December 19, 2006

Mr. Gene H. Muhlherr, Jr.
Islander East Pipeline Company, LLC
454 East Main Street, Route 1
Branford, CT 06405

RE: Water Quality Certification Application #200300937-SJ

Dear Mr. Muhlherr:

I am writing in regard to the above-referenced application submitted by Islander East Pipeline Company, LLC ("Islander East") pursuant to section 401 of the Clean Water Act ("the Act") for Water Quality Certification ("WQC"). As you are aware, on February 5, 2004 the State of Connecticut Department of Environmental Protection ("Department") denied your WQC application. Pursuant to the Energy Policy Act of 2005, Islander East sought relief through the federal courts and on October 5, 2006 the United States Court of Appeals for the Second Circuit ("the Court") rendered a decision in Docket No. 05-4139-ag. In its decision, the Court remanded the matter back to this agency with the direction that the Department conduct the sort of review required by federal law. The Department has complied with the Court's directive.

As stated in the enclosed Decision, the Department has again concluded that the proposed pipeline project would violate Standards No. 1 and No. 2 of the State of Connecticut Water Quality Standards ("WQS") and the Connecticut Anti-Degradation Implementation Policy. Accordingly, the Department hereby denies Water Quality Certification Application #200300937-SJ in accordance with Section 401(a)(1) of the Clean Water Act.

As Department staff have stated on several occasions, we are not opposed to the construction of a natural gas pipeline across Long Island Sound. We recognize that a reliable and robust system of natural gas supply for this region serves the public interest in both New York and Connecticut; however, we believe there are other pipeline routes that would avoid the impacts to sensitive nearshore areas posed by the present application. Should the applicant wish to discuss a proposed pipeline alignment which would substantially minimize the impact to sensitive nearshore areas, I will make appropriate staff available for such discussions at the earliest mutually agreeable opportunity.

If you have any questions regarding the enclosed determination, please contact Mr. Brian Thompson, Director of the Office of Long Island Sound Programs, at (860) 424-3034.

Yours truly,

/s/ Gina McCarthy
Gina McCarthy
Commissioner

GM/slj/pbf/db

Enclosures –Decision and Appendices

cc: Colonel Curtis Thalken, District Engineer, US Army Corps of Engineers
Richard Blumenthal, Connecticut Attorney General
Robert Varney, EPA Regional Administrator, Region 1 EPA

Water Quality Certification Application #200300937-SJ

Islander East Pipeline Company, LLC

Executive Summary

The Islander East Pipeline Company, LLC has proposed to construct a natural gas pipeline that crosses Long Island Sound from Juniper Point in Branford, Connecticut to Wading River in Long Island, New York. The application under consideration by this Department pursuant to Section 401 of the federal Clean Water Act for consistency with Connecticut's Water Quality Standards ("WQS") includes three sequential construction methodologies - horizontal directional drilling ("HDD"), dredging and backfilling, and plowing - each with a distinct set of environmental impacts. The affected area in Branford, the Thimble Islands, is noted for its high water quality, unique geological features, valuable shellfish habitat, and active shellfish industry.

The WQS state:

1. It is the State's goal to restore or maintain the chemical, physical, and biological integrity of surface waters. Where attainable, the level of water quality that provides for the protection and propagation of fish, *shellfish* [emphasis added], and wildlife and recreation in and on the water shall be achieved.

2. Existing and designated uses such as propagation of fish, *shellfish* [emphasis added], and wildlife, recreation, public water supply, agriculture, industrial use and navigation, and the water necessary for their protection is to be maintained and protected.

After a thorough review and consideration of the record as directed by the U.S. Court of Appeals for the Second Circuit in its October 5, 2006 decision, the Department finds that:

1. The waters of the Thimble Islands region have been assigned a Water Quality Classification that requires exceptionally high water quality and habitat conditions be maintained in order to fully support existing and designated uses.

2. Shellfish harvesting is specifically identified in the Water Quality Standards as a designated use for this area.

3. The existing high water quality conditions, in concert with the fine-grained cohesive seafloor sediments of the Thimble Islands region of Long Island Sound currently provide

exceptionally high quality shellfish habitat and historical records confirm that shellfish harvesting is an existing use[1] for water in this area.

4. Connecticut's Water Quality Standards, consistent with the federal statutory mandate at 40 C.F.R. §131.12(a)(1), prohibit any change in water quality conditions if that change will result in the loss of an existing use.

5. Dredging would directly eliminate an existing designated use (commercial shellfish beds) in an area of approximately 5½ acres, and this dredged area would be backfilled with non-native coarse stone.

6. The use of engineered backfill (non-native coarse stone) would permanently and substantially alter the seafloor, and the applicant has not met its burden of demonstrating that the habitat for seafloor (benthic) organisms and their community structure will recover to pre-project conditions within a reasonable period of time, if ever.

7. The engineered backfill would prevent future commercial shellfishing in this area.

8. Dredging, plowing, anchor strikes and anchor cable sweeps would alter benthic habitat and seafloor contours within a corridor encompassing approximately 1,119 acres of existing and potential shellfish resources. The seafloor disturbance caused by these operations would result in the loss of commercial shellfish harvesting in an area of 588 acres and eliminate 531 acres of submerged lands from future shellfish harvesting.

9. Bottom sediments disturbed during dredging would become suspended in the water, dispersed by currents and re-deposited on shellfish resources surrounding the dredged area resulting in smothering of benthic organisms and damage to shellfish habitat for a period of years.

10. Drilling fluid used during the proposed horizontal directional drilling operation would be released onto the seafloor, by design and possibly as a result of unintentional release, at which time some of the bentonite would enter the water and subsequently settle onto the surrounding seafloor smothering benthic organisms and habitat.

The use of an engineered backfill would permanently eliminate the existing productive shellfish bed habitat and create an entirely new habitat type that may be incapable of supporting the existing biological integrity of the natural habitat in contravention of the WQS No. 1 and No. 2. The new coarser backfill material, in addition to the variation in bottom contours caused by the direct bottom disturbance from equipment operation, would create an obstacle to the existing water-dependent agricultural use of shellfishing in contravention of WQS No. 2. The sedimentation impacts of this pipeline construction also violate the State's WQS No. 1 and No. 2

[1] Existing uses are defined by federal law as uses that have actually occurred since November 28, 1975.

by creating a situation that does not maintain the chemical, physical, and biological integrity of surface waters and, as such, the project fails to protect the existing and designated uses of the receiving waters.

For these reasons, the Department has again concluded that approval of the proposed pipeline project would be inconsistent with the State of Connecticut Water Quality Standards. Specifically, the proposed project would be inconsistent with the State's Anti-Degradation Implementation Policy as stated in Standard 2. This Standard, required by federal law, mandates that designated uses be achieved and maintained where feasible and existing uses and the level of water quality necessary to support those uses be protected in all cases without exception.

It is important to note that any single inconsistency with the Water Quality Standards is sufficient grounds for denial of the application. Based on the foregoing, Islander East has not met its obligation of determining that the proposed activity is consistent with the State's Water Quality Standards.

Determination

In accordance with Connecticut General Statutes Section 22a-2, the Commissioner of the Department of Environmental Protection has jurisdiction over all matters relating to the preservation and protection of the air, water and other natural resources of the state. Pursuant to Connecticut General Statutes Sections 22a-359 through 22a-361, the Department has regulated dredging and the erection of structures and the placement of fill in the tidal, coastal and navigable waters of the state since 1971, and its predecessor agencies have regulated such work since 1939. In implementing these responsibilities, the Department has evaluated over 6,500 applications for impacts to the environment, navigation, and coastal uses such as recreation and shellfishing since 1971.

The proposed work was evaluated by the Department for compliance with the applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, the State of Connecticut's Water Quality Standards[2] including the Connecticut Anti-Degradation Implementation Policy, Water Quality Criteria adopted pursuant to Section 22a-426 of the Connecticut General Statutes, and the goals and policies of Chapter 444 of the Connecticut General Statutes. Based on this review, the Department has determined that the proposed work in the proposed location is inconsistent with the Water Quality Standards. The work, as proposed, would adversely affect water quality, prohibit the existing and designated uses of the receiving waters for an undefined period of time and alter the existing biological integrity of natural habitats in the Thimble Islands region. In addition, Islander East failed to provide an adequate application to establish that impacts to existing water quality, benthic resources and water dependent uses have been minimized to the greatest extent practicable. Accordingly, the Department hereby denies Water Quality Certification of Application #200300937-SJ in accordance with Section 401(a)(1) of the Clean Water Act.

The Record

In making this determination, the Department has considered the points raised by the U.S. Court of Appeals for the Second Circuit in its October 5, 2006 decision and, as directed by the Court, has conducted the type of review required by law of the administrative record in

[2] Connecticut's most recent water quality standards were adopted effective December 17, 2002.

connection with Islander East's WQC application. A majority of the materials provided by Islander East in support of its WQC application were originally submitted as appendices to the Structures, Dredging and Fill/Tidal Wetlands and 401 Water Quality Certification application ("SDF/TW/WQC application") dated February 13, 2002. This application, DEP R. 7, contains a number of documents that will be referred to throughout this Decision. For citation clarity, these frequently referenced items from Attachment F of DEP R. 7, will be referred to as follows:

- "Community Structure Survey" - Pellegrino, "Macrobenthic Community Structure Along The Proposed Islander East Gas Pipeline Route In Long Island Sound," January 2002;

- "Bottom Characterization Survey" - Pellegrino, "Bottom Characterization Surveys of Selected Subtidal and Nearshore Environments Off Juniper Point," January 2002;

- "Soil Test Results" - Haley & Aldrich, Inc., "Report On Laboratory Soil Test Results Natural Gas Pipeline Crossing Long Island Sound, Branford, Connecticut To Wading River, New York," January 2002;

- "Marine Geophysical Survey" - Ocean Surveys, Inc. ("OSI"), "Final Report Marine Geophysical Survey Program Islander East Pipeline Branford, CT to Wading River, NY," May 18, 2001; [3]

- TRC Environmental Corporation ("TRC"), "Vibratory Core Sampling Report," February 4, 2002; and,

- "2002 Impacts Analysis Report" - TRC, "Impacts Analysis Report,"[4] February 12, 2002.

Appendix A of DEP R. 7 is the "Marine Pipeline Installation Methodology," February 4, 2002, which contains:

- Concepts for Subsea Containment of Drilling Fluid, and
- Directional Drilling Monitoring and Operation Program.

Several additional reports and amendments were submitted throughout 2002, including:

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[3] The Marine Geophysical Survey included hydrographic, sub-bottom profile, side-scan sonar, magnetometer, and acoustic Doppler current profiling. The OSI report presents a discussion of regional geology, Long Island Sound sediment distribution, meteorological conditions, fisheries, and vessel traffic. The survey area from Branford, Connecticut to Wading River, New York included three potential pipeline route options through the Thimble Islands and several modified/alternate pipeline routes. Appendix H of the report includes plan view and profile data of the entire survey area. The three route options through the Thimble Islands converge approximately 6 miles off the Branford mainland ("convergence point") and then follow one route across Long Island Sound. Other than this report and the three route options considered through the Thimble Islands, Islander East offered no further baseline information on any other alternative pipeline routes along the Connecticut shoreline.

[4] The 2002 Impacts Analysis Report discussed "the existing resources within the project corridor, the potential impacts to those resources, and mitigation measures that may be implemented to offset impacts." The overall report included terrestrial/upland, freshwater aquatic and marine/Long Island Sound resource impacts.

- DEP R. 38, "Zajac Video Analysis" - Zajac, "Analysis of Video Records of Sea Floor Features Collected by Remotely Operated Vehicle Along the Proposed Islander East Gas Pipeline Corridor in Long Island Sound," August 2002;

- DEP R. 121. Under one cover letter dated September 5, 2002 from Joseph Reinemann (Islander East) to Susan Jacobson (Department), the following documents were submitted:

    - Bohlen,[5] "*On the Erosion and Transport of Sediments Displaced By The Construction of the Islander East Natural Gas Pipeline Across Long Island Sound: A Continuing Investigation*," July 18, 2002;

    - Bohlen, "*An Initial Evaluation of Marine Sediment Dispersion Associated with the Installation of the Islander East Natural Gas Pipeline*," April 8, 2002; and

    - Applied Science Associates, Inc. ("ASA"), "Dredged Material Mound Dispersion Analysis Using LTFATE," July 2002.

In correspondence dated March 13, 2003, Islander East withdrew the original WQC and the subject WQC application was submitted. This new application proposed significant modifications to the original application, specifically related to the changes in the installation technology. Between the depths of 13 feet and 20 feet, the originally proposed mounding of native sediment adjacent to an exit pit and trench was eliminated. Instead, Islander East proposed to dispose of the native sediments at an offshore disposal site and the exit pit and trench would be backfilled with an engineered backfill (a non-native course backfill). Additionally, the depth of pipeline cover for the entire pipeline was minimized from 3 feet to 2 feet in an effort to eliminate one barge pass.

The project modifications proposed between the initial SDF/TW/WQC application submittal and the final WQC application proposal resulted in an application file with a patchwork of documents. Some of these documents were no longer relevant to the Islander East proposal by the time the Department made its ruling on the WQC application. Included in this patchwork of documents was the Federal Energy Regulatory Commission ("FERC") Final Environmental Impact Statement ("FEIS") (DEP R. 123) which was completed in August 2002. While the FEIS provides valuable resource discussions regarding the original proposed

[5] Frank Bohlen, Ph.D., a University of Connecticut marine sciences professor, was contracted by Islander East to predict the erosion and transport of sediments associated with the originally proposed trenching methodology that included mounding sediments along the trench. While two initial studies were provided to the Department, Islander East specifically declined to submit Dr. Bohlen's final report to the Department.

construction technology impacts, it does not address the modified installation techniques or impacts associated with such techniques which were proposed in early 2003.

This mosaic of application documents becomes problematic in that Islander East's WQC application relies, in part, upon benthic recovery predictions for installation technologies that are no longer proposed. Specifically, the scientific studies that were cited with the original proposal were based on benthic recovery in areas that were dredged without the engineered backfill. This is very problematic as these studies did not consider the replacement of native substrate with the bank-run gravel engineered backfill that creates an entirely new habitat. Therefore, any studies or opinions provided by Islander East concerning post-dredging studies or recolonization rates of benthic fauna cannot be relied upon when considering the revised installation technology.

Project Proposal

The existing Islander East proposal under consideration by this Department includes three sequential construction methodologies: horizontal directional drilling (HDD), dredging and backfilling with engineered backfill, and plowing. These construction techniques are described in detail in the Pipeline Installation Methodology section of this Decision, below. Where the project enters Long Island Sound at the Connecticut shoreline, the landward-most 3,500 linear feet of pipeline is proposed to be installed in the ground underneath the nearshore waters from Juniper Point utilizing HDD. At the termination of the HDD drill path, an exit pit of approximate dimensions 18 feet deep by 130 feet wide by 301 feet long is proposed for excavation. From this exit pit, a dredged trench approximately 5 feet deep by 37 feet wide by 5,851 feet long[6] is proposed to extend to approximately Milepost 12. The exit pit and 5,851 linear foot trench is proposed to be backfilled with bank-run gravel, referred to as "engineered backfill."[7] From Milepost 12 for nine miles to the Connecticut/New York state line, three passes of a sub-sea plow are proposed to: lay the pipe; create a trench 5 feet deep by 25 feet wide at the top of slope and install the pipe; and backfill previously sidecast sediment mounds. Please refer

[6] DEP R. 72 indicates that the trench is 5,851 feet long. Previous application materials indicated the trench was 5520 feet long. Since the purpose of the April 28, 2003 letter (DEP R. 72) was specifically to address impact area, the Department has relied on the accuracy of the 5,851 foot estimate for disturbance calculations discussed later in this Decision.

