Appendix F

Draft Essential Fish Habitat Assessment

DRAFT
ESSENTIAL FISH HABITAT ASSESSMENT

WITH ADDITIONAL INFORMATION ON SELECTED SPECIES OF COMMERCIAL AND RECREATION VALUE

EASTERN LONG ISLAND EXTENSION PROJECT

July 2002

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
CFR	Code of Federal Regulations
cm	centimeter
cm/s	centimeter per second
CTDEP	Connecticut Department of Environmental Protection
DO	dissolved oxygen
EBP	Early Benthic Phase
EFH	Essential Fish Habitat
EFHA	Essential Fish Habitat Assessment
ELI Project	Eastern Long Island Extension Project
FERC	Federal Energy Regulatory Commission
Iroquois	Iroquois Gas Transmission, L.P.
m	meter
MAB	mid-Atlantic Bight
mg/l	milligram per liter
MLW	Mean Low Water
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
SAFMC	South Atlantic Fishery Management Council
SAV	submerged aquatic vegetation
sf	square feet
SNE	southern New England
SPCC Plan	Spill Prevention Containment and Countermeasures Plan
TL	total length
USDOC	United States Department of Commerce
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 Eastern Long Island Extension Project as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, amended by the Sustainable Fisheries Act of 1996 (MSFCMA). This EFH Assessment (EFHA) is based on the regulations implemented in the EFH Final Rule, 50 Code of Federal Regulations, Part 600 (Federal Register, 2002). The objective of this EFHA is to describe how the actions proposed as part of the Eastern Long Island Extension Project may affect EFHs and species managed by the National Marine Fisheries Service (NMFS) and the Mid-Atlantic Fisheries Management Council (MAFMC) for the area of influence of the project.

Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH. According to the 1996 amendments to the MSFCMA, EFH 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 in the Long Island Sound from approximately 2 miles southeast of Milford, Connecticut to the shoreline east of Shoreham, New York.

The EFHA includes a description of the proposed action; information relating to the habitat suitability of managed species in the Long Island Sound; an analysis of the direct, indirect and cumulative effects on EFH for the managed fish species and their major food sources; and proposed mitigation measures selected to minimize expected project effects if applicable. Additionally, this EFHA addresses potential impacts to other important commercial and/or recreational fisheries associated with the project area as requested by the NMFS.

~ 0 PROPOSED ACTION

2.1 PROPOSED INTRODUCTION

Iroquois Gas Transmission L.P. (Iroquois) is proposing to construct and operate a natural gas transmission pipeline to supply consumers in Suffolk County, New York and other surrounding counties. This project is called the Eastern Long Island Extension Project (ELI Project) and includes construction of approximately 29.1 miles of a new 20-inch-diameter mainline, which would originate at a marine tap into an existing Iroquois 24-inch-diameter mainline already located in the Long Island Sound within New Haven County, Connecticut. From the marine tap, the new mainline would continue southerly onto the Long Island mainland at Shoreham, New York (Figure 2-1). From this location, the pipeline would continue across land to its terminus at a co-generation facility west of Brookhaven, New York. In addition to the construction of the new mainline, the ELI Project includes constructing a new meter station, one new compressor station, upgrades to two existing compressor stations, and various appurtenant facilities. The components of the project that would impact EFH in the Long Island Sound are the marine tap interconnection and subsequent 17.1 miles of 20-inch-diameter mainline to be placed along the seabed.

2.2 PROJECT LOCATION

The proposed ELI Project would cross the central portion of Long Island Sound for a distance of 17.1 miles. Beginning in Connecticut State waters approximately 2 miles off the coast of Milford, ~ 'rfield County, Connecticut at milepost (MP) 0.0, it would come on shore near the Village of ›reham, Suffolk County, New York at MP 17.1. The pipeline would cross 7.5 miles in Connecticut waters and 9.6 miles in New York waters (Table 2-1). The Long Island Sound is a large estuary with a productive benthic community that supports various shellfish, crustacean, and finfish resources, many of which are recreationally and/or commercially important. The Connecticut Department of Environmental Protection (CTDEP, 1998) and the New York State Department of Environmental Conservation (NYSDEC, 1977) identify Long Island Sound as a class SA water. Proposed activities that can impair Long Island Sound's fishery use are generally prohibited by the CTDEP and the NYSDEC through the Section 401 Water Quality Certification programs.

The Long Island Sound is approximately 113 miles long (east to west) and approximately 20 miles wide (north to south) at its greatest width. Mid-Sound depths vary between 60 and 130 feet. The Sound has water quality characteristics that at certain times of the year and in certain portions, fluctuate widely between estuarine 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 parts per thousand (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 conditions or slightly lower.

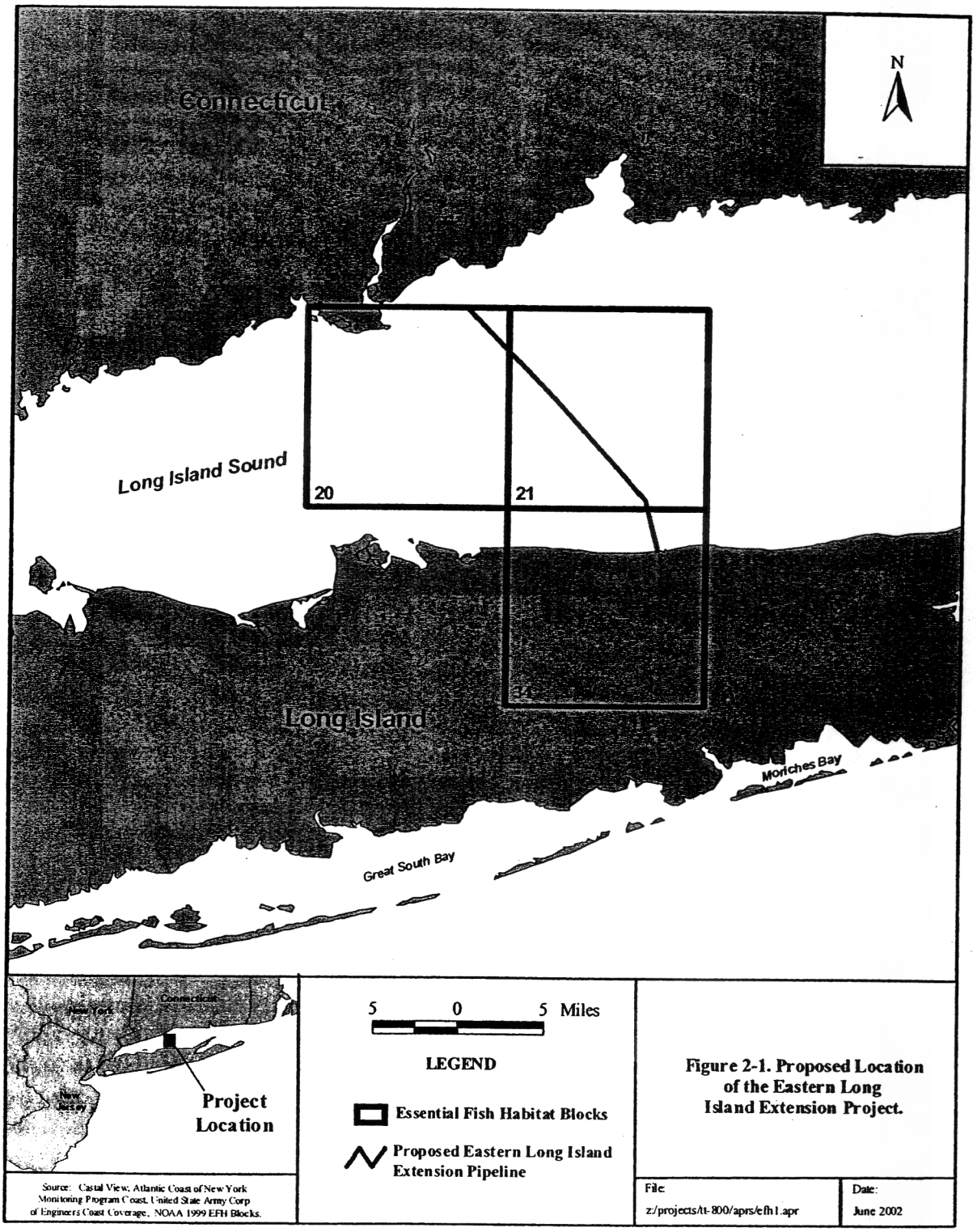

Figure 2-1. Proposed Location of the Eastern Long Island Extension Project.

