely with the lease holders, and state and federal agencies to coordinate construction plans and timing of construction to minimize impacts to shellfish lease areas.

Pipeline construction may have short-term benefits to some EFH-designated species. Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the Lower Bay of New York Harbor, and found that during and immediately after dredging, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Due to the composition of the benthic infaunal organisms, the bottom feeding fish species (flounders) would be the primary species attracted to feed along the pipeline route following sled, plow, and dredging activities. However, opportunistic species (striped bass) would also seek the Project area as source of food. Species attracted to the project activity would be limited to highly motile species (mostly in the juvenile and adult stage) that can avoid direct impact from the sled, plow, and dredge.

Sedimentation and Turbidity

The construction process would cause an increase in sedimentation and turbidity in the Project and adjacent areas. The magnitude of turbidity and sedimentation impacts would depend on the trenching method utilized. Islander East is proposing to primarily use the subsea plowing method for trenching along the pipeline route. This method does not resuspend large amounts of sediment and would cause minimal turbidity and sedimentation impacts. Mechanical dredging would be used for trenching between MPs 10.9 and 12.0. This method also produces a turbidity plume with associated sedimentation in the adjacent areas.

Increased sedimentation has the potential to decrease predation ability of sight feeders (flounders), cause gill damage and lead to suffocation of fish species, and smother demersal eggs and larvae. Sedimentation and turbidity loads during pipeline construction would be temporary as the suspended sediments would redeposit upon completion of construction. Bottom-feeding finfish that had trouble finding sufficient prey along the construction route would relocate to the adjacent unaffected areas to feed. Sedimentation from pipeline construction may result in the loss of some prey species and mortality to eggs and larvae along the proposed pipeline route. However, provided plowing is the primary trenching method utilized, the overall potential impacts to EFH-managed species from increases in turbidity and sedimentation would be temporary and minor as displaced fish would return to the affected areas after construction, and spawning activities that occur over broad areas of the Long Island Sound would be unaffected.

Sedimentation and turbidity resulting from pipeline construction would affect shellfish and shellfish habitat in the nearshore waters off of Connecticut. Shellfish larvae are particularly sensitive to increased levels of suspended materials in the water column. However, impacts to larvae would be avoided and minimized by scheduling construction activities to avoid the spawning season. In addition, Islander East would use the HDD construction method in the nearshore coastal waters of Connecticut to avoid direct impacts to rocky subtidal habitats and some shellfish lease beds.

From MP 10.9 to 12.0, mechanical dredging would occur through shellfish habitat. The turbidity associated with dredging may impact adult and juvenile shellfish feeding but the impact would be temporary because the sediment types found in this environment favors rapid settling (Bohlen et al., 2002). The increased sedimentation from mechanical dredging would deposit on average 1.9 cm (0.8 inches) of sediment on shellfish approximately 100 feet to either side of the trench. Additionally, modeling of sediment mound erosion indicates that 0.0 to 0.1 foot of sediment could be deposited 50 feet to either side of the mounds (see section 3.4.1.2 of this EIS for more details). Many adult hard clams and some oysters could survive this impact (Stanley and Dewitt 1983, Kennedy and Briesch, 1981). However, because this is only an average depth of deposition, some areas may receive more sedimentation resulting in some shellfish mortality.

Between MPs 12.0 and 32.15, Islander East would use plowing, which produces minimal turbidity plumes and would have minimal impacts to shellfish adjacent to the trench and spoil mounds. Long-term impacts from increases in turbidity and sedimentation to shellfish populations of the Long Island Sound would be minimal due to the temporary nature of the turbidity plumes; use of the subsea plow in waters deep enough for its use; and, the proposed construction schedule that would avoid shellfish.

Between MPs 32.15 and 32.7, mechanical dredging would be used to install the pipeline. This area primarily consists of sandy habitat. Dredging between these MPs would have impacts similar to those discussed earlier in this section for dredging between MPs 10.9 and 12.0. However, no commercially or recreationally fished shellfish beds occur in this area. The Long Island shore HDD would exit at MP 32.7 and would introduce drilling muds into the nearby water column as discussed in section 3.1.4.2 of this EIS.

Blasting Impacts

Detailed geophysical surveys conducted by Ocean Surveys (2001) indicate that there are no blasting requirements along the marine portion of the Islander East pipeline route. Were Islander East to discover bedrock surface subsequent to marine pipelay activities that interfered with pipeline lowering , the most likely option would be to cover the length of pipe exposed above the seabed with articulated concrete mats.