[7] There are discrepancies in Islander East's application materials regarding the exact composition of the engineered backfill material. Refer to discussion of this in the Engineered Backfill section beginning on page 36 of this document.

to Appendix A, attached hereto, for a comparison of the original versus the proposed installation technologies.

Existing Site Conditions

The following description of Long Island Sound was provided in TRC's 2002 Impacts Analysis Report at 6:

> "The Long Island Sound is bounded by Connecticut and Westchester County, New York, on the north and by Long Island on the south. The Sound is approximately 113 miles long (east to west) and about 20 miles across (north to south) at its widest point with mid-Sound depths between 60 and 120 feet. Whereas most estuaries have a single outlet to the sea, the Long Island Sound is unique in that it has two connections with the sea. The Long Island Sound is open through the 'Race' to the east and through the East River and New York Harbor to the west. The Long Island Sound Watershed encompasses approximately 16,000 square miles, and includes the Connecticut, Quinnipiac, Housatonic, Norwalk, and Thames Rivers."

Islander East's proposed pipeline installation across Long Island Sound begins in Branford, Connecticut and heads in a generally southerly direction through the Thimble Islands complex to approximately the New York border in Long Island Sound where it turns southwest to reach shore at Wading River, New York on Long Island (Figure 1). As currently sited, the proposed work corridor will pass through the geological features of the Thimble Islands, a total of 141 islands and exposed rock outcroppings creating a total of 15 miles of coastline[8] within 6.2 linear miles. Many of the larger islands are east of the proposed work corridor but several exposed rock outcroppings are located to the west. This hummocky topography formed of bedrock is found nowhere else in Long Island Sound.

The pipeline is proposed to leave shore in Branford from Juniper Point in a recessed section of shoreline with headlands[9] to both the east, Sachem Head in Guilford, and the west, Indian Neck in Branford. Because of this recessed location, the pipeline would need to cross a significant expanse of relatively shallow water (< 20 feet deep). Please refer to Figure 2 which highlights the location of the 20 foot depth contour. This water depth is significant because Islander East has identified the 20 foot depth as the minimum depth requirement for the pipe-

[8] Total coastline was measured through use of Geographic Information System by measuring total perimeter of all island features within the town boundary.
[9] A headland is defined as "an extension of land seaward from the general trend of the coast; a promontory, cape, or peninsula."

installation vessels to install the pipe using the less intrusive plow installation technology (FEIS at 3-71).

The Department's major concern with the Islander East proposal specifically relates to the siting of the pipeline in an area which includes an extensive stretch of shallow water, requiring the direct excavation and imported gravel backfill of approximately 5½ acres of shellfish beds. If the pipeline were proposed in a location where depths were sufficient to use a combination of less intrusive installation technologies, Islander East would likely be able to avoid the more disruptive excavation and backfill processes and have fewer impacts on water quality, coastal resources and the water-dependent uses that rely on both.

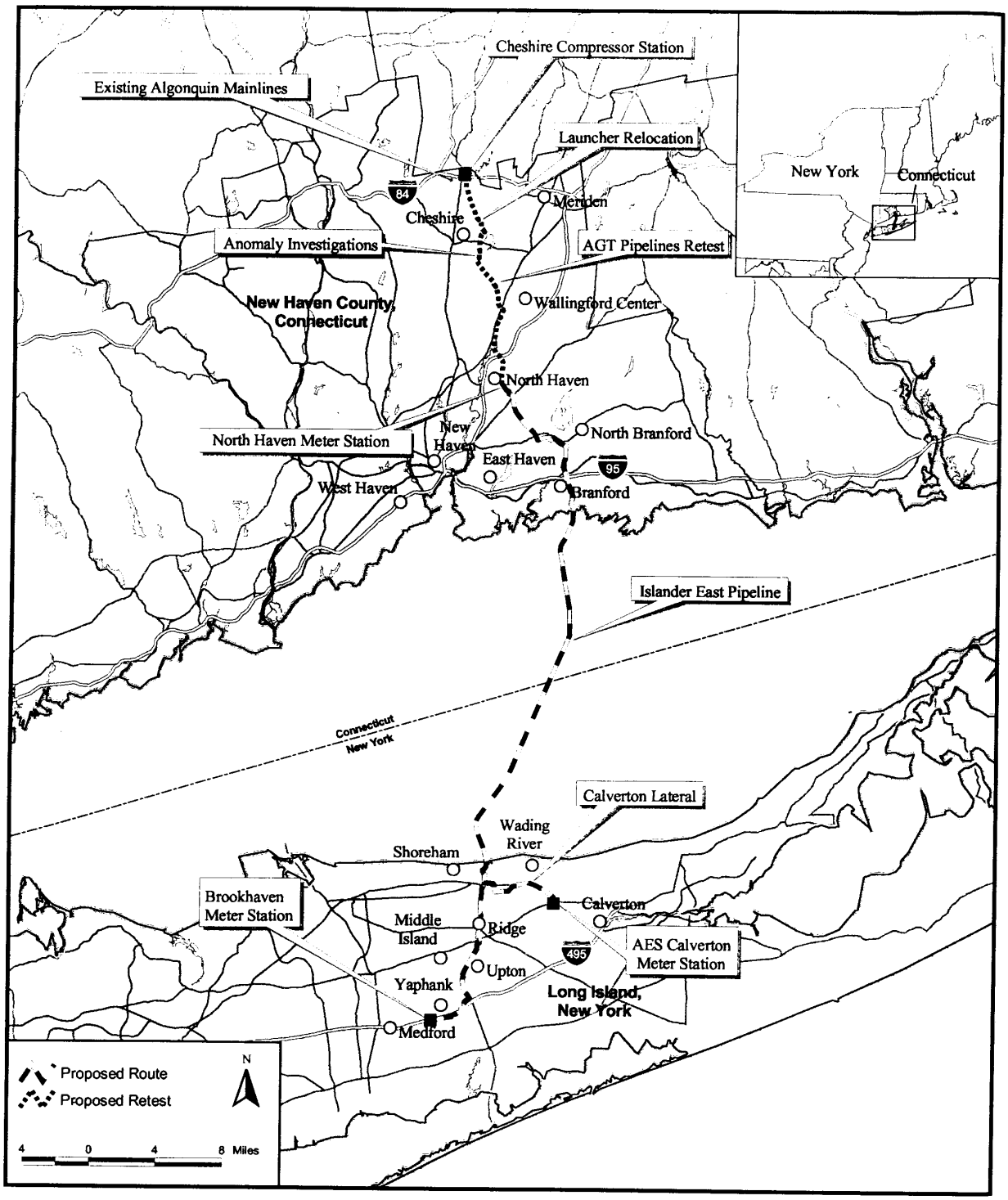

Figure 1. Proposed pipeline route, from FERC FEIS, at 2-2.

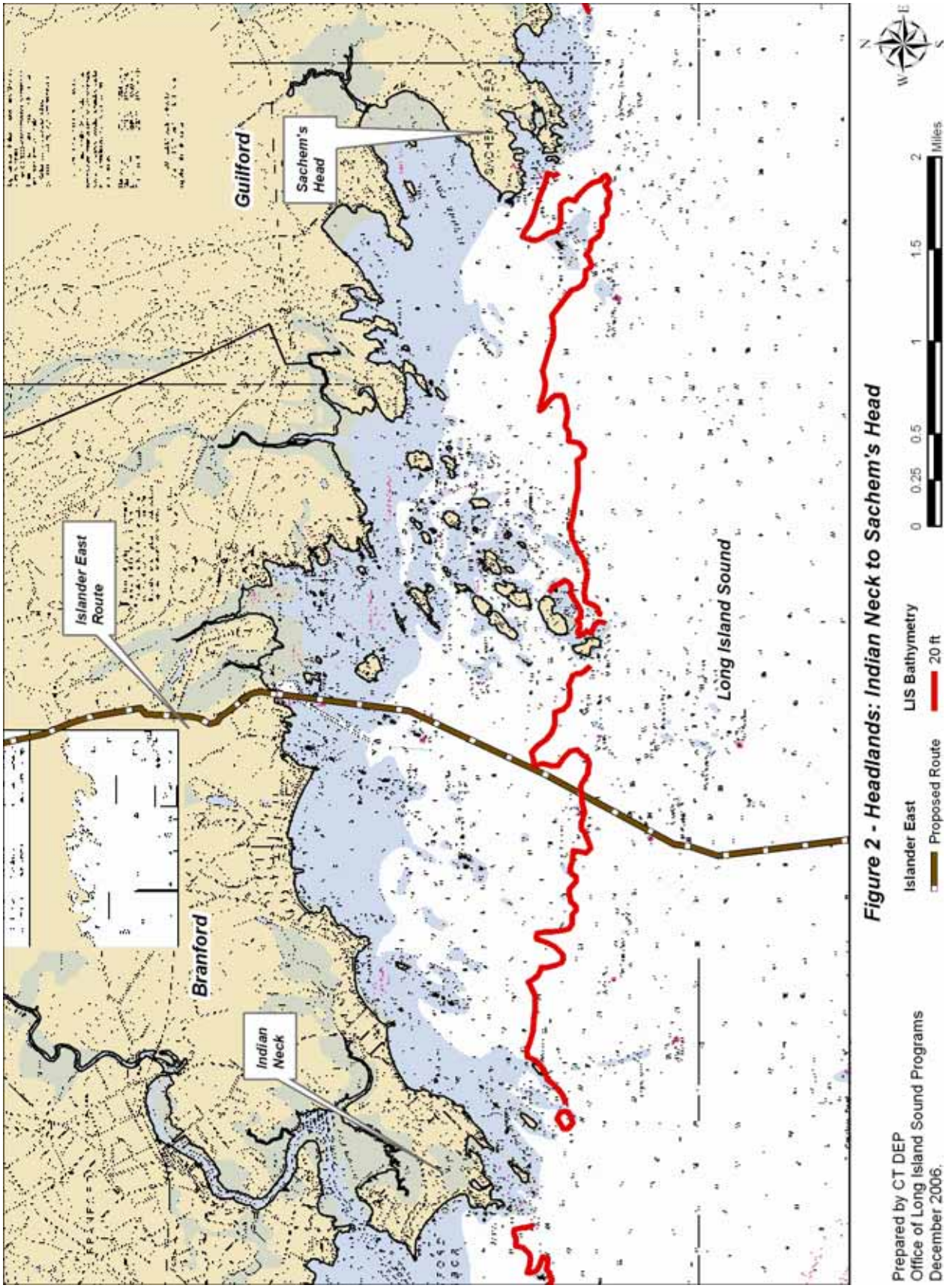

Figure 2 - Headlands: Indian Neck to Sachem's Head

Geology

The unique geology of the Thimble Islands is attributed, in part, to the glacial history of the region. The following discussion was provided in the Marine Geophysical Survey, at 4:

> "The regional geology, especially the surficial sediments for both the onshore and offshore areas of Long Island Sound, is closely tied to the recent glacial history of the area and a marine sea transgression into the present Long Island Sound. From a geologic time perspective, all these events have occurred within a relatively short period, i.e., within the last 20,000 years. A final series of glacial advances approximately 18,000 to 16,000 years before present (BP) transgressed the present day Connecticut and adjacent southeastern New York area. The advance of these glaciers effectively denuded the region of the prior unconsolidated materials leaving the bedrock, composed of Precambrian and Paleozoic schists, granites and gneisses, exposed at the surface. The glaciers moved toward the southwest to the current location of Long Island where the two distinct glacial moraine deposits mark the end of the glacial advances."

As the glaciers receded northward, a freshwater lake was formed in the area that is now Long Island Sound. Thick deposits of layered silt and clay accumulated at the bottom of this lake for approximately 1,000 years. The land that was formerly underneath the mile-thick glaciers began to rise with the relief of the glacier's weight. The rising land caused the lake to drain and the accumulated fine sediments were exposed to air until approximately 13,000 years BP when rising sea levels breached a natural dam near the Race on Long Island Sound's eastern end and once again, the sediments became submerged.

OSI's Marine Geophysical Survey noted that the seafloor over the vast majority of the project area was gently sloping and uniform with some irregularity in the Thimble Islands area associated with the presence of rock either exposed on the seabed or in the shallow subsurface. Within the Thimble Islands, OSI (at 57) found a profile depicting irregular and abrupt vertical relief over short horizontal distances (at 36). Please refer to Figure 3 which shows a general profile of the central Long Island Sound Basin and the irregularities found along the Connecticut shoreline. The profile view shows the general slope of the underlying bedrock which is shallow to exposed at the Connecticut shore and significantly deeper, under coastal plain sediment, at the Long Island shore. In general, the OSI surveys reflect the Department's understanding of the Thimble Island geology and its unique character when compared to the rest of the pipeline route.

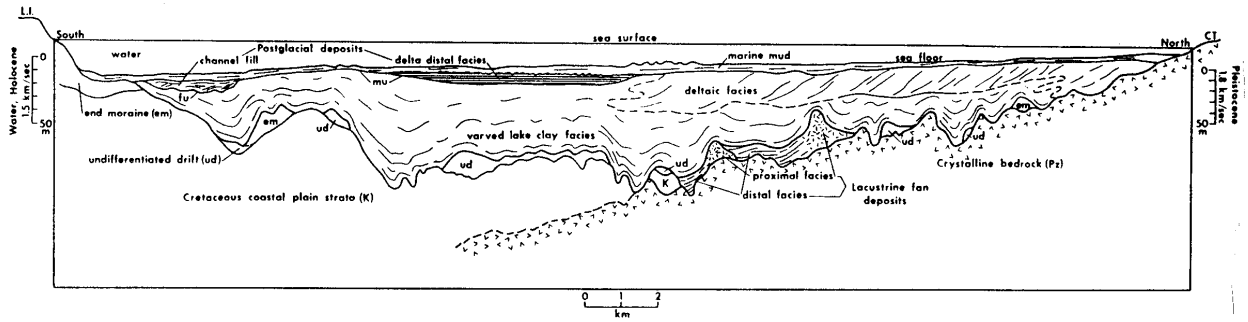

Figure 3. Profile of the central Long Island Sound Basin from Marine Geophysical Survey, at 6.

Soils

The geological processes which created Long Island Sound have produced a thick layer of fine-grained cohesive sediments. Sediment deposition has continued over the past 13,000 years and the seafloor is generally smooth as a result. In the Marine Geophysical Survey at 57, OSI reports an approximately 10 foot layer of silty clay to cobble size material, referred to as unconsolidated sediment, characterizing the survey area outside of the Thimble Islands. Dr. Bohlen defined the sediments along the proposed pipeline corridor as fine sands, silts and clays with the exception of sands found along the north shore of Long Island (DEP R. 121, April 8, 2002 at 4). Within the Thimbles, the compact layer of silt and clay deposits is interspersed among deposits of glacial till and/or bedrock.[10] In its undisturbed form, the sediment is naturally compressed and is referred to by both Dr. Bohlen and John Roberge, P.E.[11] as being "cohesive" and "plastic."