2.3 PIPELINE CONSTRUCTION

The proposed ELI pipeline would traverse 17.1 miles of the Long Island Sound. This crossing of Long Island Sound would require deepwater construction techniques to install the pipeline. A marine tap interconnection facility would be constructed at the origin of the proposed pipeline. Installation of the pipeline would be carried out by specialized barges that assemble, inspect, deploy, and bury the pipeline. These barges would be supported by other vessels such as anchor tugs and transport boats.

Iroquois selected the Long Island Sound crossing route for the ELI pipeline based on information gathered from field surveys, literature searches, review of public records, discussions with installation contractors, and conversations with various regulatory and citizen groups. This process enabled Iroquois to refine the crossing route to minimize disturbance to marine life and commercial/recreational activities in consideration to the constructability of the facilities.

Iroquois would acquire an easement for the New York offshore portions of the pipeline from The New York State Office of General Services. No easement is necessary for the Connecticut offshore portion. Iroquois would acquire a 30-foot-wide permanent easement for the New York offshore areas where the pipeline is laid. This easement however, is not indicative of the potential impacts that would be associated with pipeline's construction.

The proposed marine tap interconnection facility would connect the existing Iroquois 24-inch-diameter mainline to the proposed 20-inch-diameter ELI pipeline. The construction workspace for the interconnection would disturb about 60,000 square feet (sf), equivalent to 1.4 acres. After construction, the marine tap facility would occupy approximately 5,625 sf (0.14 acre) of the Long Island Sound seabed.

The proposed 20-inch-diameter mainline would be assembled and placed on the bottom using a lay barge designed especially for this use. The lay barge is essentially a floating work platform where the pipeline is assembled. On the deck of the barge, pipeline segments are connected, and pipeline joints are welded, treated, and inspected. The pipeline is then fed off the stern of the barge to lay on the seabed along the pre-determined route. The lay barge is advanced by pulling on mooring anchors which are placed in forward locations by an anchor barge. The lay barge bow anchors are typically placed several thousand feet ahead of the lay barge and provide most of the traction for pulling the barge forward. Breast and stern anchors are also utilized to provide lateral stabilization and holdback, respectively. The anchors are designed to sink several feet in the sediment, and typically impact an area of 360 sf. The anchors are reset three times per mile of construction and there are typically twelve anchors in an array. Large cables connect the anchors to the construction barges. Portions of these cables sweep across the seabed, creating cable sweep impacts to the seabed during these operations.

Following placement on the seabed, the pipeline would be "lowered" to sit 0.5 to 3 feet below the seabed. The pipeline lowering is typically performed by a bury barge, which excavates a trench under the pipeline. Alternatively, the lay barge may be used to perform both functions, first assembling and laying the pipeline and then returning to bury it. There are various trenching methods that could be used for lowering the pipeline below the seabed. These methods include

plowing, jetting, trenching machine, dredging, and blasting (in extreme cases). The magnitude of impact to the marine environment varies among the different trenching methods.

For the majority of the Long Island Sound crossing, where conditions permit, Iroquois proposes to use the plowing technique to place the pipeline below the seabed. Plowing involves passive displacement of sediments to the side of the trench as the plow is pulled forward by a pull barge or the lay barge. Plowing would create a trench approximately 5 to 6 feet deep by 20 feet wide. The trench spoil would be sidecast in mounds that would extend out to 20 feet on either side of the trench. The spoil pile height would be approximately 3.6 feet at the ridge, decreasing to zero at the furthest distance from the trench, with an average depth of 16.2 inches. Plowing would directly impact at least a 60-foot-wide corridor for 16.5 miles across the Long Island Sound, impacting at least 120 acres of seabed. Plowing is best suited to consistent silt clay sediments and would not be feasible in highly variable or certain unsuitable soil conditions. Iroquois has stated that the construction right-of-way would vary from between 100 to 300 feet wide, which equates to an overall acreage potential affected within the construction right-of-way of 230 acres. However, Iroquois has also estimated that without the use of mid-line buoys, approximately 2,700 acres of Long Island Sound bottom would be impacted by anchor cable sweep.

After the pipeline is lowered below the seabed, Iroquois proposes to let backfilling of the trench take place naturally through sediment deposition. This would reduce the number of equipment passes required and eliminate the associated turbidity and sedimentation impacts associated with an additional pass and to backfill the trench.

Iroquois also proposes to use conventional open-cut construction (mechanical dredging) techniques to lower pipeline below the seabed for short distances near the marine tap interconnect and at the shallow water approach to Long Island, New York. Mechanical dredging would be used for 211 feet after the marine tap interconnect and for 3,168 feet prior to the Shoreham crossing to bury the pipeline. This trenching technique would require excavation using a crane or hydraulic excavator positioned on a relatively small barge and would create a trench approximately 35 feet wide with the trench spoil mound on one side extending out to 50 feet from the trench edge. The dredged trench would then be backfilled to cover the pipeline.

The ELI Pipeline would cross telecommunications cables at three locations (MP 7.8 , 10.8 and 14). In these areas, the pipeline would not be lowered below the seabed. Instead, the pipeline would lay on the sea floor over the existing utility lines for at least 100 feet to either side of the utility crossing. Iroquois would place concrete matting or rock over the pipeline depending on the requirements of the company that owns the utility cable crossed.

The pipeline facilities proposed by for Long Island Sound by Iroquois that would impact EFH are summarized in Table 2-1.

TABLE 2-1
Pipeline Facilities in Long Island Sound

Facility Name	Description	Length (miles)		County, State
Marine Tap Interconnection	Marine Tap to Existing 24-inch Mainline	less than 0.1		New Haven County, CT
Eastern Long Island Extension Pipeline	20-inch diameter Pipeline	17.1 {	7.5	New Haven County, CT
			9.6	Suffolk County, NY

4.0 MANAGED FISH SPECIES

A total of 16 finfish, three shark, and one squid species are currently designated as managed species that have a designated life stage associated with EFH along the proposed route of the ELI Project in state and federal waters. Table 4-1 lists these species and their life-stage designations.

TABLE 4-1
Summary of Essential Fish Habitat Designations [a/]

Coastal Demersal Species	Eggs	Larvae	Juveniles	Adults
American plaice (*Hippoglossoides platessoides*)			x	x
pollock (*Pollachius virens*)	x	x	x	x
red hake (*Urophycis chuss*)	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
Coastal Pelagic 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
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
...up (*Stenotomus chrysops*)	x	x	x	x
Spanish mackerel (*Scomberomorus maculatus*)	x	x	x	x
Highly Migratory Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
blue shark (*Prionace glauca*)				x
sandbar shark (*Charcharinus plumbeus*)		x		x
sand tiger shark (*Odontaspis taurus*)		x		
Pelagic Mollusc Species	**Eggs**	**Larvae**	**Pre-recruits**	**Recruits**
longfin inshore squid (*Loligo pealeii*)	x		x	x

Source: USDOC 1999a.
[a/] All Three Ten Minute Squares covering pipeline route

4.1 ECOLOGICAL NOTES ON THE EFH FISHERIES AND SPECIES

Available information on the life history and habitat requirements for each 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. At the end of each species description a discussion of potential impacts to the various life history stages of each species is presented. This assessment is based on the probable impacts of the project, the species habitat use, and the species likelihood of occurrence along the ELI Project route. 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 sediment. 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)

This species is found in western North Atlantic from Labrador to Cape Cod and Narragansett Bay, Rhode Island (Bigelow and Schroeder, 1953). The Project area contains EFH for juvenile and adult life stages of American plaice. In addition, estuaries in Long Island Sound with salinities greater than 25 ppt contain EFH for juvenile and adult life stages including spawning adults. EFH for juveniles includes water temperatures below 17°C, depths between 45 and 150 m, and sand, gravel, and fine-grained substrates. A wide range of salinities is tolerated. EFH for adults is similar to that for juveniles except that water depths range from 45 to175 m. EFH for spawning adults includes water temperatures less than 14°C and depths less than 90 m. A wide range of salinities and bottom habitats is tolerated. Spawning begins in March and continues through June (NEFMC, 1998).