Anchor Scars, Cable Sweeps, Trenching and Pipelay

An additional source of impact to EFH and benthic fauna is the placement of anchors for the pipe lay and bury barges. There are two components of the impact: the actual anchor scar from the footprint impact of an anchor during each placement, and the scraping or sweeping of the sea bottom from the movement of the anchor cables across the sea bottom (cable sweep), as the forward anchor arrays are winched in and the aft anchor arrays are played out.

Anchor scars for the size barges that would be used on this project are predicted to be up to 8 feet deep and affect about 172 square feet (8.6 feet by 20 feet) each. This area could be larger where anchors are dragged or need to be reset. Using an average 10-anchor array and resetting the anchors three times per mile, offshore pipeline construction and burial operations would create an average of 30 anchor scars per mile. Allowing for a total of four passes (one by a pipe lay barge, two by plow or jet, and one by a bury barge), offshore pipeline installation activities would result in 2,628 anchor scars along the 21.9-mile portion of the Long Island Sound crossing impacting at least 10 acres of soft (non-live) sea floor. Due to the weight of the anchor and the depth of the scar, the impact on benthic fauna would be complete mortality within the footprint of the scar. A long-term recovery is expected for the impacted footprint of the anchored areas.

Some of the depressions created by anchors could persist for many years. An investigation by van der Veer et al. (1985) described the recovery of pits created by dredging in the sandy substrata of the Dutch Wadden Sea. They showed that in channels with high current velocities, pits were filled in within one year, but pits in areas with lower current velocities took 5 to 10 years to fill. Due to the fact that much of the offshore route is located in a depositional environment with low current velocities, it is likely that some long-term seabed depressions could result from anchor placement. These long lasting depressions can act as sediment traps accumulating fine sediment and organics, which can lead to anoxic sediments that develop considerably different communities from the original deposits (Hall, 1994). The persistence of these depressions would represent a long-term conversion of EFH.

Based on area affected, the largest single source of impact to the sea bottom community would be from cable sweep. The area to be affected by cable sweep is expected to be relatively extensive (up to 2,500 feet to the front and back and up to 2,000 feet to either side of the barge). To minimize this impact, Islander East proposes to conduct pipe laying, trenching, and burial using mid-line buoys on anchor lines. These mid-line buoys would keep the anchor cables from making contact with the sea bottom for all but a small portion of the distance from the barge to the anchor. According to Islander East, cable sweep impact to soft bottom in Long Island Sound would be reduced by over 50 percent (3,107 acres) from an estimated 5,915 acres down to an estimated 2,808 acres. It is expected for the area of cable sweep that some areas of benthic fauna would survive relatively intact (*e.g.*, areas of benthic fauna within depressions and areas where the cable does not make complete contact). As indicated in the section on trenching impacts, most of the benthic communities found in the silt, clay, and sand habitats across the offshore portion of the pipeline route could be expected to recover within 5 years (Newell et al., 1998).

Exposed Pipeline Impacts

In accordance with USDOT safety requirements, Islander East would concrete coat and bury the pipe to a depth of 3 feet from MPs 10.9 to 32.8. However, where the pipeline intercepted foreign utility lines (at MP 25.9 and MP 26.9) or submerged bedrock outcrops (if discovered), Islander East would lay the pipeline on the surface of the seafloor and armor it with stone rip-rap or concrete mats. At the utility line crossings the pipeline would be exposed for approximately 200 feet.

In areas where the pipeline is not completely buried, the NMFS and local interest groups have expressed concern regarding potential impacts to American lobster and flounder migration. At the utility line crossings, the pipeline would create a potential maximum barrier approximately 200-feet-long by at least 60-inches-tall by 56-inches-wide on the sea floor. There is a low probability that migrating fish or shellfish would directly intercept these two short sections of exposed pipeline. However, if encountered, fish or shellfish could swim or move around these obstacles with minimum impact on migration.

The concrete mats or rip rap that cover and protect unburied pipeline would develop a hard substrate benthic community. They would also provide habitat to some EFH-managed species that are attracted to structure or prey upon the benthic community on the hard substrate.