The OSI Marine Geophysical Survey included the collection of soil samples every one mile along the proposed pipeline route using the vibratory core method. Once collected, the soil data was provided to Haley & Aldrich and TRC for further analysis. In the Haley & Aldrich Soil Test Results, standard engineering tests were conducted and concluded that sediments were fairly homogenous and tended to be plastic and cohesive. Plasticity is a property of the fine-grained portion of a soil that allows it to be deformed beyond the point of recovery without cracking or changing volume appreciably.[12] A table providing various soil test results for each

[10] Glacial till is a mix of rocks and finely ground material deposited by melting glacier. Bedrock is generally the solid rock that underlies loose surface material. Most of the Thimble Islands are exposed bedrock.
[11] John Roberge, P.E., of Coastal Engineers, LLC was commissioned by the Town of Branford's Blue Ribbon Committee to evaluate potential sedimentation impacts from pipeline installation. Mr. Roberge is a Stratford, Connecticut-based coastal engineer frequently hired by applicants seeking SDF/TW/WQC permits from the Department.
[12] Definition from http://www.tpub.com/content/engineering.

core sample included a description of the clay's plasticity; fat clay is highly plastic and lean clay is slightly plastic.

A portion of the vibratory core sediment data collected by OSI was sent to TRC for analysis of their chemical constituents. Presented in TRC's Vibratory Core Sampling Report is a description of the sampling and analysis methods, the regulatory criteria used to establish testing parameters and the analytical results of the sediment testing. Sediment sampling plans were designed based upon consultations with both New York and Connecticut state regulatory agencies and the U.S. Army Corps of Engineers ("Corps"). In general, the bulk "sediment chemistry of the sediments proposed for dredging exhibited very low heavy metal concentrations, with pesticides, PAH, and PCB contaminant concentrations being below detection limits" (DEP R. 74).

Currents

A current is generally defined as the horizontal movement of water and it may be either tidal or non-tidal. The overall current flow in Long Island Sound depends on the tide. In the Marine Geophysical Survey at 18, OSI notes that "[tides] in Long Island Sound are semidiurnal (two high tides per day) with little variation in phase or heights across the Sound in the area investigated." In general, currents flow to the west during an in-coming (flood) tide and to the east during an out-going (ebb) tide.[13] The Marine Geophysical Survey at 56 notes the "[m]aximum current flow expected in mid-Sound is approximately 0.7-0.8 knots (at a depth of 15 feet)."

Tidal currents are influenced by wind wave induced velocities. The influence of wind wave induced velocities is significant in shallow water. The Marine Geophysical Survey at 21 provides a good introductory discussion of current velocities and the effects of wind waves in shallow waters such as those found around the Thimble Islands:

> "In the central part of Long Island Sound (survey area), where tidally driven currents are lower in velocity than the funnel shaped eastern entrance, wind and wave driven currents may play an increased role in defining the physical processes affecting the seabed. For example, winds of 30 knots (typical of a winter northeaster storm) can produce significant wave heights of 4 to 7 feet and induce bottom current velocities of greater than 0.4 knots. This effect is most pronounced in the shallow areas, and is virtually negligible at water depths greater

[13] OSI at 20 states, in reference to current speed and direction, that "in areas of constricted water flow significant variations do exist, especially in and around the Thimble Islands along the Connecticut shoreline."

> than 60 feet. As a point of reference, the wave orbital current velocity necessary to re-suspend fine-grained mud is approximately 0.3 knots. Signell, 1997 estimated that the near-bottom current velocities needed to re-suspend fine-grain sediments are reached about 1-10% of the time in the shallower, near shore portions of Long Island Sound."

Measured tidal currents within the nearshore areas are significantly greater than those found in deeper waters because of the wind wave induced velocities. Dr. Bohlen's initial investigations (DEP R.121) provided valuable insights to the existing process of tidal current, wind and wave impacts on sediment and resuspension in the shallow Thimble Islands region. Survey data collected by Dr. Bohlen and presented in his July 18, 2002 report concur with OSI's observations presented in the Marine Geophysical Survey. Dr. Bohlen found frequent occurrences of waves approximately 3.3 feet in height (1 meter) in the vicinity of the HDD transition basin and dredged trench. He reported that wave height would increase near bottom wave orbital current velocities[14] 0.7 knots (38 centimeters/second) in water depths –30 feet and 1.26 knots (62 centimeters/second) in water depths -15 feet[15] (DEP R. 121, July 18, 2002 at 4).

Natural Sediment Resuspension

The current velocities, soils, smooth topography and shallow water around the Thimble Islands combine to create a significant sediment mobilization and transport factor. Bottom conditions are characterized by high concentrations of suspended sediment that are kept in constant motion. TRC's 2002 Impacts Analysis Report at 28, notes "Bohlen (1993) has shown that sediment transport over much of LIS largely involves the resuspension and deposition of a soft 'fluff' layer (a mobile layer of materials just above the sediment-water interface referred to as the nephloide layer), but patterns varied among basins." The Impact Analysis Report also noted that in the vicinity of the proposed work area, "the amount of suspended material ranged from 5-10 mg/L with amounts increasing somewhat with increasing water velocity." In DEP R. 121, April 8, 2002 at 6, Dr. Bohlen reports that in the proposed work area, it is only the top 10 millimeters of the sediment surface that is being constantly resuspended in the high-energy environment. Bohlen found that the sediments deeper than 10 millimeters were uniformly fine-grained and cohesive (a clump of cohesive sediment tends to stick together rather than separate

[14] An orbital current is the circular motion imparted to the water column by a passing wave.

into individual sediment particles) with a relatively low water content and a high bulk density. These dense, cohesive, in-situ deposits resist erosion and are not prone to resuspension as are the top 10 millimeters.

The FEIS at 3-49 notes: "[a] study by Signell et. al, 2001 describing the physical conditions in the Long Island Sound that affect sediment suspension notes that fine sediments along coastal margins are regularly resuspended by tidal currents, that storm related events occur between 10-20 times per year that can redistribute fine sediment to depths of 20 meters, but in depths greater than 20 meters, the frequency of wind or tidal driven currents with velocities to resuspend fine sediment is infrequent." For the most part, the Department concurs with statements in the record regarding the frequency of storm events and the associated sedimentation.

Ecology

The shallow waters off Juniper Point in Branford give rise to the numerous Thimble Islands which provide sensitive and critical habitats (Bottom Characterization Survey at 2). The area is generally recognized as important colonial waterbird nesting habitat,[16] a waterfowl wintering area,[17] and one of only four primary seal haul-out areas in the State of Connecticut.[18] This area has been recognized by the United States Fish and Wildlife Service as a significant habitat complex in need of protection and has been incorporated into a larger New Haven Harbor Complex in the Northeast Coastal Areas Study: Significant Coastal Habitats of Southern New England and Portions of Long Island, New York.[19] Significant and unique areas called out in this report specifically include bird rookeries on the Thimble Islands and abundant shellfish beds in the nearshore areas.

Both the original Islander East application (DEP R. 7) and the FERC FEIS (DEP R. 123) contain descriptions of the fisheries resources and the essential fish habitat found within the

[15] Existing depths in the vicinity of the HDD exit point (MP10.9) are 12 to 15 feet and 22 to 25 feet at the southern end of the trench (MP12).
[16] DEP R. 94 at 3.
[17] DEP R. 94 at 3.
[18] DEP R. 94 at 3.
[19] Appendix C of DEP R. 94.

proposed pipeline corridor.[20] DEP R. 7 contains numerous studies and inventories of the existing benthic communities found within the Thimble Islands in the vicinity of the proposed pipeline corridor. Most notably, Peter E. Pellegrino, Ph.D. and Roman Zajac, Ph.D. describe the various bottom habitats along the proposed pipeline corridor and the species found within these distinct habitats. Dr. Pellegrino was commissioned by Islander East to conduct two ecological surveys and Dr. Zajac was hired to conduct a video survey of the proposed pipeline route using a remotely operated vehicle ("ROV").

Dr. Pellegrino's Bottom Characterization Survey, at 2, delineated "the location and nature of sensitive habitats in the vicinity of the pipeline route within Long Island Sound." This survey focused on the nearshore and subtidal environments off Juniper Point in the Thimble Islands. One may reasonably infer from Dr. Pellegrino's study description that the only sensitive habitats along the pipeline route are in the Thimble Islands. Dr. Pellegrino surveyed 17 subtidal stations and 15 nearshore stations[21] in this region and described the sediment and the invertebrate species found within a 0.5m^2 grid. The subtidal (always underwater) stations are described as being generally dominated by silt/clay to sandy/silt soft sediment. Four of the stations were selected for their proximity to rocky bedrock outcrops and the remaining sites were located within shellfish lease areas. The nearshore sites (both subtidal and intertidal/exposed at low water) were located between Lewis Island and Brown Point. Two of the stations were noted for

[20] The following list of marine species was copied from Table 3.4.1-2 in the FEIS entitled "Recreational or Commercial Important Fish Species Known to Occur In the Project Area."

Butterfish	Pollock	Sand Eel
Summer Flounder	Red Hake	Sand Lance
Silver Hake	Windowpane	American Lobster
Weakfish	Stripped Bass	Crab
Winter Flounder	Sturgeon	Oyster
Scup	Tautog	Clam
Black Sea Bass	Cunner	Conch
Bluefish	Sandbar Shark	Scallop
Atlantic Mackerel	Sand Tiger Shark	Squid

Several clarifications and corrections should be made to this list. Species that should be added include: Little skate, Atlantic herring, Atlantic menhaden, American shad, Horseshoe crab, and Hickory shad. "Crab" may refer to Blue, Green, and most likely Asian Shore crabs. Sand lance and Sand eel are both common names for one species, the American sand lance. The lance should not be on this list because it is not targeted by any fishery. The FEIS list does not specify what type of sturgeon, but it should not be on the list; both Atlantic and Shortnose sturgeon harvesting is prohibited as both species are protected. Species that are infrequent and not considered recreationally or commercially important in the project area include: cunner, sand bar shark, sand tiger shark, Atlantic mackerel, scallops and pollock. Additionally, stripped bass should be striped bass.

the growth of tidal wetlands and one station contained intertidal flats. Dr. Pellegrino noted that both of these habitats are critical and sensitive ones. Both the subtidal and nearshore stations contained a variety of habitats and invertebrate species ranging from silt/clay soft mud with only worms to silty-sand and exposed rock with barnacles, mussels, oysters, snails, crabs and worms.

The purpose of Dr. Pellegrino's Community Structure Survey, at 1.0, was "to document existing benthic community structure and to provide a benthic baseline against which future changes may be detected." Included in this baseline survey was a brief literature review citing some of the major benthic inventories conducted in Long Island Sound. Dr. Pellegrino's methodology included taking four benthic samples from each of 12 locations along the pipeline route. The samples were taken in both Connecticut and New York waters by OSI during the Marine Geophysical Survey and delivered to Dr. Pellegrino for analysis. Six of the twelve sample locations were within the Thimble Islands area. In general, those samples with the highest species richness and community density were located within this area. He reports that the "assemblages found associated with the proposed gas pipeline route are typical of most soft sediment habitats in central and western LIS." It is important to note that nowhere in either of his two surveys prepared for Islander East does Dr. Pellegrino attempt to predict the recovery rates of macrobenthic communities following pipeline installation.

Dr. Zajac provided an analysis of seafloor video tapes taken by a ROV (DEP R. 38). The video tapes, taken by OSI in the spring of 2002, were forwarded to and interpreted by Dr. Zajac to provide a better understanding of the "ecological characteristics of the benthic habitats and communities along the proposed pipeline corridor" (DEP R. 38 at 1). The first video survey line spanned Long Island Sound from the horizontal directional drilling exit point near the Connecticut shore across to Long Island. Ten east-to-west lines were run perpendicular to the first survey line near the Connecticut shoreline and 8 east-to-west lines were run near the New York shoreline. These perpendicular lines were approximately 3,000 feet in length to capture the area closest to the pipeline location which would be directly affected.

The results of Dr. Zajac's video analysis corroborated the earlier reports of benthic communities provided by Dr. Pellegrino and the soil characteristics found by both OSI as reported in the Marine Geophysical Survey and in Haley & Aldrich's Soil Test Results. The

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[21] Page 3 of the report indicates 25 nearshore stations were sampled. This number appears to be an error as only 15 stations are described in the survey and presented in Table 3.

Connecticut nearshore area was described by Dr. Zajac as a "heterogeneous, but primarily mud bottom." Please refer to Figure 4 for a chart summarizing the diverse habitat types found along the Connecticut shore in the predominantly soft sediments. For comparison of the sea features found along the rest of the proposed corridor, see Figures 5 and 6. Figure 4 shows that the "most numerous features found along the CT lateral survey lines were pits, mounds and burrows (P, M, B), tracks and tubes." These relatively shallow features in the mud are created by organisms such as lobsters, crabs and fish. The high occurrences of vents[22] noted by Dr. Zajac are the product of bivalves (*i.e.*, clams, *etc.*) and other burrowing fauna. In his analysis, Dr. Zajac does not offer a recovery rate estimation for macrobenthic communities following pipeline installation.

In general, these surveys are a valuable aid in documenting the existing conditions in Long Island Sound and in providing a baseline against which future changes caused by pipeline installation can be monitored. None of the Pellegrino or Zajac reports cited in this section, however, made any benthic recovery rate predictions and were based on the previous application proposal (dredging with replacement of native sediment) and not on the current application proposal (dredging with placement of engineered backfill).[23]

[22] A vent is a hole/tunnel at the substrate surface caused by the expulsion of water and/or waste from burrowing organisms.

[23] The only possible statement made by Dr. Zajac that could be credited with making a prediction is in DEP R. 60, TRC report, at 5, where Dr. Zajac discusses the potential impacts of sedimentation on the benthic community adjacent to the project. This impact assessment cannot be considered a complete as habitat recovery within the project corridor was not considered. (See Appendix J, attached hereto, for Dr. Zajac's complete memo.)

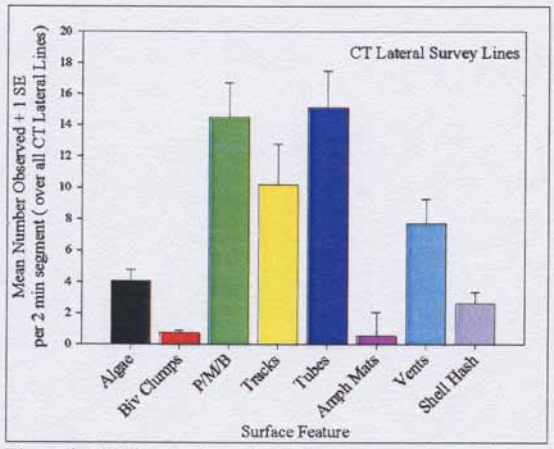

Figure 4. Relative number of sea floor features observed over all CT lateral survey lines.

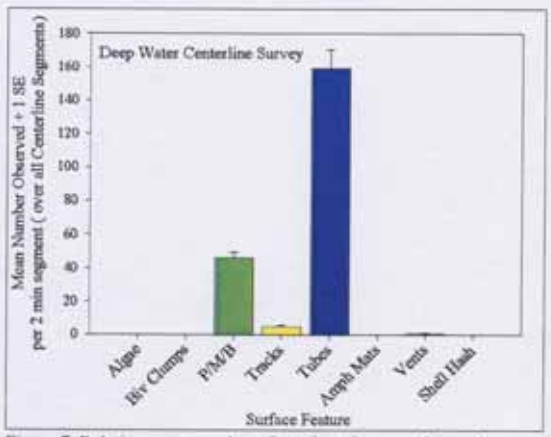

Figure 5. Relative mean number of sea floor features observed over all deep water centerline segments between MP 13 and MP 31.