Project Area: The American plaice is an arctic-boreal pleuronectid flatfish with the ELI Project area being the southern temperature limit for this species. Therefore an occasional juvenile or adult may occupy the project area during the spring and fall, however, the ELI pipeline construction should not impact either of these stages for this species.

Pollock: Juveniles and Adults

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

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 (Bigelow and Schroeder, 1953). EFH for juveniles includes water depths up to 250 m, temperatures below 18°C, and bottom substrates with aquatic vegetation, sand, mud or rocks. EFH for adults includes hard substrate but they are found on a variety of habitats, depths from 15 to 365 m, and temperatures less than 14°C. These life stages of this species generally prefer offshore habitat.

Project Area: Based on the habitat utilization of this species, juvenile and adult pollock may occupy the ELI Project area during the spring and summer, but in low numbers. Pollock are not commonly caught in trawl surveys in the Long Island Sound and none have been recorded since 1989 (Gottschall *et al.*, 2000). In surveys conducted between 1984-1990, just 24 juveniles were caught. This species was caught at all depths and on all bottom types except sand. No adults were caught during or since completion of these surveys in the Long Island Sound. Therefore, the ELI pipeline construction as proposed would have a minimal impact on these stages for this species.

Red Hake: All Stages

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

The red hake occurs in continental waters from the Gulf of St. Lawrence to the middle Atlantic States (Bigelow and Schroeder, 1953). The Project area contains EFH for all life stages including spawning adults. 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. However, EFH for eggs is defined as surface temperatures less than 10°C and salinity less than 25 ppt. 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 less than 200 m. Larvae typically settle to the bottom in the fall and need shelter. Juveniles seek shelter and commonly associate with scallops, surf clam shells, and seabed depressions. Juveniles prefer depths from less than 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 could be found during the summer in the water column of the ELI 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 could occupy the ELI Project area in any season. Connecticut trawl surveys indicate that adult red hake are most abundant in spring whereas juveniles are more abundant during the spring and fall. The mobile life stages of this species would be expected to move away from the construction activity. Because greatest abundances of red hake in the Long Island Sound occur from March through November, the proposed fall to early spring pipeline construction schedule would minimize impacts to most red hake.

Summer Flounder: Juveniles

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

Summer flounder are distributed from the eastern portion of Georges Bank to South Carolina and Florida, but are most abundant south of Cape Cod (Bigelow and Schroeder, 1953). The Project area contains EFH only for juvenile summer flounder. This species exhibits 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, whereas 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 less than 5 m (in estuary), salinities between 10 to 30 ppt, and temperatures greater than 11°C.

Project Area: In Connecticut waters, summer flounder migrate to inshore waters in late April and early May, are present in Long Island Sound throughout the April to November trawl survey period, and probably occur in winter in limited numbers as well (Grimes *et al.*, 1989). Given their migration patterns, their association with sandy substrates, and the fact that they feed on a variety of bottom-dwelling invertebrates and fish species, juvenile summer flounder would most likely occupy the Project area from spring to fall. Construction of the ELI pipeline during the fall to spring would minimize impacts on juvenile summer flounder.

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 ELI Project area in all seasons. These fast swimming fish would be expected to avoid areas being disturbed by construction activity and subsequently not be impacted by these activities.

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. Spawning generally occura near the bottom at temperatures ranging from 6 to 21°C. The eggs of windowpane are pelagic and are found along with larvae in the water column at depths less than 70 m and temperatures less than 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 less than 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: In Long Island Sound, eggs of windowpane flounder could be expected to occur in the water column throughout the year. Juvenile windowpane are most abundant in CTDEP trawl surveys in the summer and fall months. Adult windowpane flounder can be found throughout the year but have their greatest abundance from April through June in Long Island Sound. Although all stages of this species can be expected to be found in the Project area throughout the year, construction of the ELI pipeline during the fall to spring would

minimize impacts on windowpane spawning, which peaks in May, and on juvenile and adult populations, which are higher in the spring, summer, and fall.

Winter Flounder: All Stages

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

Winter flounder occur in coastal waters from the Strait of Belle Isle south to Georgia (Bigelow and Schroeder, 1953). The Project area contains EFH for all life stages of this species. 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 less than 4.5 m, with salinities between 10 to 32 ppt, and dissolved oxygen (DO) between 11.1 to 14.2 milligrams per liter (mg/l). Eggs are adhesive and demersal, and are deposited on a variety of substrates. Sand is the most common substrate, however, eggs have been found attached to vegetation, mud, and gravel. Larvae are found inshore in depths less than 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-the-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 less than 12 m over mud to sand substrate with shell or leaf litter, with temperatures less than 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 greater than 2.9 mg/l, and salinities greater than 22 ppt. Adults are found inshore at depths less than 30 m over mud, sand, cobble, rocks, and boulders.

Project Area: Because winter flounder deposit eggs on sandy continental shelf substrates in depths as great as 120 m, construction of ELI pipeline through sandy habitat along the Long Island coast (MPs 15.8 to17.1) could impact demersal eggs of this species. However, most of the substrate along the pipeline route consists of silts and clays. Winter flounder larvae are expected to be found in the ELI Project area during the spring and summer. Juveniles and adults can be expected to be common in the Project area in all seasons. Surveys in Long Island Sound indicate that adult winter flounder are broadly distributed throughout the Sound during both spring and fall. ELI Project pipeline construction activities in shallow waters could impact all stages of winter flounder whereas construction in deeper waters would primarily impact adults of this species.

4.1.2 Coastal Pelagic Fishery

Atlantic Mackerel: All Stages

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

Atlantic mackerel is a fast swimming, pelagic schooling species distributed in the northwest Atlantic from the Gulf of St. Lawrence to Cape Lookout, North Carolina. 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 greater than or equal to 7°C and peaks with salinities greater than 30 ppt. Eggs are pelagic, and found at depths ranging from 10 to 325 m. Eggs are typically found at temperatures between 5 to 23°C in estuarine (18 to 25 ppt) to full (greater than 30 ppt) seawater.

Larvae are most abundant in offshore waters where salinities are greater than 30 ppt. The distribution of larvae is from 10 to 130 m, with preferences less than 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 greater than 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 greater than 25 ppt and are intolerant of temperatures below 5 to 6°C or above 15 to 16°C.

Project Area: Atlantic mackerel are not abundant in the Long Island Sound. Gottschall *et al.* (2000) reports that very few adult Atlantic mackerel were taken in trawl surveys across the Long Island Sound. The greatest abundance of these fish was found in Long Island Sound during the months of April and June. Based on the habitat utilization of this species, juvenile and adult Atlantic mackerel might occur from the spring to the fall and eggs and larvae are might occur from late spring to early summer in the ELI Project area. Because of the fall to spring construction schedule and low abundance of all stages of this species in the Long Island Sound, construction of the ELI Project pipeline would have minimal impact all stages of Atlantic mackerel.

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 less than 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 less than 22.8°C and DO levels are greater than 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 less than 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 ELI Project area during the spring and fall, but only in limited numbers. However, these stages for the Atlantic salmon would likely avoid construction activities and would not be expected to be impacted by these activities.

Atlantic Herring: Juveniles and Adults

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

The Project area contains EFH for juveniles and adult herring. Atlantic herring is distributed on both sides of the Atlantic, and along the American coast, as far north as northern Labrador and the west coast of Greenland, and commonly as far south as Cape Cod and Block Island (Bigelow and Schroeder, 1953). Adult 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. Juveniles are typically found in pelagic and bottom waters ranging in depth from 15 to 135 m, temperatures below 10°C, and with salinities ranging from 26 to 32 ppt. 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 greater than 28 ppt.

Project Area: Based on the habitat utilization of this species, juvenile Atlantic herring are likely to occupy the ELI Project area during the spring and early fall, and adults are likely to occupy the ELI Project area during winter and spring. CTDEP trawl surveys indicate that Atlantic herring were most abundant in Long Island Sound in the spring. However, during winter tows, adults were relatively scarce. Juvenile Atlantic herring showed similar temporal abundance patterns as adults. Because adult and juveniles have relatively low abundances in Long Island Sound during the winter and because these schooling fish would likely avoid construction activities, ELI Project pipeline construction would likely have a minimal impact on juvenile and adult Atlantic herring.