Potential for Offshore Oil Spills

Another potential impact to marine and estuarine fish and wildlife is accidental spills of petroleum lubricants and fuel during pipeline construction. These spills could originate from accidental spills from construction barges or support boats, loss of fuel during fuel transfers, or accidents resulting from collisions. Construction would involve a significant amount of work activity aboard vessels, and the movement of pipeline lay barges, supporting vessels, and other specialized marine equipment. Islander East and their construction contractor must comply with all laws and regulations related to the handling of fuels and lubricants, including 40 CFR Part 110, and vessel-to-vessel transfers, including 33 CFR Part 155. Additionally, Islander East would implement the containment and clean up measures outlined in its Spill Prevention Containment and Countermeasures (SPCC) Plan in the event of any spill or release. Implementation of these measures would avoid or minimize potential impacts of accidental oil and fuel spills on estuarine and marine EFH.

5.2 SUMMARY OF ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Impacts to Long Island Sound EFH

The degradation of coastal and marine EFH is associated with the following:

- temporary disturbance and displacement of fish species;
- short-term and long-term disruption of sea floor and associated benthic communities;
- temporary increases in turbidity sediment deposition;
- short-term loss of food items to some EFH-managed species;
- sediment transport and re-deposition; and.

- temporary degradation of the water quality due to construction activities (*e.g.*, trenching burial, pipe laying, spills, discharge of HDD drilling muds).

The Islander East Pipeline project would impact a substantial area of Long Island Sound EFH. Most of the impacts would be temporary or short-term in nature and recover within 1 to 3 years. However, there is the potential for long-term impacts to EFH that could take > 3 years to recover. Consequently, impacts to EFH-managed species would be for the most part short-term but there could also be longer-term impacts due to the potential for long-term impacts to EFH. However, no significant long-term adverse impacts to the populations of EFH-managed species in the Long Island Sound would be expected.

The EFH impact evaluation process for the Islander East Pipeline Project is summarized below in Table 5-1. Impacts are listed by type and nature (*i.e.*, significance of effects). Impacts are considered direct, indirect, temporary, short-term, long-term, permanent, and/or cumulative.

5.3 PROPOSED MITIGATIVE MEASURES AND GUIDELINES FOR EFH PROTECTION

There are no Federal- or state-specific EFH guidelines or standards for construction of the Islander East Pipeline Project. However, Islander East has developed a SPCC Plan to avoid or minimize the effects of accidental fuel and other chemical spills on aquatic resources. Due to the proximity of lease shellfish beds to the pipeline corridor, Islander East would continue to work extensively with state and Federal agencies and local shellfishermen to minimize impacts on shellfish resources occurring along the pipeline corridor until completion of the proposed Project. In addition, Islander East would use the HDD construction method to avoid and minimize impacts to rocky subtidal habitats and some lease shellfish beds. Islander East has prepared a Directional Drill Monitoring and Operations Program (Drill Plan) describing how Islander East would monitor for and handle inadvertent releases of drilling mud (e.g., routine surveys, contracting appropriate agencies if release occurs and initiating remediation) during the HDD crossing. In support of Drill Plan preparation, Islander East is evaluating the feasibility of various drill mud containment measures for the Long Island Sound exit point.

5.4 PERMITS AND APPROVALS

Table 5-2 lists the anticipated environmental permits and approvals that would be needed or for which Islander East intends to apply. Documentation of agency approvals and permits would be provided to the Federal Energy Regulatory Commission (FERC) prior to construction.

TABLE 5-1
Summary of Potential Impacts to EFH by Impact Type

Type of Impact	Temporary (Recovery Days to Weeks)	Short Term (Recovery < 3 Years)	Long Term (Recovery > 3 to < 20 Years)	Permanent (Recovery ≥20 Years)	Cumulative
Post-plow Lowering[a]		√	√		
Barge Anchoring[a]		√	√		
Pipelay on Seafloor (completely buried)[a]		√	√		
Sedimentation/Turbidity[b]	√	√			
Disruption of Hard Substrate[a]			√	√	√
Disruption of Live Bottom/Soft Substrate[a]		√	√		
Seafloor Area Occupied[a]				√	√
Epifauna/Infauna Destruction[a]		√	√		
Fish Fauna Disruption Species[b]	√	√			
Fish Fauna Disruption Habitat[b]		√	√		
Reduction of Water Quality/Spills, Mud discharges[a]	√	√	√		