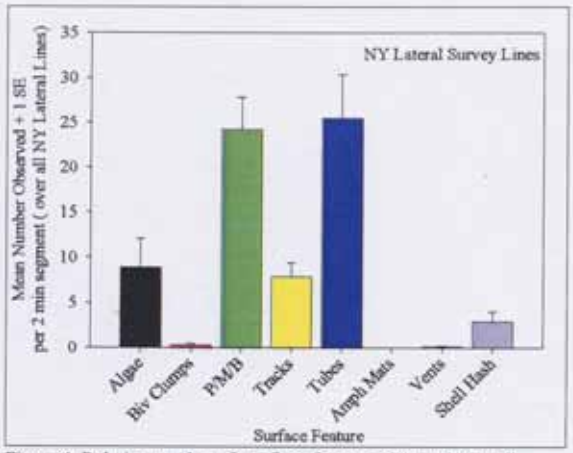

Figure 6. Relative number of sea floor features observed over all NY(north shore Long Island) lateral survey lines.

Figures 4, 5 and 6 from Zajac Video Analysis, at 42, 43 and 45.

The FEIS compiled the survey information from the Zajac and Pellegrino reports and presented a list of the substrate, locations, and benthic macrofauna in Table 3.4.1-1 (Figure 7) as follows:

TABLE 3.4.1-1
Characteristics of Benthic Habitats Along the Islander East Marine Crossing

Substrate	Locations	Benthic Macrofauna [a]
INTERTIDAL		
Intertidal Flats	MP 10.2, Branford, Connecticut	Clams, oysters, snails, worms
Rocky	MP 10.2, Branford, Connecticut	Abundant macro algae, oysters, barnacles, mussels, snails
Tidal Wetlands	MP 10.2, Branford, Connecticut	Amphipods, snails, crabs, and shellfish
Sandy	MPs 32.8, Shoreham, New York	Surf clams, worms, gem shells
NEARSHORE		
Rocky	MPs 10.2 to 12.5, Connecticut	Abundant macro algae, mussels, sea stars, sponges
Soft Sediment with abundant shellhash	MPs 10.2 to 12.5, Connecticut	Clams, oysters, lobster burrows, crabs, and various worms
Sandy	MPs 32.1 to 32.8, Shoreham, New York	Surf clams, gem shells, and worms
OFFSHORE		
Soft Sediment	MPs 12.5 to 32.1, Long Island Sound	Low-to-high diversity, dominated by mid to late stage succesional communities, polychaete dominated, bivalves and gastropods relatively abundant

[a] This list is not intended to be comprehensive.

Figure 7. Benthic habitat table from FEIS, at 3-56.

Water Quality

As discussed above, the Thimble Islands are located in Long Island Sound's Central Basin. Overall, chemical and bacteriological water quality conditions in the Thimble Islands region are consistently excellent. Long-term water quality monitoring initiated in 1991 by the Department as part of the Long Island Sound Study[24] shows that only rarely are these waters subjected to the impacts of low dissolved oxygen conditions that generally develop each summer in areas farther to the west in Long Island Sound.[25] In general, this area meets the Long Island Sound Study interim management goal for bottom water dissolved oxygen, usually with dissolved oxygen concentrations that are excellent and fully supportive of marine life.

[24] Initiated in 1985, the Long Island Sound Study (LISS) is a partnership of federal, state, and local governments agencies, private organizations and citizens formed to develop and implement a comprehensive conservation and management plan for Long Island Sound. Funding support for the LISS is provided by the Environmental Protection Agency through the National Estuary Program and by the States of Connecticut and New York.
[25] See Appendix B of DEP R. 112 for a summary of monitoring program and a sample of survey results.

Water Quality Classifications

Section 303 of the amendments to the Act (33 U.S.C. §1333) requires that states adopt surface water quality standards. These state water quality standards are submitted to, and must be approved by, the Administrator of the U. S. Environmental Protection Agency ("EPA"). Connecticut's most recent water quality standards were adopted effective December 17, 2002. State water quality standards provide the basis for water quality management decision-making by the Department and are a critical component in the state's efforts to achieve the fundamental goal established in the Act of protecting and maintaining the physical, chemical, and biological integrity of the nation's waters. At a minimum, the standards must be sufficient also to meet the interim goals of the Act for achieving water quality conditions that allow for protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water.

As required by the Act, Connecticut's Water Quality Standards include:

- beneficial designated uses for each waterbody (*e.g.*, habitat for marine fish and aquatic life, shellfish harvesting for direct human consumption, navigation, *etc*.) that are assigned on the basis of the waterbody's classification;

- narrative and/or numeric water quality criteria that must be met to support each designated use; and

- policy statements including an anti-degradation policy and implementation procedures designed to maintain and protect water quality in high quality waters, and protect and maintain existing uses in all cases.[26]

These elements do not stand alone, but must be read in such a fashion as to be internally consistent within the Water Quality Standards and consistent with the goals of the Act.

The resulting water quality classifications for the Thimble Islands region are SB/SA and SA. The SB/SA Classification signifies that the water quality management goal is to achieve full support of all Class SA designated uses. Class SA waters are designated for habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption; recreation; industrial water supply; and navigation.[27] A Class SA designation is the highest that

[26] See Appendix A of DEP R. 112 for State of Connecticut, Department of Environmental Protection, Water Quality Standards.
[27] Please refer to Appendix A of DEP R. 112 (Water Quality Standards, pages 15-17) for a more complete description of these classifications and designated uses.

can be achieved. Please refer to Figure 8 for a water quality classification map of the Thimble Islands region.

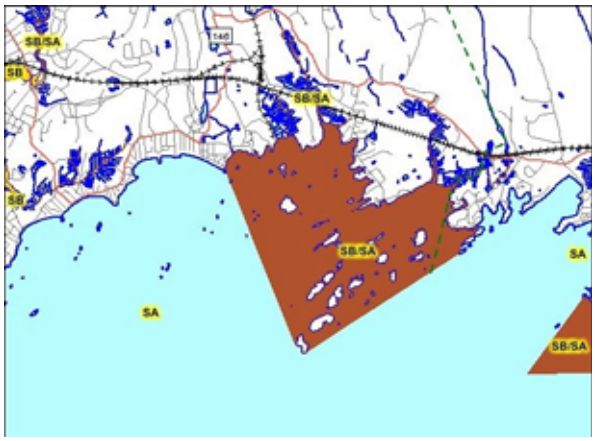

Figure 8. Water Quality Classifications from DEP R. 112, Appendix C.

Existing Uses

Waters of the Thimble Islands region support recreational and commercial boating and fishing, sightseeing tours and unique wildlife observation opportunities such as seal watching. In 2004, the Thimble Islands region supported 3 full-time commercial lobstermen and 14 licensed shellfishermen as well as numerous recreational fishermen.[28] Historically, the area supported as many as 5 commercial lobstermen with 15 other part-time lobstermen also fishing the area at one time or another. The existing use most relevant to this Decision is that of commercial shellfishing. Commercially valuable shellfish found in the area of the proposed pipeline route include eastern oyster (*Crassostrea virginica*), hard clams (*Mercenaria mercenaria*), soft clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), and channel whelk (*Busycon canaliculatum*). The Department's primary concern with pipeline installation at the proposed location is the impact to oyster and hard clam cultivation and harvesting.

Long Island Sound in general and the Thimble Islands area in particular supports an economically-significant and long-established shellfishing industry. Connecticut's nationally-recognized shellfish industry produces the highest quality oysters in the United States. In 2001, Connecticut ranked first and second, respectively, for the production of hard clams and oysters

[28] DEP R. 94, at 3.

along the East Coast of the United States despite a devastating blow to oyster production from MSX[29] in 1997 (DEP R. 112, at 3).

Through routine interaction and consultation with the Connecticut Department of Agriculture Bureau of Aquaculture ("DA/BA") on regulated activities, the Department has developed an expertise in understanding both cultivation and harvesting methods. Also, this expertise is derived through direct regulation of certain types of aquaculture activities. Significant preparation and work goes into shellfish cultivation and harvesting. Just as farmers seed and plant their fields, shellfishermen prepare and stock their beds with juvenile seed shellfish. In general, the waters of Connecticut contain shellfish seed beds, grow-out beds and depuration[30] beds. Seed beds are most often naturally productive areas where the water depth, temperature and currents promote natural shellfish production. The juvenile shellfish is taken from a seed bed by the shellfisherman to a grow-out bed where the shellfish will filter nutrient rich waters and grow quickly. These "Shellfish Growing Areas" are designated by DA/BA in accordance with the National Shellfish Sanitation Program to meet the requirements of the United States Food and Drug Administration. Once the shellfish reach market size, they are taken from the grow-out beds to depuration beds where they spend from two weeks to six months, depending on the water quality designation of the area from which they are coming. In the depuration beds, impurities pass through the shellfish's system. Depuration beds are "Conditionally Approved" or "Approved." Refer to the Shellfish Area Classification map of the Thimbles region, in Appendix D of DEP R. 112.[31] In the vicinity of the Thimble Islands, the pipeline is proposed primarily through "Approved" shellfishing areas.

This combination of exceptional water quality and existing habitats around the Thimble Islands is such that the grow-out beds and the depuration beds are actually one and the same, thus, eliminating an entire harvesting stage for the shellfisherman. The DA/BA "Approved" designation, which is the most stringent and, therefore, the most difficult to achieve, recognizes that the water is of sufficiently high quality to allow for direct human consumption of shellfish without the requirement for relocation and depuration of the shellfish. Although many of

[29] MSX (multinucleated sphere unknown) is a single-cell parasite that invades the oyster's soft body, grows and divides within the tissue, and eventually overwhelms the normal metabolic processes in the shellfish resulting in death.

[30] Depuration is defined in www.shellfishquality.ca/glossary.htm as the "process of using a controlled, aquatic environment to reduce the level of bacteria and viruses in live shellfish."

Connecticut's marine waters are classified SA or SB/SA, the designated areas where suitable habitat exists and monitoring data documents the exceptionally good water quality necessary to receive an "Approved" designation by DA/BA are, in fact, quite limited. In general, the waters off Branford support approximately 46% of shellfishing areas approved for direct harvest in eastern Connecticut.[32] Islander East's consultants recognize the importance of water quality to shellfishing: regarding the anthropogenic input of contaminants into surface waters, TRC, at 9 in the 2002 Impacts Analysis Report, notes that the "project area is distant enough from potential source areas that levels are low, as evidenced by the presence of oyster leases that are used for depuration."

As previously mentioned, a significant amount of work goes into commercial shellfish harvesting. In order to seed a bed, both oyster and clam seed may be purchased from commercial hatcheries or they may be harvested from existing seed beds. A usable oyster seed bed depends upon the availability of an even topography and hard substrate.[33] Released by the millions, the oyster eggs become fertilized in the water column and develop into free-floating larvae. As the developing larvae settle out of the water column they attach themselves only to hard substrate which is free of silt. These "spat" often settle on cultch which is crushed shell. The seafood industry produces large volumes of cultch, which is in high demand as it is reused by shellfishermen and planted on the seed beds. The cultch is used to improve seed bed quality by providing hard surface for spat. The spat-covered cultch is harvested from the seed beds with an oyster dredge[34] and brought to the grow-out beds. The spat are then broadcast off the vessel to settle in the grow-out beds. Once the oysters are grown-out and harvested, the shellfishermen collect the remaining shell or cultch from the grow-out bed, place it in an upland location so that algal growth will dry (thus keeping the hard surface clean), and then place the cultch back into seed beds prior to the next spring season.

Clam harvesting is different than oyster harvesting because clams burrow into the sediment rather than remaining on the surface attached to hard substrate. To harvest young

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[31] A more detailed description of the specific parameters and required criteria relating to authorization for direct harvest of shellfish is referenced in the Water Quality Standards (Appendix A of DEP R. 112) at 17.
[32] DEP R. 112, at 3.
[33] Naturally occurring oysters are found in hard substrate anywhere from the intertidal area to depths of approximately 35 feet, while commercial oysters are grown in depths to 50 feet.
[34] Oyster dredges are approximately 30 inches by 60 inches and weigh 30 to 300 pounds. The teeth are 2 ½ inches long and are at a 90 degree angle to the frame. The dredges are towed along by a boat with the 2 ½ inch teeth skimming the substrate surface at the bottom.

clams, a clam dredge is used. The dredge has 1 inch openings to allow all clams smaller than 1 inch to pass through.[35] These smallest clams are left in the seed bed to be harvested in subsequent years. A typical clam dredge used in Long Island Sound consists of a steel sled with a basket that typically weighs no more than four hundred pounds. Like the oyster dredges, the clam dredges are also towed by a vessel. Seawater is pumped down a hose at low pressure to a manifold on the front of the sled where it is directed through nozzles into the seafloor to loosen the softer sediments into which clams burrow. Teeth, up to two inches long, extend below the runners and steer the clams into the basket. Nozzles located in the basket clean off the clams. Critical to a successful tow is achieving the proper balance between the depth of the teeth into the substrate, the manifold angle, appropriate water pressure for the type of bottom, boat speed, line length and current flow.

The record leaves no doubt that the nearshore area through which the pipeline is proposed is a productive and important shellfishing area. DEP R. 116 is a map entitled "Town of Branford Privately Owned Shellfish Beds" showing that the proposed pipeline corridor traverses directly through these beds. DEP R. 117 is the Town of Branford's recently completed (2003) division of the recreational shellfish area into approximately 20-acre plots for commercial lease.[36]

Islander East's consultants have consistently acknowledged that the Thimble Islands area maintains extensive and productive shellfish beds. TRC notes "[s]hellfish of commercial importance inhabit nearshore Connecticut waters traversed by the proposed project including species such as American lobster, blue crab, clams, and oysters."[37] TRC further states that "Town of Branford shellfish lease areas are located in the area traversed by the HDD installation, town recreation shellfish area are located in the dredge section of the route and state leases are in areas of dredging and plowing."[38] TRC's observations were completely consistent with these comments: "[s]ide scan surveys show that the sea floor is relatively featureless to about MP12, and that just past MP12, there are extensive trawl marks throughout the corridor and adjoining

[35] If clams smaller than 1 inch are sought, an appropriately sized wire mesh may be placed over the basket.
[36] The Town of Branford first initiated commercialization of the recreational bed area in 1998 after receiving complaints that commercial shellfisherman were using the recreational beds. At a Representative Town Meeting in 1998, a 6 month moratorium was initiated while the Town began the process of commercializing the shell fishing grounds.
[37] Impact Analysis Report, 2002 at 8 and 19.
[38] Impact Analysis Report, 2002.

areas of sea floor." The trawl marks are minor marks upon the seafloor attributed to shellfish harvesting.

In the Marine Geophysical Survey, OSI comments that "[o]yster lease areas are abundant throughout the inner shelf region of the southern Connecticut shoreline" (at 17). Also, "[a]long various sections of the proposed pipeline route corridor, the side scan sonar identified continuous and semi-continuous linear features on the seabed. These features appear to be drag marks left by anchors or by fishing activity in the area. Features interpreted as drag marks were most commonly observed along the Connecticut shoreline, shoreward of the route convergence point" (at 58).

While describing the sea floor features along the proposed pipeline route, it was noted in the Zajac Video Analysis that several of the survey lines contained tracks that "were large and appeared man-made, coinciding with trawl marks that were found in the previously conducted side scan sonar" (at 42).

In Dr. Pellegrino's Bottom Characterization Survey at 8, Dr. Pellegrino states: "Station 9 was located in leased shellfish lot #170 adjacent to Roger's Island. The bottom type was soft mud (silt/clay) with moderate amounts of *Mulinia* shell hash. Although no live clams were recovered the substrate at this station should still be considered potential hard clam habitat."