Bluefish: Juveniles and Adults

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

The Project area supports EFH for juvenile and adult bluefish. Bluefish are a highly migratory species that occur from Cape Cod, and occasionally as far north as Nova Scotia, south to Argentina (Bigelow and Schroeder, 1953). Juvenile bluefish recruit to estuarine habitats in the MAB in late May to mid-June, arriving when temperatures reach approximately 20°C. A second cohort of summer spawned juveniles may enter these nursery habitats in mid- to late August. 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.

Project Area Both YOY juveniles and adults appear in the Long Island Sound in May or June and are found in depths less than 18 m. CTDEP trawl surveys frequently capture juvenile and adult bluefish from July to October. In Long Island Sound, bluefish are generally found over sandy, muddy, and/or silty substrate. Based on the habitat utilization of this species and surveys, YOY juvenile bluefish and adults can be expected to occupy the ELI Project area during the summer through fall. Because these predatory fish usually avoid areas of disturbance and because of the winter through spring construction schedule, the ELI Project pipeline installation would have a minimal impacts on juvenile and adult bluefish.

Black Sea Bass: Juveniles and Adults

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

Black sea bass are distributed from Maine to northern Florida, but are most common south of Cape Cod (Bigelow and Schroeder, 1953). 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, salinities above 18 ppt, and temperatures greater than 6 °C. 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. Adults have nearly identical requirements but have no salinity restrictions. Adults have been collected inshore from May to October. Structured habitats, sand, and shell are the generally preferred substrates (NEFMC, 1998).

Project area: 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. Black sea bass were relatively rare in CTDEP trawl surveys and were mostly caught in shallow nearshore habitats and the central portion of Long Island Sound. The greatest abundance of this species occurred from April to June in Long Island Sound (Gottschall *et al.*, 2000). Based on their association with structured habitats, the greatest potential to impact black sea bass would only occur in the shellfish lease area crossing (936 feet) of the ELI Project. Otherwise, due to the lack of structure along most of the proposed pipeline route and winter construction schedule, impacts to juvenile and adult black sea bass would not be expected.

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 greater than 20°C and salinities greater than 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 ELI 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 ELI Project area. Therefore, construction of the ELI Project pipeline would not be expected to impact any life stages of this species.

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. EFH for eggs and larvae of king and Spanish mackerel include sandy shoals of capes and offshore bars, rocky bottom and barrier island, oceanside waters from surf to the shelf break zone, as well as high salinity bays, estuaries, and eelgrass beds. Adult king mackerel are primarily an open-water, migratory species, preferring warm waters that seldom fall below 68°F. They often occur around wrecks, buoys, coral reefs, ocean piers, inlets, and other areas where food is abundant. The northern population of Spanish mackerel occurs from Miami to the Chesapeake Bay and occasionally to Cape Cod.

> ***Project Area:*** Spanish mackerel have been observed in CTDEP trawl surveys but they were relatively uncommon. Most Spanish mackerel were taken in nearshore waters less than 18 m deep. Due to the migratory and epipelagic nature of these species, a few adult Spanish and king mackerels may pass through the ELI 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 ELI Project area. Because Spanish and king mackerel are considered south Atlantic species for EFH purposes (NOAA, 1998) and surveys indicate that they are uncommon in the Long Island Sound, construction of the ELI Project pipeline would not be expected to impact any life stages of these species.

Scup: All Stages

> ***Primary Source:*** Steimle *et al.* (1999c)

Scup occur from the Gulf of Maine to Florida, but are most abundant south of Cape Cod. 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 less than 30 m deep, temperatures between 11 to 23°C, and salinities greater than 15 ppt. Larvae are also common in nearshore waters of MAB and SNE. Larvae will remain in the water column (less than 20 m) until juvenile transition and prefer temperatures between 14 to 22°C and salinities greater than 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 inhabit 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:*** Scup are highly abundant in Long Island Sound in spring and fall and were found over mixed sand and mud substrate (Gottschall *et al.*, 2000). Scup may also 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 ELI Project area during the spring through fall. Construction of the ELI pipeline during the fall to spring would minimize impacts to juvenile and adult scup.

Long-finned Inshore Squid: Eggs, Juveniles and Adults

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

Long-finned inshore 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 suggests that they typically have a lifespan of less than 1 year. Egg masses of longfin squid are often found attached to rocks, and small boulders on sandy/muddy bottom and on aquatic vegetation. Juvenile squid pass through two stages; "pre-recruits" and "recruits." Pre- recruits inhabit the upper 10 m of the water column over water 50 to 150 m deep. Off of Martha's Vineyard the pre-recruit life stage of a longfin squid last about 1 month. During this time they shift from inhabiting surface waters to a demeral lifestyle and are considered recruits. The recruits 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:*** Long-finned inshore squid were among the most abundant species collected during fall CTDEP trawl sampling. Long-finned squid were relatively less abundant during the fall sampling period. However, 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 ELI 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 long-finned squid.

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 greater than 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 and are unlikely to be affected by the proposed construction.

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 ELI Project area is an unlikely nursery ground for this species, but late juvenile and adult sandbar sharks probably occupy the ELI Project area during the summer. It is unlikely that the project would affect either of these life stages of this species.

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 ELI Project area. It is possible that pipeline construction could have direct and indirect impacts on this species.

4.1.4 Selected Fish and Shellfish Species with Commercial and Recreational Value

This section provides information on life history and habitat requirements for selected recreational and commercial species that are not federally managed but are of interest to the NMFS, [i.e., tautog (*Tautoga onitis*), weakfish (*Cynoscion regalis*), American lobster (*Homarus*

americanus), blue crab (*Callinectes sapidus*), horseshoe crab (*Limulus polyphemus*), and various other crabs]. Similar to the managed species, primary reference sources are cited once, at the beginning of each summary.

Unlike the federally managed species, no life stages of importance have been designated for these species with commercial and recreational value, and therefore each species assessment addresses all life stages of that particular species. Conclusions regarding the likelihood of occurrence of each species and life history stage in the ELI Project area and potential to be affected are presented at the end of each species assessment.

Tautog

Primary Source: Steimle and Shaheen (1999)

Tautog is a valuable recreational and commercial fishery resource from Massachusetts to Virginia in the northwest Atlantic. They are generally a coastal species and are most abundant between Cape Cod and the Chesapeake Bay. Tautog eggs and larvae have been collected on the inner continental shelf. Eggs are generally found in the greatest numbers at or near the water surface. Newly settled juveniles typically inhabit waters less than 1 m in depth. Adult and juvenile tautog prefer complexly structured coastal habitat such as vegetation, rocks, natural and artificial reefs, and mussel and oyster beds. In the late fall adults migrate to offshore areas with rugged topography. Adults generally migrate inshore in spring from coastal wintering sites to spawn. Peak spawning in the central bight occurs in June and July.

Project Area: Due to their association with complex topographic habitat, tautog would primarily be impacted only at the short portion (936 feet) of the ELI pipeline that would pass through a shellfish lease area. Otherwise, a winter construction schedule and construction along the proposed ELI Project route that is relatively featureless would not be expected to impact this species.

Weakfish

Primary Source: Mercer (1989)

Weakfish can be found from the southern coast of Florida to Massachusetts Bay. They spawn in the nearshore and estuarine areas of the coast after a spring inshore migration. Weakfish larvae have been found in nearshore waters to 70 kilometers offshore. Juvenile weakfish use estuarine areas as nursery grounds and are more commonly found in the deeper areas of rivers or bays. Adults migrate seasonally between inshore and offshore waters. In the spring weakfish migrate to northerly warming inshore waters and reverse this migration in the fall. In northern areas a greater proportion of adults spend the summer in oceanic waters rather than estuaries. Weakfish have been collected over a temperature range of 9.5 to 30.8°C and a salinity range of 0.1 to 32.3 ppt. However, areas with the most abundant juvenile catches had salinities of 2.0 to 10.8 ppt. Young weakfish feed primarily on mysid shrimp and anchovies; older weakfish feed primarily on available clupeid fish.

Project Area: Weakfish can be expected to occasionally occupy the ELI Project area because they migrate in and out of the Long Island Sound on a seasonal basis and utilize Long Island Sound as a foraging and nursery area. The high salinity environment of the Project Area is not an ideal environment for juvenile weakfish because they prefer lower salinity waters. A winter construction schedule would minimize impacts to this species because they migrate south and offshore as water temperatures cool.