[a] Direct Impacts [b] Indirect Impacts

TABLE 5-2
Agency Permits and Approvals

FEDERAL

Advisory Council on Historic Preservation
- Review under Section 106 of the National Historic Preservation Act

Department of the Army, Corps of Engineers
- Permit under Section 10 of the Rivers and Harbors Act
- Permit under Section 404 of the Clean Water Act

Department of Commerce, Coast Guard
- Review of Section 10 of the Rivers and Harbors Act

Department of Commerce, National Marine Fisheries Service
- Review under Section 7 of the Endangered Species Act
- Review under the Marine Mammals Protection Act
- Review under the Magnuson-Stevens Fishery Conservation and Management Act

Department of the Interior, Fish and Wildlife Service
- Review under Section 7 of the Endangered Species Act

TABLE 5-2
Agency Permits and Approvals

Federal Energy Regulatory Commission
- Certificate of Public Convenience and Necessity under Section 7 of the Natural Gas Act

Environmental Protection Agency
- Water Quality Certification under Section 401 of the Clean Water Act
- Permits under Section 402 of the Clean Water Act
- Review of Section 404 application

STATE - CONNECTICUT

Department of Environmental Protection
- Review of State Protected Species
- Permit of Construct and Operate an Air Emission Source
- Review and Approval of Noise Analysis
- Permit for Stormwater and Dewatering Discharges
- Permit for Hydrostatic Test Water Discharges
- Coastal Zone Consistency Determination
- Permit for Inland Wetland and Watercourse Crossings
- Permit for Stream Channel Encroachment
- Permit for Structures, Dredging and Fill
- Permit for Water Diversion
- Permit for Water Quality Certificate under Section 401 of the Water Quality Act

Siting Council
- Certificate of Environmental Compatibility and Public Need
- Development and Management Plan Approval

STATE - NEW YORK

Department of Environmental Conservation
- Review of State Protected Species
- Permit for Freshwater Wetland Crossings [Article 24, Environmental Conservation Law (ECL)]
- Permit for Tidal Wetland Crossings (Article 25, ECL)
- Permit for Protected Water Crossings under Wild, Scenic, and Recreational River Systems (Article 15, Title 27, ECL)
- Permit under the State Pollutant Discharge Elimination System
- Permit for Water Quality Certificate under Section 401 of the Water Quality Act
- Permit for Coastal Erosion Hazard Areas (Article 34, ECL)

Department of State
- Certification of Consistency under the Coastal Zone Management Act

Office of General Services
- Permit to Cross Land Beneath Coastal Waters and Waters of Large Lakes and Rivers

6.0 CONCLUSIONS

6.1 UNAVOIDABLE IMPACTS

Some unavoidable impacts would be generated during the construction of the Islander East Pipeline across the Long Island Sound. However, efforts have been made to avoid or minimize impacts to particularly sensitive habitats. The pipeline route was designed to avoid impacts to rocky subtidal habitats, and some shellfish lease beds. Islander East also proposes the use of specialized construction techniques to prevent damage to sensitive resources, when crossing these features was inevitable. Islander East would use the HDD construction method to traverse and minimize impacts to rocky subtidal habitats and some shellfish lease beds along with using a subsea plow to install the pipeline in water depths > 20 feet. Additionally, Islander East would perform the construction in the late fall to early spring to avoid impacts to specific EFH-managed species.

The offshore segment of pipeline would affect a substantial area of soft bottom EFH across 21.9 miles of Long Island Sound. However, the selected route is biased towards crossing soft bottom (sand, silt, and clay) habitat, which is more resilient to temporary disturbance and has the ability to recover to pre-construction conditions faster than that of live bottom habitat. Most of the disturbed soft bottom habitat would be expected to recover within 5 years. However, some areas would take more time to fully recover and would represent a long-term impact to EFH in Long Island Sound.

Some impacts to EFH are recognized as permanent (*i.e.,* placement of concrete mats over unburied pipeline and long lasting depressions in the sea floor), because full recovery could take up to 20 years. These areas represent a conversion of EFH. In the case of the concrete mats, the conversion may be beneficial to some EFH-managed species attracted to structure and those that would feed on the benthic community that develops on the hard substrate.