Because the State's water quality standards require the Department to take into account existing designated uses of its waters, the Department must differentiate those impacts associated with an existing water dependent use such as shellfish harvesting, from those impacts associated with pipeline installation which is neither an existing nor designated use. Shellfish harvesting generally involves a disturbance of only the top 2 inches to 3 inches of substrate. As will be explained in the following Pipeline Installation Methodology and Direct Bottom Disturbance sections of this Decision, pipeline installation operations will require sediment disturbance from 5 feet to 18 feet deep. More importantly, the installation impacts will prevent the shellfish beds from being harvested for an unknown, but prolonged, period amount of time.[39]

Pipeline Installation Methodology

The Long Island Sound crossing of the Islander East pipeline would use three separate technologies, each with its own set of associated impacts upon the marine environment. Starting

[39] Refer to discussion in Shellfish Harvesting Section.

from the Connecticut shore, the pipeline would begin at Juniper Point in Branford using a construction methodology known as horizontal directional drilling ("HDD").[40] An HDD exit pit would be excavated several thousand feet offshore to mark the transition of the pipeline from a deep underground burial (> 80 feet) to a shallow surface burial (approximately 18 inches). From the exit pit, a one-mile long trench would be excavated until the project reached the 20 foot bathymetric contour where a plow would be used for pipeline installation in deeper waters past the New York state line. Figure 9 (from DEP R. 73) provides a schematic summary of the installation sections. Appendix B, attached hereto, contains the most recent maps of the pipeline route provided by Islander East (from DEP R. 73 and 93).

[40] HDD enables subsurface installation of linear projects such as cables and pipelines by creating a drill path underneath geological or anthropogenic features.

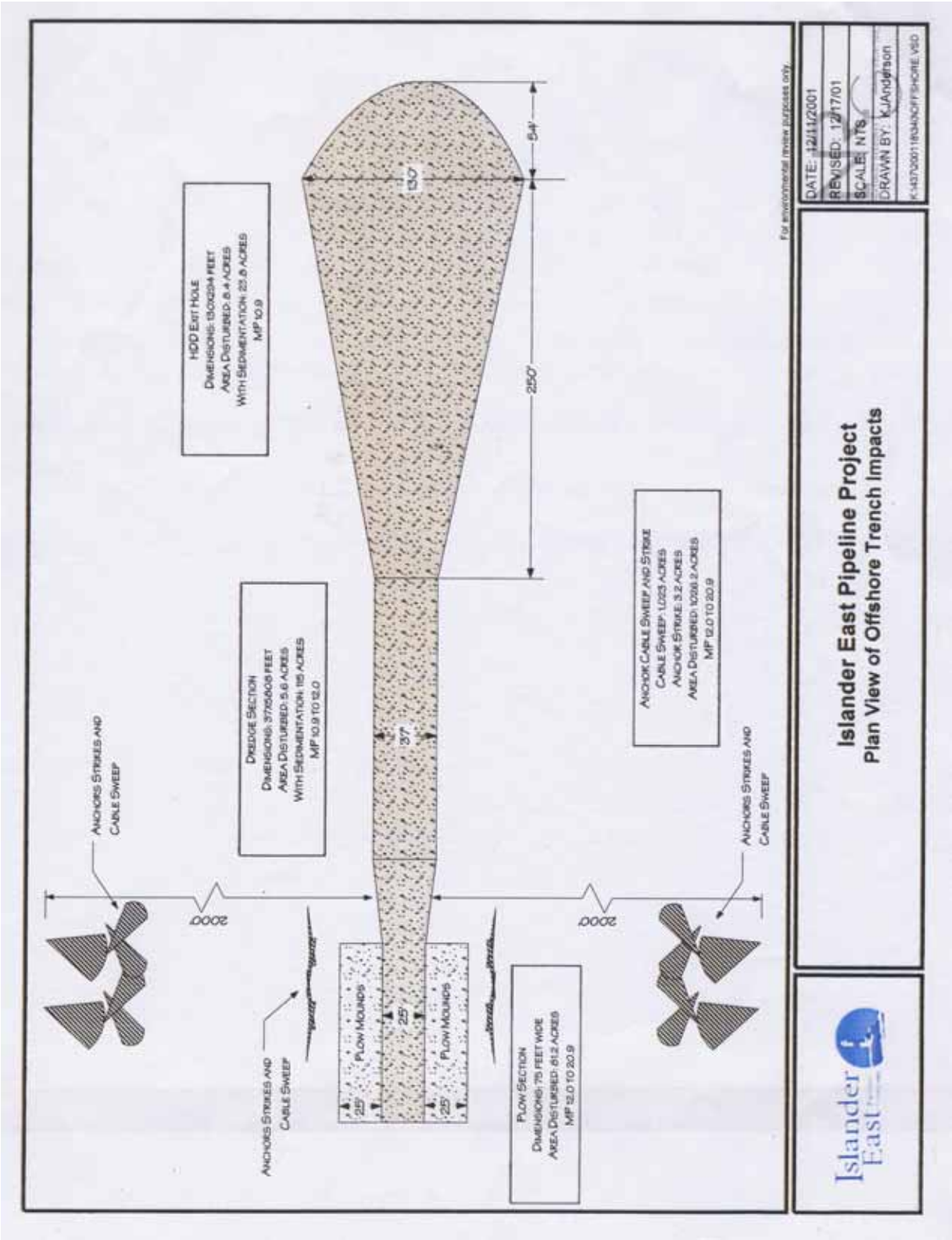

Figure 9. Installation sections from DEP R. 73.

HDD Segment

An understanding of the HDD construction process, including its requirements and limitations, is essential in order to evaluate the potential adverse impacts associated with this type of construction methodology. As currently proposed by Islander East, the HDD staging area would be located at the upland site of Tilcon Connecticut, Inc., an industrial supplier of crushed stone, hot mix asphalt and ready mix concrete. Tilcon's Branford marine terminal is a crushed stone transfer facility where the stone is loaded on barges for distribution throughout the northeast.[41] The FEIS summarizes the HDD methodology as follows:

> "The process would involve drilling a hole from a point on the mainland (entry side) to a point on the seafloor (exit side) and installing a prefabricated segment of pipe through the hole. Islander East estimates that the borehole would be at least 80 feet and up to 120 feet below the sea floor at the Tilcon Channel Crossing. The segment of pipe would be fabricated on a lay barge near the exit hole in Long Island Sound. After the hole is drilled, the pipeline segment would be attached to the drill string on the exit side of the hole and pulled back through the drill hole toward the drill rig. Islander East has submitted a 'Directional Drilling Monitoring and Operations Program for Natural Gas Pipeline Installation in Long Island Sound for Islander East Pipeline Co., L.L.C.' which describes several conceptual techniques for containing and capturing a postion [sic] of the drilling fluid to be utilized during the HDD process in Connecticut. These measures would generally apply to the reaming passes associated with the HDD. Control of the fluid during the pilot hole and pullback passes would be limited to collection of the fluid within the excavation at the exit hole."[42]

More explicitly, once equipment is staged on the upland, a small diameter drill is used to create a pilot hole that will drill between 80 feet and 120 feet below the surface. The pilot hole eventually becomes the pipeline path underground. A magnetic steering tool directs the drill to its final destination. When the pilot hole is completed, the drill punctures the seafloor and drilling fluid will be released. The sequencing of the pilot hole completion and the exit pit excavation is not clear as the record provides conflicting information. The FEIS, at 3-53, states the exit pit "would be excavated immediately after the emergence of the drill head." The FEIS also states, as cited above, "[c]ontrol of the fluid during the pilot hole and pullback passes would be limited to collection of the fluid within the excavation at the exit hole." In order for the

[41] This particular water-dependent use has been in existence at this site since at least 1914.
[42] Section 2.3.4.1 at 2-36, DEP R. 123.

drilling fluid from the pilot hole to be captured in the exit pit, the pit would already need to be in place.

The use of drilling fluids is an integral component of any HDD project. According to the Directional Drilling Monitoring and Operations Program in Appendix A of DEP R. 7, Islander East proposes to use a drilling fluid consisting of bentonite and water. Bentonite is a sedimentary rock formed largely from the clay mineral montmorillonite and maintains a clay-like consistency. Bentonite alone does not exhibit a toxic capacity. According to the Marine Pipeline Installation Methodology, bentonite is often enhanced by the addition of polymers to increase yield. By letters dated September 5, 2002 (DEP R. 37) and September 12, 2002 (DEP R. 39), Islander East provided information on potential additives that may be considered during drilling operations but failed to identify which of 39 potential bentonite products and additives would be utilized.[43] The drilling fluids function to lubricate the bit and drill pipe; stabilize the hole; carry the cuttings away from the drill bit; and, eventually, reduce friction on the pipeline as it is later pulled back through the borehole (FEIS at 3-52). The drilling fluid is continuously circulated from the borehole to a pool/tank at the upland staging area where it is filtered and processed for reuse. The drilling fluid is circulated in the borehole under high pressure.

Appendix B of the Marine Pipeline Installation Methodology (DEP R. 7) is a document on "Concepts For Subsea Containment of Drilling Fluid." Two potential methods of recovering the drilling fluid are discussed at 1-1 and 1-2. The applicant proposes to defer a final decision and development of the system until after an HDD contractor has been selected. The two methods discussed would potentially require setups including mooring systems, conductor pipes and "goal posts" or sheetpilings, tieback pilings/land-anchors and mooring piles. Regarding this facet of the proposal, Islander East's application is vague and largely inadequate. Accordingly, Islander East's materials fail to demonstrate that there will not be any environmental impacts associated with these conceptual containment systems. Considering the scope and nature of the possible recovery proposals, there is reason to be concerned about potential environmental impacts and our ability to determine consistency with the WQS.

[43] There is a contradiction in the record at 3-53 in the FEIS: "[t]he drilling fluids would consist of bentonite clay native rock cutting, and freshwater with no additives". While the FEIS reports that no additives will be used, Islander East has indicated that additives will be used as necessary based on conditions encountered during the drill.

An HDD exit pit will be excavated at the pilot hole termination. The FEIS recommends that the pilot hole be successfully completed prior to creation of the exit pit.[44] The proposed HDD exit pit, approximately 18 feet deep by 130 feet wide by 301 feet long, would be excavated 3,400 feet from shore and would be located in Town of Branford shellfish beds[45] in water approximately 13 feet deep.[46] An exit pit of this size, approximately a football field, would require the excavation and off-site disposal of approximately 5,300 cubic yards of sediment. During excavation, a barge-mounted crane would be held in place with several spuds, which are giant poles driven into the substrate to perform as anchors (see photo in Appendix C, attached hereto). Once the pilot hole is successfully completed and the exit pit is constructed, work vessels at the exit pit refit the drill head with larger drill bits and these are back-reamed through the pilot hole until a 36-inch diameter hole is achieved. While this back-reaming process is underway, Islander East proposes to leave a 4,000 foot section of prepared pipe, called a "pullback string," upon the seafloor. Once the hole is completed, the pullback string would be pulled into the exit hole towards the upland staging area. This pipe section would be tested for damage and the exit pit would be backfilled. Please refer to Appendix C, attached hereto, which contains schematics and photos related to this segment of pipeline installation.

Dredge Trench Segment

From the HDD exit pit, Islander East has proposed to dredge an approximately one-mile long trench to Milepost 12. Islander East has proposed that the trench would be 5 feet deep by 37 feet wide by 5,851 feet long and require the excavation of between 14,000 and 23,000 cubic yards of sediment, depending on the angle of the trench side slopes. Please refer to Figure 10. According to DEP R. at 93, the side slope angle would not be determined until the actual dredging is being conducted: "The actual angle of repose will be determined by site specific conditions at the time of construction, which includes weather and tidal influences." For the purpose of application review, that leaves the total dredge volume (including the HDD exit pit)

[44] As mentioned earlier, there is a contradiction in the record regarding when the exit pit will be excavated.
[45] The Haley & Aldrich "Report on Laboratory Soil Test Results Natural Gas Pipeline Crossing Long Island Sound Branford, Connecticut to Wading River, New York" misidentifies the exit pit as being in "Oyster Lease" #171 (Attachment F in DEP R. 7).
[46] The "Directional Drilling Monitoring and Operations Program For Natural Gas Pipeline Installation in Long Island Sound for Islander East Pipeline Co., LLC"(Appendix A in DEP R. 7) states: "The pipeline will be installed using directional drilling techniques on the Connecticut side in the near shore environment (out to water a depth of

between 19,300 and 28,300 cubic yards. Islander East has provided conflicting information as to the fate of the dredge material, including the material to be dredged from the HDD exit pit. It appears that a majority of the sediment would be placed on barges for open water disposal at one of the Long Island Sound dredge sites; however, in correspondence dated July 29, 2003 (DEP R. 93), Islander East suggests that they may return a portion of this material as backfill to cover the pipe.

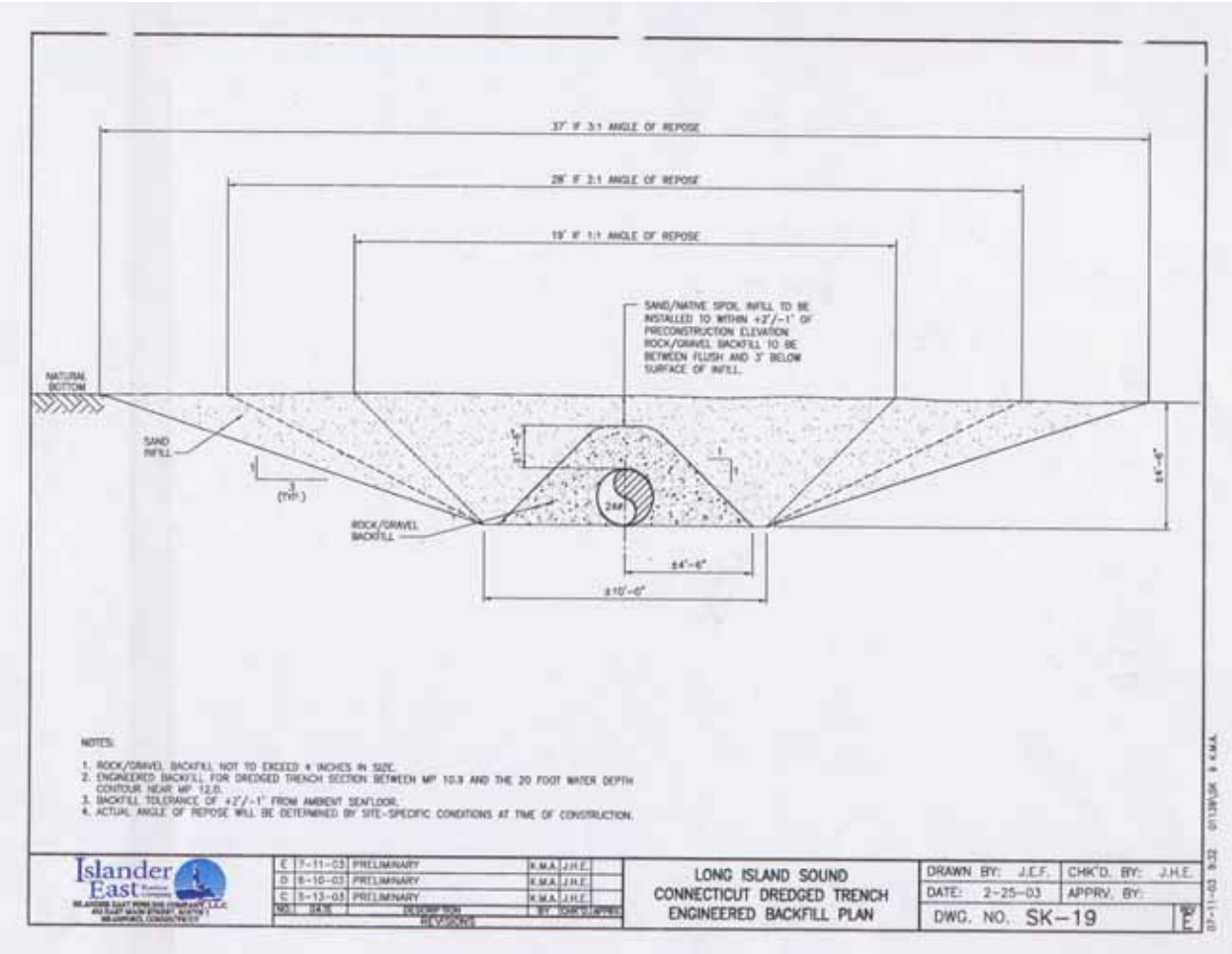

Figure 10. Potential trench side slopes from DEP R. 93.