Blue Crab

Primary Source: Hill *et al.* (1989)

The blue crab is found in coastal waters from Massachusetts to South America. Its primary habitat is in bays and brackish estuaries. Substrate preference varies with life stage. Areas with submerged aquatic vegetation (SAV) and soft sediments are important for juvenile crabs, which use the vegetation as refuge from predation. Adult crabs prefer harder substrate such as sand, rock, or mud bottoms. Mating takes place primarily in relatively low salinity waters in upper portions of estuaries and lower portions of rivers. After mating, females migrate to high salinity waters in lower estuaries, sounds, and nearshore spawning areas. Juveniles migrate to shallower low salinity waters where they grow and mature. Blue crabs are predators on commercially important clams and oysters, and serve as food for commercially important species such as striped bass.

Project Area: Based on their range of habitat utilization and availability of food sources, adult blue crabs are expected to occur in the ELI Project area. Although the ELI Pipeline construction has the potential to impact blue crabs of all the life stages, it would primarily have potential impacts limited to direct (mortality) and indirect (turbidity and sedimentation) affects on individuals that are dormant during the winter. Individual crabs are highly mobile, and if they encounter areas disturbed by construction during the fall it is likely they would not be affected by turbidity and could avoid direct impacts by swimming away. Crabs that are dormant in the sediment could suffer direct mortality or injury from pipeline construction activities.

American Lobster

Primary Source: MacKenzie and Moring (1985)

The American lobster occurs in coastal surf to continental slope waters of up to 2,300 ft in depth. However, this range is divided between inshore and offshore groups, with some overlap occurring. Lobsters are solitary, territorial crustaceans that live in a variety of different habitats preferring areas that have a rocky or soft mud bottom to one that is sandy. Lobsters reproduce when a recently molted soft-shelled female mates with a hard-shelled male in the summer or fall. The female generally extrudes and fertilizes the eggs about a year after mating, and then carries the eggs on her abdomen until they hatch the following spring or early summer. Hatched larvae go through a planktonic stage for about a month, and then permanently settle to the bottom. Recent studies have shown that settlement is limited to water shallower that 20 m. Newly settled lobsters stay near their settlement site for years. Adult lobsters are concentrated in rock areas where shelter is readily available although occasional high densities occur in mud substrates suitable for burrowing.

Seasonal distribution of lobsters may be related to water temperature. Most lobsters are caught in shallow inshore waters, -15 to -100 feet mean low water (MLW).

Project Area: American lobsters are known to occur throughout Long Island Sound and were highly abundant in CTDEP trawl surveys, particularly in the fall. Lobsters were most common on mud bottom. Based on there habitat use, lobsters can be expected to occur in the ELI Project area. Pipeline construction has the potential to impact all stages of American lobster. The pelagic larval phase that occurs in the water column and the adult phase that is highly mobile are less susceptible to impacts from pipeline construction. The early benthic juvenile stages are the most susceptible to impact because they are less mobile and stay in the area of settlement for several years. Adults and benthic juveniles may be attracted to mounds of sediment created by trenching. Backfilling of the trench would impact those lobsters that had burrowed into the disturbed sediments. The magnitude of this impact would depend on the length of time the sediment mounds remains in place between trenching and backfilling. Utilizing the subsea plow and mid line anchor buoys that both reduce impact to the benthic environment would avoid and minimize impacts to American lobsters.

Atlantic Horseshoe Crab

Primary Source: Atlantic States Marine Fishery Commission (1998)

The horseshoe crab is a benthic arthropod that utilizes both estuarine and continental shelf habitats. It is not a true "crab" and is classified in its own class (Merostomata), which is more closely related to arachnids. Horseshoe crabs range from the Yucatan peninsula to northern Maine but are most abundant between Virginia and New Jersey. The NMFS, Northeast Fisheries Center bottom trawl surveys show that 74 percent of the horseshoe crabs caught were in waters shallower than -66 feet MLW. Horseshoe crabs are ecological generalists that can survive in a range of environmental conditions. Studies report that adult horseshoe crabs migrate from deep bay waters and the Atlantic continental shelf to spawn on intertidal sandy beaches. Spawning generally occurs from May to June. Eggs are laid in the sediment and hatch approximately 14 to 30 days after fertilization. Larvae may overwinter in the sediment but when they emerge they generally settle in shallow water areas to molt. Juvenile horseshoe crabs usually spend the first two years on intertidal flats near the breeding beaches. Older individuals move out of intertidal areas to a few miles offshore, but some remain in intertidal areas year round.

Larvae feed on a variety of small polychaetes and nematodes. Juvenile and adults horseshoe crabs feed primarily on mollusks including various clams and blue mussels. Horseshoe crabs will also prey on a wide variety of benthic organisms.

Project Area: Based on their range of habitat utilization and availability of food sources, adult horseshoe crabs are expected to occur in the ELI Project area and pipeline construction activities could potentially impact horseshoe crabs the same as other true crabs.

Additional Crab Species

In addition to the blue crab and horseshoe crab, there are a variety of other crab species that are found throughout the Long Island Sound that have important commercial and recreational value and could be impacted by the ELI Project pipeline construction. Some of these crab species are

harvested for human consumption (e.g., jonah crab, rock crab, and lady crab) whereas others are caught and sold as fishing bait (e.g., spider crab, hermit crab, green crab). In addition to having important commercial value, these crabs are important food sources for other managed fish species, (*e.g.*, black sea bass, summer flounder, red hake), commercially and recreationally important fish species (*e.g.*, striped bass), and sea turtles such as the Kemp's Ridley turtle.

Crabs are mobile benthic organisms that primarily walk on the seafloor, but also may swim throughout Long Island Sound. As previously stated, subsea plowing and mechanical dredging, including trench excavation and trench spoil displacement, would temporarily impact approximately 128 acres of the Long Island Sound seafloor. Where subsea plowing would be used between MPs 0.04 to 16.5, the majority of crabs would be expected to move out of the way of the slow moving subsea plow as it passed through their habitat. However, some juvenile or slower moving crabs especially during winter could be affected by subsea plowing, suffering injury or mortality if struck by the moving plow or suffocating if buried by displaced trench spoil or trench backfill. In areas where mechanical dredging would be used between MPs 0.00 to 0.04 and 16.5 to 17.1, the majority of crabs present in the path of the clamshell dredge likely would suffer direct mortality or injury by being struck by the dredge or buried by trench spoil.

As previously stated, Iroquois has estimated that cable sweep without the use of mid-line buoys would impact 2,700 acres of the seafloor. Within this area of impact, some individual crabs may avoid harm if located within depressions or areas where the cable does not make contact with the seafloor, whereas others in the path of the sweeping cable could suffer injury or mortality. Also as previously stated, anchor placement would impact 10.2 acres of the seafloor. Within this area of impact, individual crabs likely would suffer mortality by being directly struck and crushed by the anchor.

Subsea plowing, mechanical dredging, anchor placement, and cable sweep would result in direct mortality and injury to the majority of individual crabs present in the path of construction activities. However, populations of commercially and recreationally important crab species likely would not be significantly impacted because the majority of individual crabs present in Long Island Sound would not be affected by the pipeline construction activities. Although crab densities along the path of construction activities would be temporarily reduced, affected crab populations would recolonize affected areas within 1 year of construction. As a result, only a temporary and localized impact would be anticipated on crab harvesting for human consumption and fishing bait and use of crab as a food source by managed fish species, commercially or recreationally important fish species, and sea turtles.

4.1.5 Marine Benthic Communities

Benthic communities are those biological assemblages associated with the sediments of aquatic systems and are an integral component of the ecology of Long Island Sound. The physical characteristics of the sea floor in the Sound vary on several spatial scales and benthic communities respond to this variation, creating a rich ecological mosaic (Zajac, 1998). 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.

The Long Island Sound contains a spatially heterogeneous mix of sea-floor environments which provide habitat for a diverse set of soft-sediment assemblages. ENSR International conducted offshore surveys along the pipeline route in Long Island Sound during June 2001. The offshore surveys included; benthic grabs for macroinfauna and sediment texture analysis; vibracore samples for sediment chemistry and sediment texture analysis; and sediment profile images. Additionally, Thales Geosolutions, Inc. conducted a detailed geophysical survey of the proposed route and reported that the bottom and subsurface sediments are generally unconsolidated and include either soft silty clays of fine sand, with clay being the most common along the ELI Project pipeline route. Near shore, off Long Island, coarser sediment, principally medium grain sand, was encountered along the route. Overall the results of the surveys indicate that the sediment along the proposed pipeline route is predominantly fine-grained sediments, indicating a depositional environment. The following sections describing the predominant benthic habitats that may be encountered along the ELI pipeline crossing are taken from USGS (2001).