The various impacts to Long Island Sound EFH would consequently impact various EFH-managed species. Most adult fish are motile and would actively avoid direct impact from the pipe laying and trenching activities, however, larvae and eggs could be directly impacted. The pipeline construction related disruption of over 3,000 acres of sea floor would affect EFH-managed species that use the sea floor for habitat. Many prey items of EFH-managed species would be impacted, which would alter feeding patterns of some EFH-managed species along the pipeline corridor. This impact as long as it took for benthic communities to recover. Additionally, EFH-managed fish would be impacted by the temporary impairment of water quality due to high turbidity and suspended solids concentrations produced during dredging. Some impairment of ability of EFH-designated species to find prey items could occur, but this effect would be temporary and spatially limited to the vicinity of pipeline construction activities. However, it is likely that the Islander East pipeline construction would not having any significant long-term adverse impacts to EFH-managed species populations in the Long Island Sound because most EFH-manged species have the ability to relocate to suitable habitat.

6.2 MITIGATIVE MEASURES

This section summarizes actions already taken by Islander East to minimize impacts, the future actions to which Islander East is committed, and the recommended mitigative measures proposed by the FERC to minimize impacts to EFH.

Islander East has already taken, or is in the process of taking, the following measures to minimize impacts to EFH:

- Perform extensive field investigations (*Long Island Sound Sampling, Analysis, and Study Plan* for the Proposed Islander East Pipeline);
- Avoid and minimize direct impacts to seagrass beds, subtidal rocky habitats, and shellfish lease beds;
- Develop the offshore SPCC Plan for prevention and cleanup of accidental fuel and chemical spills; and,
- Develop the Drill Plan to prevent impacts associated with the HDD construction method.

Islander East is committed to using the following construction practices to minimize impacts to EFH:

- Use the HDD construction method to avoid direct impacts to rocky intertidal and subtidal habitats, sandy intertidal habitats, and shellfish lease beds;
- Use mid-line buoys on anchor lines to reduce anchor scar and cable sweep impacts;
- Use the subsea plow construction method for pipeline installation in waters >20 feet in depth; and
- Adhere to environmental construction windows developed in consultation with state and Federal agencies.

6.3 AGENCY VIEW OF THE PROJECT

The following are the FERC's views of the affect of the Islander East Pipeline Project on EFH.

6.3.1 Subtidal Rocky Habitats

The NMFS and Connecticut Department of Environmental Protection (CTDEP) are concerned with the potential of the Project to impact subtidal rocky habitats. Islander East has committed to use the HDD construction method that would avoid direct impacts to subtidal rocky habitats along the Connecticut shoreline from approximately MPs 10.1 to 10.9.

6.3.2 Shellfish Lease Beds

The NMFS, CTDEP, and local interest groups are concerned with the potential of the Project to impact shellfish lease beds. No shellfish species indigenous to the Long Island Sound are classified/designated as EFH in the Project area. However, shellfishing is an important commercial and recreational activity in this area and shellfish represent a potential food source for five EFH species, including winter and summer flounder, scup, American plaice, and sandbar shark and shellfish beds provide habitat for other species. Islander East has committed to using the HDD construction method that would avoid direct impacts to the majority of the town of Branford shellfish lease beds. However, shellfish habitat under the jurisdiction of the town of Branford, two unlisted shellfish lease areas, and one leased shellfish area (lease L-555 at MP 12.6) would be directly disturbed by trench excavation. This activity would result in short and long-term damages to shellfish habitat directly disrupted. Islander East states it would continue to work closely with the lease holder to coordinate construction plans and timing of construction to minimize impacts to the use of this area. Islander East has also stated that they would seed the disrupted lease area with hard clams. This action may reduce the time to recovery and increase shellfish abundance in adjacent areas that were not impacted. Nevertheless, areas directly impacted by trenching and anchor scars may take several years to recover.

6.3.3 Lobster and Flounder Migration

The NMFS and local interest groups are concerned with the potential of the exposed section of the pipeline to hinder American lobster and flounder (*i.e.*, winter flounder, summer flounder, and windowpane) migration. Islander East is proposing to bury the majority of the pipeline 3 feet below the seabed. Two, relatively short sections of pipeline (200 feet) would not be buried where the pipeline intercepted foreign utility cables. There is a low probability that fish or shellfish migrating along the sea floor would directly intercept these two short sections of exposed pipeline. However, if encountered, fish or shellfish could swim or move around these obstacles with minimum impact on migration.

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