The most waterward end of the pullback string would be brought onto a laybarge at the site of the exit pit. On the laybarge, the construction of the pipeline is accomplished in an assembly-line fashion. The Marine Pipeline Installation Methodology describes the pipelay barge to be between 260 feet by 72 feet and 400 feet by 100 feet with a draft (depth of the vessel

20+/-) to minimize potential impacts in the intertidal and near shore zones." This statement is obviously inaccurate as a one mile trench with backfill has been proposed to reach the 20 foot bathymetric contour.

below the waterline) as much as 16 feet. Islander East has not addressed the apparent contradiction between the exit pit water depths of only 13 feet deep and its proposal to utilize a barge with a draft of up to16 feet. It is possible that the applicant would need to restrict the loading of a larger barge, use smaller barges with reduced draft, or even undertake additional dredging to accommodate the deeper-draft laybarge.[47] The Department cannot determine the extent of potential impacts from bottom disturbance or dredging associated with use of the proposed laybarge from the information provided by the applicant.

Assuming that a laybarge could somehow be employed as proposed, the vessel will move slowly forward along the one-mile trench segment by pulling itself on the forwardmost anchors, placing the pipe inside the trench as it moves. It would use an array of 8 to 12 anchors deployed from 1,200 to 2,000 feet on each side of the pipeline depending on the water depth. These anchors stabilize the laybarge as the pipe string is processed and placed overboard. Please refer to Figure 11. The anchors would be reset by several attending tugboats. In deeper waters, there is greater distance between the deployed anchors than in more shallow waters. Islander East failed to provide the size and weight of the proposed anchors; however, the Department is aware of other projects where similar types of barge-mounted construction equipment was employed in Long Island Sound where anchors ranging from 7 to 15 tons each were used.[48] The Marine Pipeline Installation Methodology indicates that the anchors are held in place with cables that lie along the bottom for a maximum distance of 600 feet. In the Marine Pipeline Installation Methodology (at 3) it is suggested that the remainder of the cable lengths will be kept off the bottom by using midline buoys.

[47] While there was no discussion of flotation trenches in DEP R. 7, Attachment C contained Sheet 9 of 120 entitled "Typical Floatation Trench Cross-Section." This cross-section, provided as Appendix D, attached hereto, contains a note that explains: "This trench required in shallow areas to achieve minimum barge flotation depth of 8 feet."
[48] Betsey Wingfield, Assistant Director of the Department's Office of Long Island Sound Programs from 1997 until 2003, served on the Governor's Task Force under Public Act 02-95 concerning the Protection of Long Island Sound. Project was the Iroquois Gas Transmission System Eastchester Extension Project . Please refer to Appendix E, attached hereto, for a list of Taskforce technical presentations.

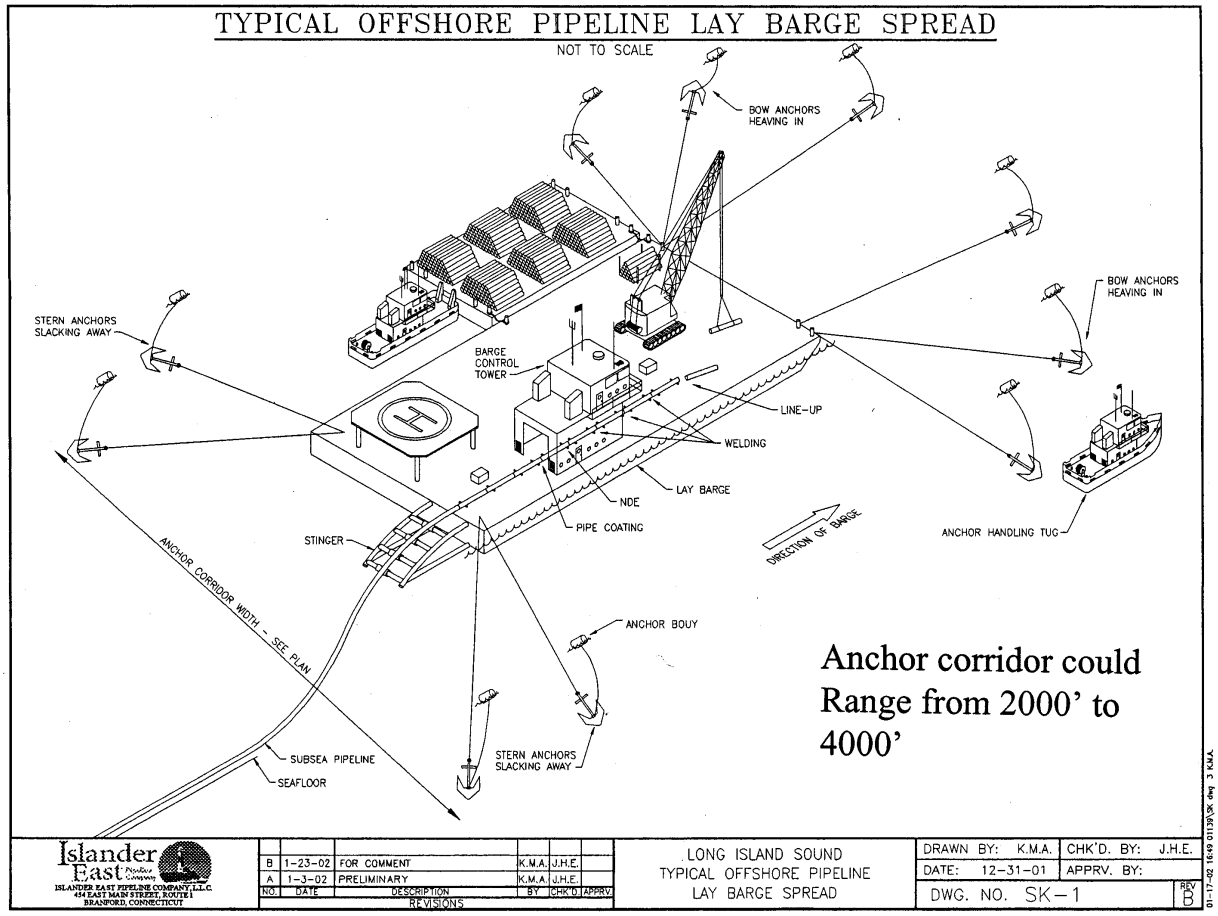

Figure 11. Laybarge with anchor spread from DEP R. 7, Attachment C.

Plow Segment

From Milepost 12 to Long Island, the laybarge would continue, placing the pipe directly on the seafloor rather than in a pre-constructed trench. The barge would return to Milepost 12 to complete a trench pass where a plow is lowered over the pipe and towed so that as the plow moves forward on the seafloor, the soil is mounded on both sides and the pipe is lowered into the trench in the same pass. Please refer to Appendix F, attached hereto, for schematics of this methodology provided by Islander East (in DEP R. 26 and DEP R. 7). Islander East's application materials indicate that the plow-created trench would be 5 feet deep by 25 feet wide at the top with spoils mounds extending 25 feet on each side of the trench. Once this next pass across Long Island Sound is completed, the barge returns again to Milepost 12 where the plow wings are reversed and the trench is backfilled with the native sediment that was previously mounded along the trench sides. The applicant suggests that after these three passes are

completed, the pipeline from Milepost 12 to the New York line would be completely buried with 2 feet of native substrate.[49]

Due to physical restrictions preventing the use of the plow in shallow waters, the plow technology only works in waters that are 20 feet deep or deeper. Because waves and wind-generated currents are not as substantial in deeper waters as they are in more shallow waters such as those in the vicinity of the exit pit, the Department's evaluation reveals that while the sedimentation and turbidity associated with the plowed sediment mounds would be substantial (DEP R. 111), they would likely be found acceptable for this portion of the installation. With the ability to store the native material adjacent to the plow trench, this material can be backfilled upon pipe installation.

Engineered Backfill

Unlike the final pipeline segment, the exit pit and the mile-long dredge trench are proposed in waters between 13 feet and 20 feet deep where waves and wind-generated currents prevent Islander East from successfully temporarily mounding native sediments adjacent to the trench. After revision of installation technology from sediment mounding to sediment removal by barge, Islander East held a technical meeting on April 15, 2003[50] with the Department, DA/BA, and the National Oceanic and Atmospheric Administration's ("NOAA") National Marine Fisheries Service ("NMFS") staff to receive technical input. It was determined that Islander East would need to conduct a study to conclude what trench backfill material would not be subject to scour and erosion. Technical experts at the April meeting, including Mike Ludwig (NMFS), George Wisker (Department) and Dr. Bohlen theorized and agreed that Islander East's interim backfill plan, consisting of sand and rock (March 27, 2003 correspondence, DEP R. 67), would be subject to significant scour and erosion in the trench.[51] In response to this observation, Islander East hired Haley & Aldrich to "evaluate proposed sand backfill materials available from local sources and provide comments and recommendations for:

- Suitability of proposed backfill

[49] The 2 foot burial depth was proposed in DEP R. 69.
[50] DEP R. 70 meeting notes.
[51] While scour and erosion of backfill trench material were the primary focus of agency comments at this meeting, subsequent shellfish habitat discussions focused on the extent of impacts the backfill would have on harvesting equipment operations.

- Maximum height of free-fall (from sea bottom to bottom of tremie pipe[52]) to minimize loss of fine-grained soil
- Optimum size of tremie pipe
- Potential for long term scour of the back fill material."

DEP R. 84 contains Haley & Aldrich's "Report On Engineered Backfill Study Islander East Natural Gas Pipeline Branford, Connecticut" which concluded with a recommendation to backfill the trench with bank-run[53] gravel that contained mostly gravel, no more than 2 inches in diameter and coarse sand (approximately .187 inch in diameter) with a smaller percentage of fine sands. Haley & Aldrich at 4 concludes with:

> "In our opinion, the proposed gravelly coarse to fine sand backfill can be placed by tremie methods. We recommend that the tremie pipe have a minimum diameter of 18 in. to limit the potential for bridging of the backfill in the tremie tube during placement. In order to minimize the amount of fine material in the backfill suspended in water, we recommend that provisions be made to adjust the length of the tremie pipe so that the bottom of the tremie pipe is not more than 3 ft. above the original seabottom as determined at the side of the trench."

The Department concurs with Haley & Aldrich's assessment of engineered backfill requirements. However, Islander East is unclear about its commitment to using the specific engineered backfill that Haley & Aldrich has recommended. In DEP R. 60, Attachment B at 6, TRC referred to the backfill as sand on top of rock: "Rock or gravel of less than 4 inches in diameter is being considered because of its cost, ease of handling, benefits as cover for the pipeline, and other potential habitat benefits." In DEP R. 84, Haley and Aldrich specifically recommend "bank-run gravel that contained mostly gravel, no more than 2" in diameter."

In addition, Islander East's suggestions regarding disposal options (DEP R. 93) appear to retreat from the conclusion reached during the agency technical discussions on April 15, 2003. At page 10 of the July 29, 2003 correspondence from Islander East, the following is noted:

> "If an excess of 24,000 cubic yards of sediment is dredged, the sediment will be returned to the HDD exit area during backfilling. During the April 15, 2003 multi-agency meeting, Islander East indicated to Federal and state agencies that it would be feasible to return up to approximately 3,000 cubic yards of dredged material to the HDD exit area. The excess dredged material will be held on a

[52] A tremie pipe is comparable to a funnel – a barge on the surface of the water would use the tremie to better control where the backfill material was placed on the seafloor.
[53] Bank-run gravel is a term used to define aggregate taken from a natural deposit, usually from a riverbed. The term is derived from "run-of-bank" gravel. It is the Department's understanding that this material is difficult to find as many states do not allow mining of the rivers.

> barge during the period of construction, and then placed in the exit area and capped."

This theoretical disposal concept was mentioned by Islander East at the April 15 meeting, but was never thoroughly described then or at any later date in any submissions from the applicant.[54] Accordingly, the Department could not analyze or review the applicant's analysis of any sediment characteristic changes resulting from dredging and temporary storage on barges.[55]

More troubling, the applicant's own May 2003 submission (DEP R. 84 at 16-1) explains why the native dredge spoil should not be reused: "[t]he temporary storage of spoil would be inefficient and slow. Additionally, backfilling with native spoil would increase sedimentation with the use of the clamshell bucket during backfill operations." Even so, at 16-2, Islander East goes on to describe why the agreed-upon use of a tremie tube to minimize sedimentation would not be feasible: "During the multi-agency meetings in March 2003, during a discussion regarding the backfilling of the dredge trench, Dr. Frank Bohlen stated that based on the samples obtained along the proposed route, the tendency of the spoil would be to remain consolidated. This characteristic would make replacement of the native spoil with a tremie tube impracticable, therefore backfilling would need to be completed with a clamshell bucket."

It is evident that there are significant discrepancies in the record regarding the methodology for the placement of the engineered backfill and even of what material the engineered backfill would consist. From an environmental perspective, an important factor in any ecological prediction for potential recovery rates is an understanding of the proposed habitat type. Considering that Islander East has not definitively even determined the nature or grain size of the materials to be replaced into the trench, it is impossible to even speculate as to which types of fauna would be able to inhabit this area in the future, let alone estimating any potential recolonization or recovery rates.

In sum, because of the missing and contradictory information supplied by Islander East regarding the construction methodologies to be used in the dredging and backfill segment of the proposed pipeline, the Department must conclude that Islander East failed to meet its burden in

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[54] There has been no discussion of sedimentation resulting from backfilling with this fine grain native sediment. In addition, as discussed above, the infeasibility and potential adverse impacts of staging a full barge in water only 13 feet deep have never been addressed.

[55] It is well known to the Department that the process of dredging generally breaks up the sediment (disaggregates) and allows water to "fluidize" the soil consistency, changing the characteristics of the original in situ material.

demonstrating consistency of the proposed activity with the State's Water Quality Standards. Specifically, there are problems with:

- Potentially underestimated dredge volumes making it impossible to predict the full extent of water quality impacts associated with sedimentation;

- Undefined vessel draft requirements for work in shallow water most likely resulting in an underestimated scope of dredging; and

- Discrepancies in the record regarding the type of backfill to be used making it impossible to determine:
    - the full extent of resulting sedimentation;
    - scour resistance; and
    - a reasonable prediction of benthic community establishment without the exact sediment grain size difference between the existing native substrate and the new backfill.

Regardless of which of the two proposed types of backfill that Islander East plans to use, the habitat will be changed and an existing use will be lost in direct violation of WQS No. 1 and No. 2.

Resource Impacts from Pipeline Installation

The proposed pipeline installation would have numerous impacts on water quality and coastal resources resulting from sedimentation, turbidity, and direct substrate disturbance associated with dredging, plowing, backfilling, equipment anchoring, and anchor cable sweeping.

<u>Direct Bottom Disturbance</u>

The FEIS at 3-49 lists potential direct impacts associated with bottom disturbance as "habitat alteration; sediment disturbance, transport, and deposition; and potential adverse affects to marine organisms, including mortality." The paragraph continues: "[t]he primary concern is impacts to benthic marine organisms, particularly shellfish beds located between MPs 12 and 13, and fisheries resources and habitats in the nearshore and shallow marine environment." The Department concurs with this summary in the FEIS.