Boulder and gravel habitats are spatially complex with interstices and epifauna that provide cover from predators and refuges from current. The greater the spatial complexity, the wider the range of sizes of organisms that utilize such habitats. For example, cunner, a temperate wrasse species, are often the dominant fish species in boulder habitats. In fact, cunner occur in the same densities as coral reef fishes in terms of numbers and biomass. For gravel pavements (*i.e.*, flat gravel areas), the lower three dimensional structure of the seabed restricts the sizes of animals which can find refuge from tidal flows and predators. Juvenile fishes and small crustaceans find shelter amongst the epifaunal species which colonize the gravel surfaces, the sides of cobbles, and also burrow directly beneath various size rocks.

Sand habitats are perhaps the least complex of the range of habitats in the region but are unique and critical for some species. Sand is generally non-cohesive such that grains do not adhere to one another. This prevents construction of defined burrows by animals. However, many species are adapted to life in these habitats. For example, many crab species can rapidly bury themselves in unconsolidated sand in order to avoid threats. Tidal and storm currents act on sands to form sand waves and ripples. These features, like other habitats, provide refuges from current flows, reducing the energy needed by fishes to hold position on the sea floor. Some fish species wait on the down-current sides of sand waves to ambush prey drifting over the bottom.

Mud habitats are often viewed as flat and featureless. Fishes and crustaceans often use and modify mud habitats exploiting the cohesive nature of the fine sediments and organic materials. Burrows of various sizes and configurations, as well as shallow depressions, greatly increase the complexity of such habitats. Lobsters are perhaps the most well studied of the many burrowing species. Some animals are structure producers and others use structures produced by other fauna. For example, species like lobsters and four bearded rockling produce bowl shaped depressions on the sediment surface. Other species like long-finned squid use abandoned depressions for cover.

5.0 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

In this section, potential impacts to EFH, managed species, and other species with commercial and recreational value 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 implemented by Iroquois to prevent or minimize impacts to EFH, when applicable.

5.1 IMPACTS AND MITIGATION

The construction of the proposed ELI Project pipeline would result in various impacts to a substantial area of EFH in Long Island Sound and thus impact various life stages of some managed species and impact other species that have commercial and recreational value and utilize the same habitat. Overall, the ELI Project would impact approximately 2,900 acres of the Long Island Sound seabed. EFH impacts of concern include disruption and conversion of habitat; injury and possible mortality to certain life stages of managed species; mortality and injury of benthic prey species; effects of sedimentation and turbidity plumes from construction activities; and, disturbance to nearshore shellfish lease beds off the coast of Connecticut. Additional impacts to fish and shellfish species from activities associated with construction and operation of the proposed ELI Project may result from temporary degradation of water quality due to trenching, pipeline installation, pipeline burial, and fuel spills, as described below. Overall, some impacts to EFH would occur along the pipeline construction corridor. Many of the impacts would be short-term in nature, however, there would also be some long-term impacts to EFH.

Iroquois has developed an overall construction plan for the ELI pipeline that includes various measures to mitigate impacts to Long Island Sound EFH, managed species, and other species with commercial and recreational value. Mitigation measures that are proposed by Iroquois include selection of a specific route, construction timing restrictions, use of specialized construction equipment, allowing for natural backfill of the pipeline trench, and coordination with state and federal agencies as well as commercial fishermen and fishing organizations.

5.1.1 Essential Fish Habitat

The ELI pipeline construction would directly impact approximately 2,930 acres of the Long Island Sound seabed from: construction of a marine tap interconnection; use of various trenching techniques to lower the pipeline; cable sweep; and the placement and movement of lay and bury barge anchors. The primary direct impacts to EFH would be the disruption of the seabed, associated sediment deposition on adjacent areas, and destruction of communities associated with disturbed areas. Although this represents a significant impact to EFH in Long Island Sound, Iroquois has carefully selected a route that avoids more sensitive habitats like rocky sub-tidal habitat and minimizes impacts to shellfish lease beds. The habitat along the route selected consists mainly of fine grained sediment, which has the ability to recover more quickly from disturbance than more coarse sediments or hard substrate.

In terms of area of impact, cable sweep would have the largest impact to the Long Island Sound seabed. Iroquois estimates that approximately 2,700 acres of seafloor would be impacted by

the cable sweep associated with pipeline construction. It is expected for the area of cable sweep, that some portions 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). However, where the cable made contact, the seabed would be disrupted and most sessile invertebrates, some mobile invertebrates, and some demersal fish could suffer mortality.

Pipeline trenching activities would impact approximately 128 acres of the Long Island Sound seabed. The majority of the trenching would be accomplished using a subsea plow. However, for short sections at the beginning (MP 0.04) and near the Shoreham landfall (MP 16.5), mechanical dredging would be used to create the pipeline trench. This method would excavate a trench 35 feet wide by 6 feet deep with trench spoil placed to one side. The spoil pile would extend an additional 50 feet from the trench edge. The benthic communities directly in the dredged trench, and spoil pile area would be destroyed. Additionally, benthic communities to either side of the trench edge or spoil pile would be impacted by sedimentation and increased turbidity associated with mechanical dredging.

Iroquois proposes to use plowing as the primary trenching technique where conditions permit. Plowing would create a 5- to 6-foot-deep trench approximately 20 feet wide. The displaced sediments would extend approximately 20 feet to either side of the trench. This activity would disrupt the benthic communities in the 60-foot-wide corridor, resulting in injury and mortality to organisms that could not avoid the plow or sediment redistributed to the sides of the trench. Most mobile benthic invertebrates and juvenile and adult fish would avoid the slow moving progress of the plow. However, sessile benthic organisms, and fish eggs and larvae in the path of the plow or in spoil pile areas would suffer injury or mortality.

Utilizing the subsea plow for pipeline lowering would significantly reduce impacts to EFH when compared to other trenching methods (*e.g.*, jetting, mechanical dredging). The subsea plow physically impacts a smaller area and resuspends significantly less sediment thus reducing the overall impact of trenching. The subsea plow is best suited for use in silty clay and may not be feasible in highly variable or certain unsuitable soil conditions.

Geophysical surveys of the pipeline route indicate that there would be no need for blasting. If a rock outcrop were encountered during trenching, Iroquois would review their construction options prior to blasting. These options include re-routing the pipeline around the outcrop or placing it over the outcrop using the same techniques used for crossing foreign utility lines. The NMFS has indicated that if blasting is required, the EFH Assesment would be re-opened.

In addition to trenching and cable sweep, the placement and movement of large anchors essential to the lay and bury barges would result is direct impacts to EFH. In the footprint of the anchor placement and where the anchors were dragged, the seabed would be disrupted and associated benthic organisms would suffer mortality. After the anchor was removed some sediment would fall back into the depression but a resulting anchor scars would remain. Iroquois indicates that typical operations involve a twelve anchor array that is reset three times per mile. Therefore, construction activities would result in 1232 anchor scars along the 17. 1 mile crossing. With an estimated 360 sq. feet of impact per anchor, two passes of the barges would impact a total of approximately 10.2 acres of Long Island Sound seabed. Many of the anchor scars would be refilled by natural sediment deposition and sediment redistribution. However some anchor scars could persist.

After the pipeline is lowered into the trench, Iroquois proposes to allow natural sedimentation to backfill the trench. We have recommended that Iroquois restore the sea floor contour to within ± 1 foot of the original conditions using sub sea plow technology between MPs 0.04 and 16.5 (see section 3.4.1.2 of the EIS). However, if the Federal Energy Regulatory Commission does not require this in the certificate, Iroquois' proposed restoration would be implemented.

Iroquois indicates that allowing the trench to backfill naturally would eliminate the need for a third pass by a bury barge and thus avoid the associated impacts of cable sweep, anchor scars, and seabed disturbance. Nevertheless, the pipeline trench would remain unfilled for some time. Portions of the trench in areas with high sediment deposition and high current velocities could fill within a year, while other portions of the trench in low flow areas may take significantly longer to fill (Van der Veer *et al.*, 1985). This 5- to 6-foot-deep by 20-foot-wide trench containing the pipeline could also act as a barrier to migrating fish and shellfish. Iroquois indicates that the plowed trench walls would initially have slopes of approximately 28 degrees and the spoil piles would have slopes of 25 degrees. These slope angles would decrease as the trench is naturally backfilled and the spoil piles are redistributed by currents. The exposed 20-inch-diameter pipeline with 3.5 inches of concrete coating sitting in the trench could initially affect migration of some fish or shellfish, but as the trench is naturally filled it would have a decreasing impact on migration. The magnitude of impact on migration would ultimately depend on the speed at which the trench is naturally backfilled, which is dependant on local current speeds and sediment composition.

Recovery of the benthic communities disturbed by trenching, cable sweep, and anchor scars would occur at varying rates dependant a variety of environmental parameters and the severity of the impact. Larger mobile organisms that moved away during construction would return to the area relatively soon after construction was completed. However, epifaunal sessile components and infaunal communities would take significantly longer to recover. Those communities at the edge of the impact would recover more quickly than the central areas that experienced the most severe impact. Thus, over the time span of benthic community recovery, there would be a mosaic of the various stages of recovery across the construction impact areas. Newell *et al.* (1998) reviewed dredging impacts to benthic communities and indicated that, although there are a variety of environmental parameters that effect benthic recovery rates, there are some general time frames of recovery associated with habitat type. Disturbed estuarine muds typically recover within a year whereas sands and gravels can take 2 to 3 years to recover and even longer where rare slow growing component are present. Geophysical studies of the ELI Project pipeline route primarily encountered fine grained sediments (*i.e.* mixtures of silt, clay and sand). Therefore, recovery of most of the disturbed benthic communities along the pipeline route could be expected to occur within 1 to 3 years. However, areas with coarser material or with slower growing or later stage succesional communities could take greater than 3 years to fully recover. Construction impacts to EFH would be the greatest in the first year and would decrease each year as recovery of the seabed and benthic communities proceeded.

Some portions of unfilled pipeline trench and deep 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 the ELI Project pipeline construction. 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.

The first 936 feet of the pipeline construction would impact a shellfish lease area. This shellfish lease area, L-580, is leased to Fairhaven Clam & Lobster Co., LLC and is primarily used for harvesting oysters. Although oysters are not managed by the NEFMC, they are a valuable commercial resource and provide EFH for several managed species including winter and summer flounder, scup, American plaice, and black sea bass. Trenching activities, anchor scars, and construction of the marine tap interconnect would impact about 2.7 acres of this available shellfish habitat. Iroquois' estimate of 2,700 acres of impact from cable sweep along the 17.1 mile crossing includes up to 30 acres along the 936-foot-long crossing of the shellfish lease area L-580. Some of this impact would occur outside the shellfish lease area because the cables extend several thousand feet away from the barges.

The areas adjacent to the shellfish lease area are also shellfish habitat and considered to be important habitat for lobsters (Volk, 2002). In these nearshore areas impacted by anchor placement, cable sweep, and trenching most shellfish would be destroyed. These construction activities would cause long-term impacts to the shellfish habitat. The recovery of the impacted oyster resources would take at least 3 to 5 years which is the time it takes for a settled oyster to reach marketable size (Seller and Stanley, 1984). However, oyster spat require hard mud, shell substrate, or other hard substrate on which to settle and establish. Therefore, full recovery could take longer than 3 to 5 years because it would be necessary for the disturbed sediment to reconsolidate to provide habitat suitable for shellfish recolonization and growth. As evidence for this, the State of Connecticut, Department of Agriculture, Bureau of Aquaculture indicated that impacts to nearby shellfish habitat can still be identified from a pipeline construction project that was constructed over ten years ago (Volk, 2002).

In order to minimize potential impacts to shellfish lease beds, Iroquois would primarily use subsea plowing to create the pipeline trench; construct the pipeline through shellfish areas in winter months to avoid impacts to spawning; notify all parties of interest of the exact location of the proposed pipeline alignment and construction corridor prior to construction; coordinate and communicate with all interested parties on the timing and scheduling of construction activities; and, evaluate potential construction methods to help avoid and minimize disruption to shellfish harvesting and reproduction.

The construction of the pipeline would result in temporary impacts to water quality along and adjacent to the pipeline construction corridor. Water quality at and around the pipeline trenching and laying activities would be temporarily impacted by the production of turbidity plumes resulting from trenching. The turbidity plume associated with mechanical dredging would be the most significant, and could impact an area several hundred feet to either side of the activity. However, this dredge method is only being use for relatively short distances, 211 feet at the beginning and 3,168 feet prior to landfall. The turbidity plumes generated would be temporary and would be dispersed within hours to days, depending on local environmental conditions and would only have minimal impacts on EFH.

In addition to short-lived increases in turbidity, the resuspension of sediments resulting from construction activities could release potentially toxic chemicals into the water column. As previously mentioned, the subsea plow resuspends relatively small amounts of sediment. This fact in combination with reported low concentrations of sediment contamination indicates that there would be minimal adverse impacts to marine organisms resulting from release of potentially toxic chemicals.

5.1.2 Managed and Other Species with Commercial and Recreational Value

Direct Impacts

Construction of the ELI pipeline could result in direct impacts to various life stages of managed species and other species with recreational and commercial value. Direct impacts to these species would primarily result from encountering trenching equipment, anchors, and sweeping cables, and from the deposition of disrupted and resuspended sediments. These construction related impacts could result in injury and mortality to certain fish eggs, fish larvae, juvenile, and adult fish that are associated with the seabed. Iroquois would minimize direct impacts to fish and invertebrates by utilizing the subsea plow, which impacts a smaller area than other trenching methods and by conducting construction primarily in the winter months when various life stages of many of the managed species are less abundant in the Long Island Sound.

Eggs, larval, juvenile, and adult stages of managed species depend on the Long Island Sound for food and shelter for growth into maturity and potentially could be directly impacted by construction activities. Demersal eggs of winter flounder would be at risk from construction activities. Winter Flounder eggs in the path of trenching or in the area of sediment deposition would be dislodged or buried and most would not survive. Winter flounder eggs along the northeast and mid-Atlantic coast are typically found in depths less than 5 m (16 feet). However, the only construction that would occur in these depths are a relatively short distance (3,000 feet) prior to land fall on Long Island, New York. Therefore, minimal impacts would be expected to winter flounder eggs and no long-term impacts to the winter flounder population would be expected. Larvae and YOY juveniles that live in contact with the bottom could be injured or killed by construction activities. YOY juveniles of summer flounder and windowpane are managed species most at risk. Juvenile flounders are likely to be present on the seabed along the ELI Project pipeline route 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. Most adult and juvenile demersal and pelagic finfish species would avoid the construction areas and relocate without injury.

Another potential direct 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 activity aboard vessels, and the movement of pipeline lay barges, supporting vessels, and other specialized marine equipment . Iroquois has developed an Spill Prevention Containment and Countermeasures Plan (SPCC Plan) to avoid or minimize the effects of accidental fuel and other chemical spills on aquatic resources. Additionally, Iroquois 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. Implementation of these measures would also

avoid or minimize potential impacts of accidental oil and fuel spills on the Long Island Sound EFH and managed species.

The American lobster is an important commercial shellfish that is harvested in both the Connecticut and New York portions of Long Island Sound. A recent die off of lobsters in 1999 has affected the local population. The ELI pipeline construction could impact various life stages of Long Island Sound lobsters. The impacts to lobsters would depend on what life stages were present in the construction area during the time of construction. Lobster larvae are typically present in the water column from May to June, therefore a late fall to early spring construction schedule would avoid impacts to this life stage. Early benthic phase (EBP) lobster remain in the area of their chosen shelter for up to two years. Any EBP lobster in the path of construction would likely be injured or suffer mortality. However, the sediment along the proposed pipeline route consists primarily of fine sediments such as silts and clays. This type of habitat has little structure and is not preferred by EBP lobster. Thus, minimal impacts to EBP lobsters are expected. Adult lobsters are highly mobile and capable of long range movement. Adult lobsters in the path of the plow, immediate area of anchor placement and cable sweep could be injured or destroyed. Iroquois consulted with experts on lobster ecology and behavior (B. Estrella of the Massachusetts Department of Marine Fisheries and K. Lavalli of Southwest Texas State University) who indicated that adult lobsters would likely move out of the way of construction activities. Overall, ELI pipeline construction would not be expected to have significant long-term impacts on the lobster fishery.