The following table of direct substrate disturbance in Connecticut was compiled from documentation provided by Islander East (DEP R. 60, 72, 125).[56]

Area Description	Equation	Area	
Anchor Strikes	18 strikes @111 acres of impact/mile x 8.92 miles		3.20 acres
Anchor cable sweep			1,023.00 acres
HDD Exit Hole (MP 10.9)	130 feet x 301 feet	39,130 s.f.	0.89 acres
Dredge Section (MP 10.9-12)	37 feet x 5,851 feet	216,487 s.f.	4.96 acres
Plow Section (MP 12-20.9)	75 feet x 46,992 feet	3,524,400 s.f.	80.90 acres
			TOTAL = 1,112.95 acres

The Department does not dispute these calculations for the direct disturbance acreage. While there are several discrepancies in the record as far as the exact numbers used in the equations,[57] the total acreage is an acceptable approximate estimate. The exact disturbance area within shellfish beds for the trench and plow segments are provided in Appendix G.

Anchor sweep impacts

A note in correspondence dated April 28, 2003 (DEP R. 72) indicates that the anchor and cable sweep area alone (without the plowing and burial) occupies 23% of a "corridor." In Dr. Pellegrino's Bottom Characterization Survey (at 2) the pipeline construction corridor is described as "the anchor spread to be used for construction barges." TRC's 2002 Impact Analysis Report at 28 also offers: "Extending further out, and indeed defining the limits of the overall width of the pipeline corridor are disturbances associated with anchoring of the work barges." As previously discussed in the Pipeline Installation Methodology section of this Decision, the anchors would extend from 1,200 to 2,000 feet on each side of the pipeline depending on the water depth. The Department has previously calculated the anchor spread construction corridor between MP 12 and MP 20.9 to be 3,700 acres, as follows:

[56] The table at page 4 of DEP R. 60 indicates the "Plowing/Burial" area for Connecticut as 81.2 acres. Based on the numbers provided in DEP R. 72, the HDD Exit Hole, Dredge Section and Plow Section total 86.7 acres. It would appear that 86.7 acres is accurate since the equations are provided and equal the indicated numbers.

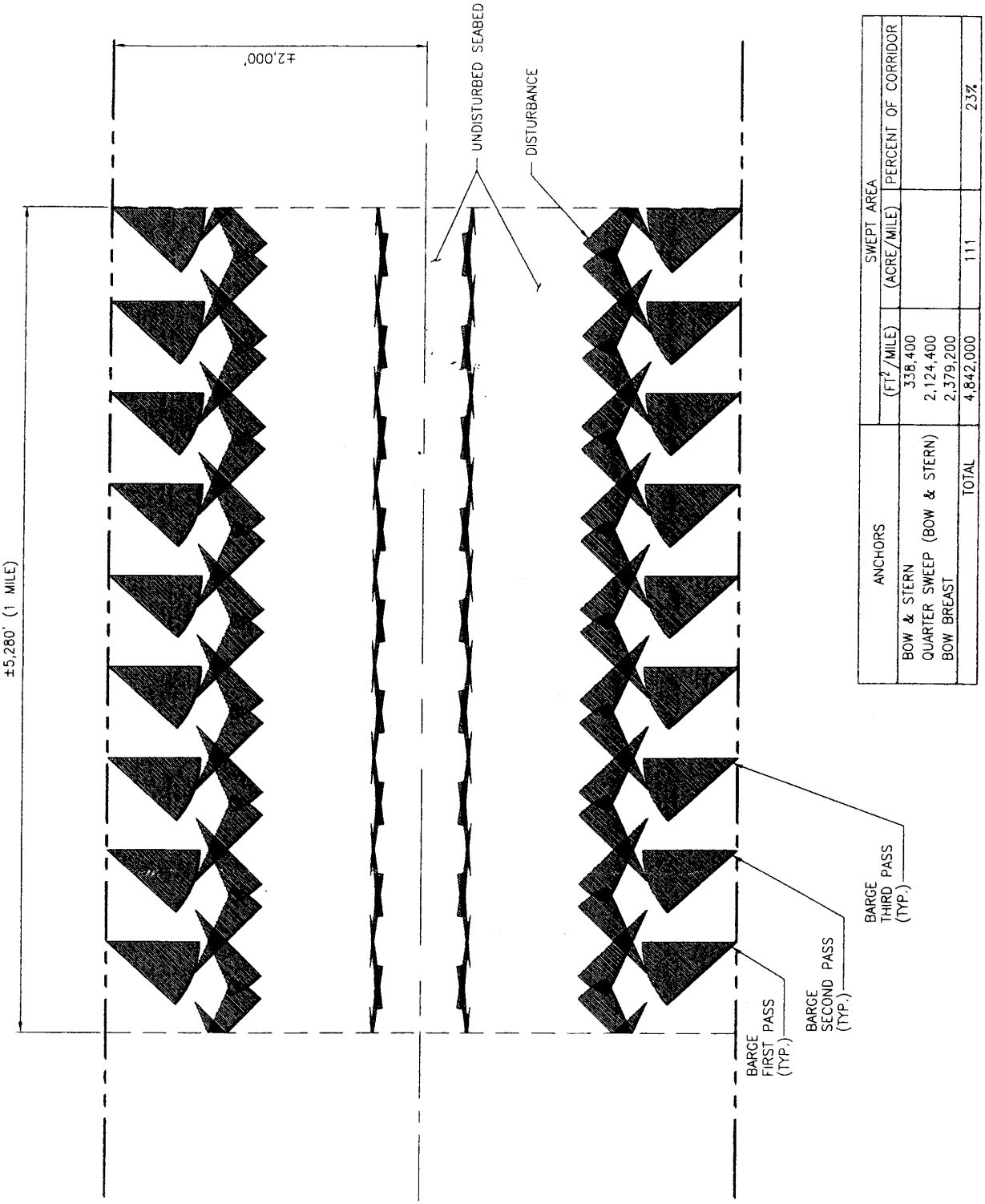
Location	Square feet
HDD exit hole 130' x 301'	39,130
Dredge trench 37' x 5851'(anchor corridor not included)	216,487
13,390 linear feet x 2,400' anchor corridor	32,136,000
9,790 linear feet x 3,600' anchor corridor	35,244,000
23,640 linear feet x 4,000' anchor corridor	94,560,000
TOTAL	**162,184,540 = 3,723 acres**

The dredge section from MP 10.9 to MP 12 was not included in the calculation as it is not clear from the record if the laybarge will need the 9 point anchor array in this work area. While Islander East has not offered a discussion of the impacts in this area, maps in Attachment C of DEP R. 7 do indeed show an anchor corridor 1200 feet on each side of the pipeline in Town of Branford shellfish beds. Therefore, the application has likely underestimated the dredge trench disturbance corridor area by 322.4 acres and the actual anchor impact corridor should be 4,045 acres.

Islander East has not provided the exact weight and size of laybarge anchors. TRC's 2002 Impact Analysis Report at 30 does offer that "each anchor placement is expected to disturb approximately 200 sq ft of sediment. A portion of this area, however, overlaps with the calculated cable sweep areas." Figure 12 (from DEP R. 72) shows a representation of the anticipated anchor and cable sweep area. Under cover letter dated August 21, 2002, Islander East provided a copy of the "Gulfstream Report" (DEP R. 124). This report was a post-pipeline installation survey conducted off the Florida coast in the Gulf of Mexico and focused on the effectiveness of mid-line buoys to prevent bottom impacts. Findings in this report are as follows:

> "Based on ROV survey, the anchor footprints typically measure approximately 15 to 20 feet in diameter and 2 to 3 feet deep. Most of the anchor footprints evaluated had 2 to 3 foot wide and 1 foot deep associated cable footprints leading away from the anchor depression. Away from the anchor depression, cable footprints usually narrowed to a surficial linear trough 1 to 1.5 feet in width at the top, and 4 to 8 inches deep in soft bottom."

[57] DEP R. 72 calculates the anchor strike and cable sweep for 8.92 miles (47,097 feet) of plow section. The same document indicates that the plow section is 46,992 feet.



ANCHORS	SWEPT AREA		
	(FT^2/MILE)	(ACRE/MILE)	PERCENT OF CORRIDOR
BOW & STERN	338,400		
QUARTER SWEEP (BOW & STERN)	2,124,400		
BOW BREAST	2,379,200		
TOTAL	4,842,000	111	23%

Figure 12. Anchor and cable sweep area from DEP R. 72.

While intended to show the mitigating factors of mid-line buoys ("MLBs"), the report and associated cover letter actually highlight the benthic impacts associated with anchor cables.[58] Islander East's letter explains that "side scan sonar results show that the average length of the anchor cable surficial footprints with MLBs was approximately 2,033 feet; without MLBs the footprint increases by 981 feet to approximately 3,014 feet."[59] It is evident that MLBs function to somewhat mitigate the impacts, however, even 2,033 is an unacceptable loss of habitat, especially given the other impacts associated with the project.

However, the Department does find anchor impacts from a pipeline installation in Long Island Sound applicable to anticipated impacts from the Islander East project. As noted in the Department's previous 2004 WQC denial (DEP R. 112), the Iroquois pipeline was installed through the nearshore waters of Milford, Connecticut in 1991 ("Milford Iroquois"). The Department is aware that the installation technologies are not the same as those currently proposed by Islander East. Regardless of the installation technology of the pipeline itself, the Milford Iroquois project is relevant because the anticipated anchor strike and cable sweep impacts are comparable.[60] Islander East's proposed use of the mid-line buoys would minimize cable sweep, but not eliminate it. In reviewing this project in 2002, the Connecticut Siting Council received testimony from Larry Williams, a commercial shellfisherman who worked the oyster beds around the Milford Iroquois installation. Through personal experience, Mr. Williams observed anchor scars as long as five-hundred feet and seven to eight feet wide, and as deep as six feet. In the four-year period during which he directly observed the bottom conditions in that installation area, the seafloor had not recovered to pre-installation conditions. (DEP R. 22, April 17, 2002, id at 93, 96). Islander East dismisses this bottom scarring issue and asserts that the scarring was attributed to failed attempts by Iroquois to smooth the seafloor after pipeline

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[58] The Department recognizes that the bottom impacts discussed in this Gulfstream survey do not necessarily translate into expected impacts in Long Island Sound as the bottom substrate at the Florida site was found to have "slightly silty medium to fine calcareous beige to gray clean sand" at 11 of 19. Also, the Gulfstream report does not address current velocity impacts on sediment nor does it provide the timeframe between installation and the survey.
[59] DEP R. 124.
[60] In TRC's 2002 Impacts Analysis Report at 30, the cable sweep impacts are described as follows: "The cable sweeps may disturb the sediments in several ways. Placement of the cables and their subsequent tensioning and retrieval, may cut into the sediments and disturb their upper layers, likely generating a rougher sediment surface layer and causing some mortality of the infauna. However, it is anticipated that some portion of the community will survive. There may also be sediment resuspension, which may cause increased sedimentation in areas outside of the 2,400 ft wide pipeline corridor. For any one anchor sweep area, the cable will be in place for less than 1 day. It is likely that some anchor cable sweep areas may be disturbed on successive passes, which may act to reduce the total area that would be affected by anchor placement."

installation. Whether due to scarring from anchors or failed attempts to smooth the sea floor the fact remains that damage to the sea floor had not recovered after four years. While the record clearly demonstrates that there will be significant bottom disturbances from anchor scars and cable sweeps (DEP R. 22, 72 and 124), Islander East has neither offered restoration of bottom topography nor provided documentation to demonstrate that restoration is possible.

Dredging and associated impacts

A maximum estimated total of 28,300 cubic yards of native sediment will be excavated from the HDD exit pit and the dredge trench. In addition, there are unquantified impacts including anchor strikes, spud utilization and prop scouring[61] associated with operating the barge and work vessels in these areas. Islander East's application does not specify whether the laybarge in the dredge trench segment will employ a different anchor array than that proposed to be used within the plow segment, but assuming the anchoring arrangements to be the same, the work within the dredge trench area will create a minimum of a 2400 foot wide anchor corridor that would be expected to extend into Town of Branford managed shellfish beds and 5 State lease beds as identified in Figure 13. As previously mentioned in the Pipeline Installation Methodology section, other benthic impacts associated with bentonite containment systems could not be reviewed as the methodology has not been finalized.

After pipeline installation, Islander East's modified plans have proposed to backfill the exit pit and dredge trench with engineered backfill. This backfill area, beginning at the exit pit, would be 130 feet wide by 301 feet long. The 130 foot width would taper to 37 feet wide where the trench begins. The 37 foot wide trench would then continue for 5,851 feet where the plow section of the pipeline installation would begin. A total of 5.58 acres of native compact silty clay sediment would be replaced with engineered backfill. Islander East has assured the Department that this area could be restored to topographic variations of no more than +2 feet/ –1 foot by using a tremie tube and carefully controlling the tube's position and the backfill flow rate (DEP R. 84 at 23-1). In direct contrast to this assertion, however, Islander East's own consultants stated at a March 4, 2003 meeting that modeling of post construction surface topography could not be conducted because "the variability in the trench surface is not possible to determine"

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[61] Prop scour is the movement of sediment caused by the turbulence of the propeller. The extent of damage to the substrate depends on sediment type, water depth and vessel draft.

(DEP R. 58). The record contains no evidence to support Islander East's prediction that topographic variations of no more than +2 feet/ –1 foot can be achieved and the Department rejects the bald assertion in favor of Islander East's consultant's March 4, 2003 position.

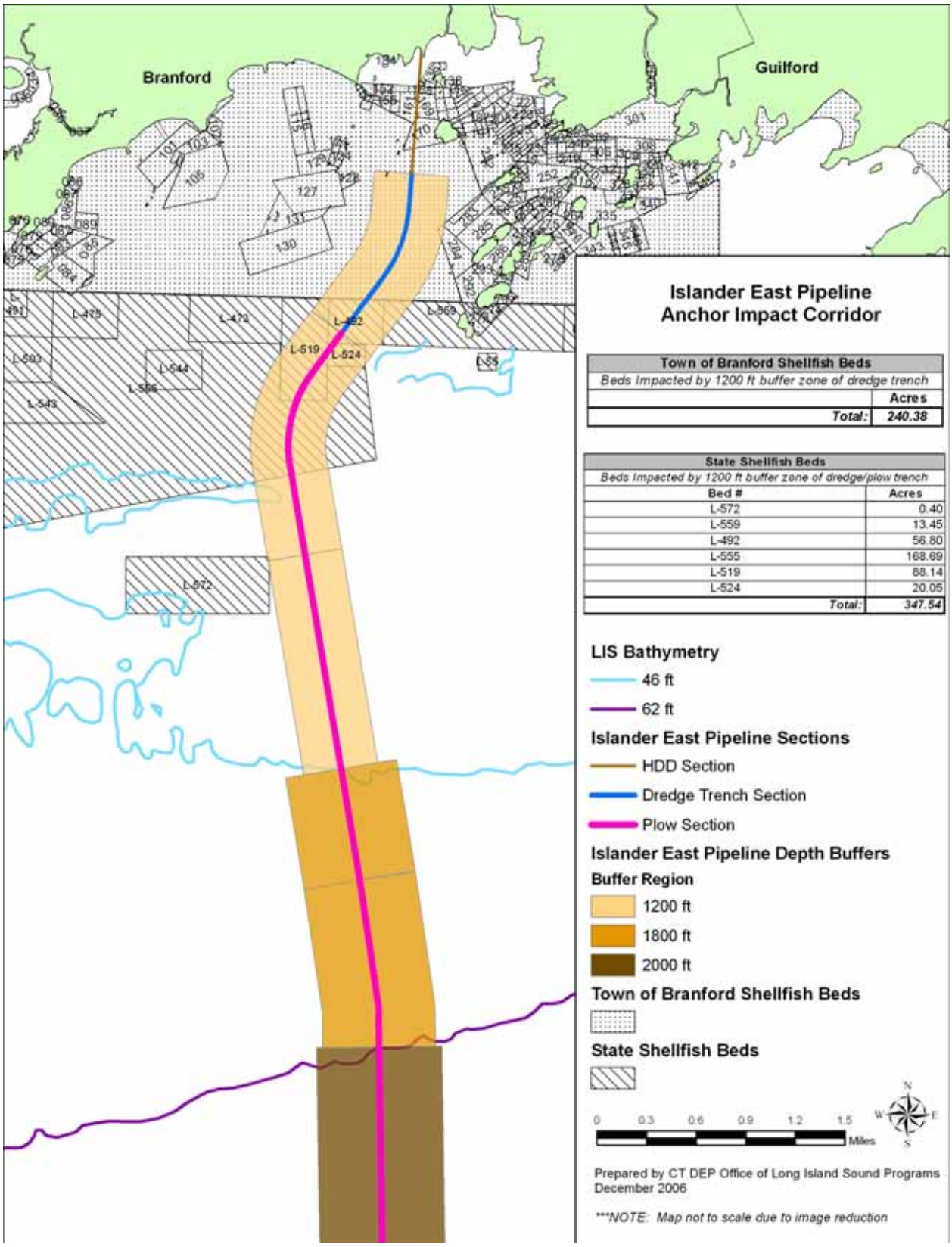

Figure 13. Anchor impact corridor.