Once construction is completed, the unconsolidated mounds of sediments from the trench may attract and provide habitat to juvenile and adult lobster. Monitoring of dredge disposal sites in the Long Island Sound has shown that areas used for disposal sites became lobster fishing grounds (DAMOS, 1985). Therefore, lobster populations in the immediate area of the trench may increase after construction.

Indirect Impacts

The ELI pipeline construction would result in various indirect impacts to managed and other species with commercial and recreational value. The construction activities that physically impacted the seabed would disrupt habitat for many species and destroy prey items of many managed species. Also, trenching activities would reduce water quality by generating sediment plumes that could effect the feeding behavior and success of some managed species and impact some of their prey species by smothering them. As discussed above, Iroquois selection of a route with primarily fine grain sediment habitat, use of the subsea plow, and allowing for natural backfill would minimize these indirect impacts to managed species and those with commercial and recreational value.

The various trenching techniques would cause indirect impacts to bottom feeding managed species by the removal of benthic infaunal prey organisms, and some epifaunal prey organisms. 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 plow, dredge, cable sweep, or anchors would be dislodged from bottom substrates and likely suffer injury or mortality. After construction was completed some of the more motile epifaunal organisms (*e.g.*, crabs, mysids, sand shrimp) would re-colonize the project area and some managed species would return and continue to feed along the pipeline route even after the subsea plow or mechanical dredge had passed. The overall impact would be short-term as most benthic communities would recover in 1 to 3 years.

The short-term loss of benthic prey resources caused by pipeline construction would cause many managed species to relocate to feed in a similar habitat nearby. There is the potential that this relocation of fish could cause increased competition for resources in other areas thus indirectly impacting managed species. However, the Long Island Sound is heavily fished as indicated by NOAA fishery landings data (NMFS, 2001). Therefore, it is unlikely that fish would temporarily relocate to an area that is at its carrying capacity and could not support the relocated fish.

The construction process would cause an increase in sedimentation and turbidity in the project and 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. Any bottom-feeding finfish that had trouble finding sufficient prey along the construction route could relocate to the adjacent unaffected areas to feed. As discussed previously, the use of the subsea plow would significantly reduce impacts associated with resuspended sediment.

There is the potential that the exposed sections of pipelines that cross foreign utility lines could hinder American lobster and flounder (*i.e.*, winter flounder, summer flounder, and windowpane) migration. There is a low probability that migrating fish and shellfish would directly intercept either of the three short sections (200 feet) of unburied pipeline on their migrations. However, if they were encountered, demersal fish or lobster could move around these obstacles and migrations would not be significantly impacted.

Pipeline construction may have short-term benefits to some managed 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, some fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Based on 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 plow and dredging activities. However, opportunistic species (striped bass) may also utilize the project area as a 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. Additionally, the short sections of pipeline that cross utility cables that would be covered with concrete mats of rock could act as artificial reefs. These structure would serve as habitat for various invertebrate and fish species that are attracted to hard structures.

5.1.3 Cumulative Impacts

Cumulative impacts result when impacts associated with a proposed project is superimposed on or added to impact associated with past, present, or reasonably foreseeable future projects within the area affected by the proposed project. Although the individual impacts of the separate projects may be minor, the additive effects from all the projects could be significant.

A cumulative impact to EFH could result if impacts arising from the construction activities combine with impacts of other nearby projects that disturb EFH to cause a greater impact than the additive effect of each individual impact. The construction corridor would be in a disturbed state for at least a year and some areas would be in a state of recovery for a longer time. Therefore, the

disturbed area may not have the capacity to provide epibenthic and infaunal recruits to a nearby disturbed site or provide adequate habitat to fish relocating from a nearby disturbed area. Also, impacts nearby the construction areas may diminish the rate at which re-colonization of the construction area occurs. The overall effect could be a greater loss of benthic prey species and EFH for a longer period of time than if each project occurred separately. There are several other projects that are proposing to place utilities across the Long Island Sound seabed (see section 3.13 of this EIS). If these projects were to occur nearby and were constructed in the same time period as the ELI pipeline, then there is the potential for cumulative impacts to occur.

6.0 CONCLUSIONS

6.1 IMPACTS

The construction of the ELI pipeline would result in various impacts to the Long Island Sound EFH, managed species, and other species with important recreational and commercial value. The primary impacts would be:

direct impacts (buried and crushed organisms);

mostly short-term but some long-term disruption of the seabed and associated biological communities;

temporary disturbance and displacement of fish species;

temporary increased sediment loads and turbidity in the water column;

short-term loss of food items to fisheries; and,

sediment transport and redeposition

The ELI Project would impact a substantial area of Long Island Sound EFH thus impacting some managed species and other species that utilize the same habitat. Most of the impacts would be temporary or short-term in nature. However, some impacts to EFH could be long-term.

The ELI Project pipeline would primarily affect soft bottom habitat across 17.1 miles of Long Island Sound. The selected route is biased towards crossing soft bottom (or sand and silt bottom) habitat because it is more resilient to temporary disturbance and has the ability to recover to pre-construction conditions faster than coarser substrate or that of live bottom habitat. Most of the impacts to soft bottom habitats are expected to recover in 1 to 3 years. However, portions of the trench and deep anchor scars that remain unfilled could collect fine materials, develop poor water quality and benthic communities different than the original ones. Impacts to the short section of a shellfish lease area crossed would take longer (greater than 3 years) to recover due to the time required for sediment reconsolidation and for shellfish to reach marketable size.

The impacts on managed species and other species with commercial and recreational value would be mostly temporary and short-term. This is because the primary impacts to fish species would result from construction activities that would disrupt some of their habitat and cause temporary impairment of water quality due to high turbidity and suspended solids concentrations during trenching activities. Most juvenile and adult fish are motile and would actively avoid direct impact from the pipe laying and trenching activities. Some impairment of ability of managed species to find prey items could occur, but this effect would be temporary and spatially limited to the immediate vicinity of pipeline construction activities.

The largest indirect impact to managed species and other species with commercial and recreational value would be the destruction of prey species (benthic fauna). Impacts to benthic fauna

would occur during the one-time pipeline installation event and be mostly short-term. The trenching would result in mortality and injury to most of the benthic community in the primary impact zones. Recovery of most of the disturbed soft bottom communities would be expected to occur within 1 to 3 years. However, some areas may take longer to recover and would represent a conversion of EFH.

6.2 MITIGATIVE MEASURES

Iroquois has proposed an effective plan to minimize and avoid impacts to EFH, federally managed species, and other species with commercial and recreational value. The route of the pipeline has been specifically selected to avoid rocky subtidal habitats, and minimize impacts to shellfish lease beds. Iroquois proposes to minimize impacts to EFH by primarily using the subsea plow for trenching and by allowing natural sediment deposition to backfill the trench. Iroquois' proposed construction schedule of late fall through early spring would also minimize impacts to many life stages of managed species and other species with commercial and recreational value.

The following is a summary of actions already taken by Iroquois to minimize impacts, future actions proposed by Iroquois, and the recommended mitigative measures proposed by the Federal Energy Regulatory Commission (FERC) to minimize impacts to EFH.

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

Performed field investigations to describe the existing environment;

Selected a route that crosses primarily fine grained sediment habitat, minimizes impacts to shellfish lease areas, and avoids impacts to subtidal rocky habitats; and,

Developed an offshore SPCC Plan for prevention and cleanup of accidental fuel and chemical spills;.

Additionally, Iroquois is proposing to use the following construction practices to minimize impacts to EFH:

Use the subsea plow trenching method for pipeline lowering where conditions permit;

Schedule construction during fall and winter months to impact minimum number of federally managed species and other species with important commercial and recreational value; and,

Allow natural sediment deposition to backfill the trench, which would avoid the various impacts associated with another pass of the bury barge.

The FERC has developed the following recommendations to further reduce the impacts to EFH:

Require Iroquois to work extensively with the NMFS, CTDEP, NYSDEC and interested organizations in coordinating a desired construction schedule to minimize impacts (see environmental condition number 14 in section 5.0 of the EIS);

Utilize midline buoys to minimize cable sweep impacts (see environmental condition number 15 in section 5.0 of the EIS); and,

Restore the seabed to within ± 1 foot of original condition (see environmental condition number 16 in section 5.0 of the EIS).

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