Plow impacts

The plow segment would be backfilled with native material that was previously mounded during the second laybarge pass. Islander East has not made any credible demonstration that this area will be restored to approximate pre-existing conditions. Based on agency experience, it is difficult, if not impossible to restore the seafloor to pre-construction conditions because depressions in the sediment become areas of either erosion or deposition. As previously mentioned in the Pipeline Installation Methodology Section, dredging and general excavation of the substrate breaks up the compact fine grain sediment and allows water to "fluidize" the consistency. Once these sediments are disturbed by dredging, they will no longer exhibit the consolidation, high density and cohesiveness of the undisturbed, in-situ sediments and they would be easily eroded in areas of high current velocity. Alternatively, depressions left on the seafloor in areas of lower current velocity may become traps for the fluidized sediments. This phenomenon is mentioned in the FEIS at 3-65 regarding impacts associated with the anchors and cable sweep: "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 benthic habitat."

Time does not necessarily heal the scars left by underwater utility installation. The record contains discussions of two other utility projects completed 30 years or more ago that, even today, have visible scars. A June 4, 2003 memo from William Hogarth to Brandon Blum (DEP R. 86) cites a recently conducted benthic profiling study for a 1974 water line installation in the Hudson River which has yet to recover to its preconstruction condition. Mike Ludwig (NMFS), at a Joint Task Force and Working Group[62] meeting, presented an aerial photo of the Connecticut Light and Power "1385" cables (DEP R 122). The aerial photo, Figure 14, below, was taken on November 1, 2001. The photo clearly shows that the cables, which were installed in 1967-1969 through Sheffield Island in Norwalk, left visible scars through the shallow water near the island. These scars persist, even today. While the installation technologies, sediments, and currents vary with every project, the substrate impacts are long-term, in these particular cases over 30 years.

[62] Please refer to Appendix E, attached hereto.

Figure 14. November 2001 photo of "1385" cables installed in 1969, from DEP R. 122. Note benthic scarring on right side of photo.

Islander East dismisses this scarring issue and asserts that installation technology has dramatically improved since these projects were completed. Indeed, the use of HDD could have prevented substrate surface scars across the Hudson River, but the important fact to be derived from the study of these earlier projects remains valid - where the sediment was disturbed, it has never truly recovered. While the use of HDD may prevent surface scarring along the proposed HDD section, once the HDD breaks through the "surface" and traditional installation techniques need to be employed, there will still be significant long-term scarring associated with the exit pit, dredging, plowing, anchor craters and cable sweeps. In addition, clean-up of any frac-outs along the HDD path is also likely to create scars. Unfortunately, marine construction technology has not advanced to a stage where it can recreate substrate that was created by the compression of a mile-thick glacier and the accumulation of compressed silt over thousands of years. The Department is aware of no installation project that has successfully installed utilities and that has

been able substantially to restore the impacted seafloor to prior existing conditions and Islander East has offered none. The resource impacts associated with these projects are, essentially, permanent.

Water Quality Impacts

The proposed pipeline installation would impact water quality in several ways: it would temporarily increase turbidity; result in the temporary containment of seawater for hydrostatic testing of the pipeline; and cause drilling mud to be released into the water column.

A combination of exit pit and trench excavation; propeller scour from barge and deep draft vessel operation in shallow water; anchor deployment, drag and retrieval; anchor cable scour; plowing and backfill; and the installation of engineered backfill from a vessel on the surface will all result in the release of sediment into the water column. "Once disturbed, these fine-grained sediments would become temporarily suspended in the water column, resulting in a 'plume' of turbid water that drifts with the water currents and eventually would settle on the bottom. The plume's duration, extent of dispersal, and aggregation rate of the suspended particles depend on many site-specific variables" (FEIS at 3-49).

The resulting impacts of suspended sediment and turbidity on water quality are expected to be relatively short term and equivalent to that of standard dredging operations routinely authorized by this Department. However, the following key distinctions apply: the scale of most dredging operations is not as significant as that proposed by Islander East; the dredging is usually routine maintenance of an existing footprint; and new dredging is strictly limited to those applicants who provide or support water-dependent uses.[63]

The 2002 Impacts Analysis Report by TRC summarizes the response of benthic organisms to increased turbidity as follows: "[m]any estuarine benthic organisms are adapted to life in turbid waters and should be able to withstand the short influx of higher amounts of sediment associated with pipeline construction through a combination of avoidance (*e.g.* reducing activity, retreating into the sediments, closing valves for bivalves) and repositioning themselves in the sediment if the sediment deposition is high." The Department recognizes that

[63] A water-dependent use is defined by statute as *"those uses and facilities which require direct access to, or location in, marine or tidal waters and which therefore cannot be located inland,"* CGS section 22a-93(16). A natural gas pipeline is not considered a water-dependent use. Tilcon Connecticut, described earlier in this Decision,

turbidity is generally short-term and does not pose significant long-term impacts to resources. For this reason, the temporary release of sediment into the water column associated with this segment of the Islander East project is not inconsistent with the Department's Water Quality Standards.

In TRC's 2002 Impacts Analysis Report, an additional water quality impact from hydrostatic testing of the pipeline was addressed. TRC noted that three separate tests were proposed to be conducted within Long Island Sound which, according to TRC, would result in minimal impacts to existing water quality. Hydrostatic testing is completed by filling the pipeline with water and adding pressure to detect leaks or flaws in the pipeline. The first two tests would be conducted on the HDD pullback string in Connecticut waters using untreated seawater. A third test of the entire marine pipeline section would be conducted at the New York landfall with treated seawater to be neutralized prior to discharge back into New York waters.

The Department recognizes both the proposed and accidental release of drilling mud as a short-term impact on water quality. However, the impact to benthic organisms would be devastating. Because of the significant benthic impacts, the release of drilling mud is addressed in a separate section of this Decision, below.

Sedimentation

Sedimentation is the term used to describe the process of suspended sediment material settling out of the water column onto the seafloor. In TRC's Vibratory Core Sampling Report (at 3 of 7), it is noted that "[t]he sediment entering the water column will be transported and redeposited adjacent to the work area in a manner depending upon such factors as grain size distribution and currents." Other variables impacting transport and deposition noted in the FEIS at 3-49 include "water depth and temperature, current velocity and tidal stage, wind directions and speed, etc." As described below, sedimentation associated with the proposed pipeline installation may have significant impacts on resources and may cover a larger area than the pipeline corridor as defined by the anchor impact area.

The Department acknowledges that Islander East has made substantial improvements in reducing a significant source of potential sedimentation by modifying the originally proposed pipeline installation methodology. The fact remains that a significant area of both natural habitat

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is an existing historical water-dependent facility that receives water quality certifications from the Department on a regular basis to conduct maintenance channel dredging for sufficient barge navigation.

and prime shellfishing beds would be exposed to sedimentation exceeding normal levels and for extended periods of time. The Department does not suggest that sedimentation would change the substrate. Rather, sedimentation would alter the benthic habitat through deposition of a fine layer of fluidized material on the existing substrate. Eventually, this layer of sediment may be incorporated into the 10 millimeter thick "nephloide" layer described by Dr. Bohlen, or be dispersed by currents if settled over harder substrate such as reefs or bedrock outcrops.[64]

Benthic habitat can be significantly altered by sedimentation when a blanket of silt covers the benthic surface including the benthic epifauna and infauna.[65] The general effects of sedimentation on benthic organisms have been summarized in TRC's 2002 Impacts Analysis Report[66] as follows:

> "Obvious effects of dredge-induced sedimentation include smothering and burial of organisms. While the burrowing ability of a variety of benthic organisms through varying amounts of overburden is reasonably well documented (e.g., Maurer et al. 1978), sessile[67] and discretely motile benthic organisms are most susceptible to dredge-induced sedimentation. Unfortunately, limited data presently exist to determine both the short- and long-term effects of enhanced sedimentation on most species of sessile benthic organisms.
>
> Other effects of sedimentation on the benthos include disruption of larval settlement patterns and increased physiological stress. For example, Galtsoff (1964) noted that as little as 1-2 mm of silt may be sufficient to inhibit settling of oyster larvae. Sediments may also prevent larval settlement by interfering with chemical cues (e.g., Crisp 1967; Hidu 1969). In addition, Trueman and Foster-Smith (1986) have demonstrated that the energetic cost of burrowing can be large. While Carriker (1986) has noted that oyster larvae can attach to surfaces fouled by mucoid films and detritus, seasonal timing of dredging activities should consider if the dredging activities lie within the proximity of identified recreational and/or commercially important shellfish beds."

The Roberge Report dated February 4, 2004 buttresses these findings wherein it states that "benthic species will likely be killed even in areas receiving a thin veneer of deposited sediments" and this report, at 3, also noted the study by the Corps that found "sediment deposits

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[64] The nephloide layer is distinct from a layer of sedimentation. The nephloide layer as defined by Dr. Bohlen is the top 10 mm of substrate that is prone to resuspension. Over a short-term period, a layer of silt (from sedimentation) may be deposited on top of the nephloide layer.
[65] "Epifauna" is a term that describes animals that live on the seafloor such as starfish and crabs, "infauna" describes animals that live in the seafloor such as annelids and clams.
[66] Appendix I at 3.
[67] Sessile benthic organisms are those that are permanently attached and cannot move on their own accord. An oyster is a sessile organism.

of up to 1 mm will cause up to 50% mortality, and deposits of up to 2 mm will cause 100% mortality to some benthic species." In addition to the general impacts mentioned above, it is well-known to this Department that juvenile oysters would be adversely impacted by as little as 3 millimeters of sediment.

Islander East's own consultants have recognized the potential for significant resource impacts from sedimentation. In TRC's Vibratory Core Sampling Report (at 3 of 7) it is noted: "[b]ecause the water column effects are brief compared to the redeposition of sediments, results of the vibracore core sample analysis were compared to the Effects Range-Low (ERL) and the Effects Range-Median (ERM) sediment screening guidelines developed for the National Status and Trends Program (NS&T)." In other words, TRC considered the exceptional habitat quality along the proposed pipeline route and chose to use the stringent NS&T standards developed by NOAA to evaluate the chemical concentration in sediments that would be redeposited. Also, in the Marine Geophysical Survey at 25, OSI recognizes that "[s]hellfish lease areas may be very sensitive to changes in the water column and on the seabed. Agencies responsible for the leases are especially concerned about disturbance of the bottom during construction that could cause re-suspension of fine-grained sediment into the water column and deposition over shellfish beds."

The record contains several contradictory estimates regarding the potential exposure timeframes of benthic organisms to sedimentation, ranging from 6 hours in DEP R. 60 (at 6)[68] to several months in the FEIS (at 5-3). The Department acknowledges that the prediction offered by the FEIS is most likely inaccurate as the FEIS does not consider the modified construction methodology. The Department also notes that there is no explanation as to how TRC came up with an estimated 6 hours for "sediment plume exposure to organisms at any one location." The generalized reference to currents and dredge movement along the pipeline corridor provided in TRC's evaluation does not provide sufficient detail to allow the Department to conclude that this estimate is correct and that it should weigh significantly in the Department's analysis of impacts for water quality certification purposes. The Department reviewed the 2003 ASA model provided by Islander East. In that submission, it is clear that ONLY tidal currents were used in the model and not wind and wave velocities. As discussed in the Currents section of this Decision, both OSI (in the Marine Geophysical Survey) and Dr. Bohlen found that wind wave

[68] In Attachment B: "Evaluation of Benthic Impacts Associated with Islander East's Modified Offshore Construction Techniques."

induced velocities on currents were significant in shallow waters. Contrary to the observations of these consultants that sediment transport in the area is "dominated by the combination of wind wave induced velocities and tidal flows" (DEP R. 121, July 2002 at 2), Islander East used a model that did not consider a major sediment transport factor. The 2003 ASA model simulations were run using optimal weather conditions and assume that dredging operations will not occur during "wind events generating currents and waves capable of sediment transport." For this reason, the Department gave no weight to the sediment dispersion predictions offered by Islander East.[69]

In addition to exit pit and trench excavation, there are numerous activities being proposed that will cause the release of sediment into the water column and result in wide-ranging sediment dispersion and sedimentation: propeller scour from barge and deep draft vessel operation in shallow water; anchor deployment, drag and retrieval; anchor cable scour; plowing and backfill; and, the installation of engineered backfill from a vessel on the surface. John Roberge, in his evaluation of sediment dispersion associated with backfilling of the trench, comments that the "effects of the potentially significant turbidity and material deposition within sensitive benthic communities which could result from the backfilling operation have not been quantified by Islander East" (DEP R.111, May 2003, at 11).

The Department has found the Roberge documents[70] (DEP R.111) to be the most reliable in terms of predicted amount and extent of sediment dispersion, as they take more factors into consideration than the 2003 ASA model offered by Islander East. For example, Mr. Roberge's discussion includes equipment used at different sites, water depths and currents (including near bottom wave orbital velocities), tide directions and storm events. He notes several times that he has chosen conservative values to use in his computation as Islander East has failed to provide critical information regarding best management practices and operational controls. The following sediment deposition pattern was estimated in Mr. Roberge's most updated evaluation:[71]

- 1 mm up to 328 feet from the trench centerline (approximately 86 acres); and
- 3 mm up to 131 feet from the trench centerline (approximately 35 acres).

[69] Impact assessments based on these predictions were likewise given no weight. Such assessments were offered in DEP R. 60.
[70] Roberge, "Potential Sedimentation Impacts Which Could Result From Dredging, MP 10.9 – MP 12.0 Proposed Construction of The Islander East Gas Transmission Pipeline," May 5, 2003 and Roberge letter dated February 4, 2004 regarding 2003 Islander East Reply Brief.
[71] DEP R. 111, February 4, 2004.

Figure 15 displays the estimated sedimentation area and the associated tables provide the extent of cover for each shellfish bed.

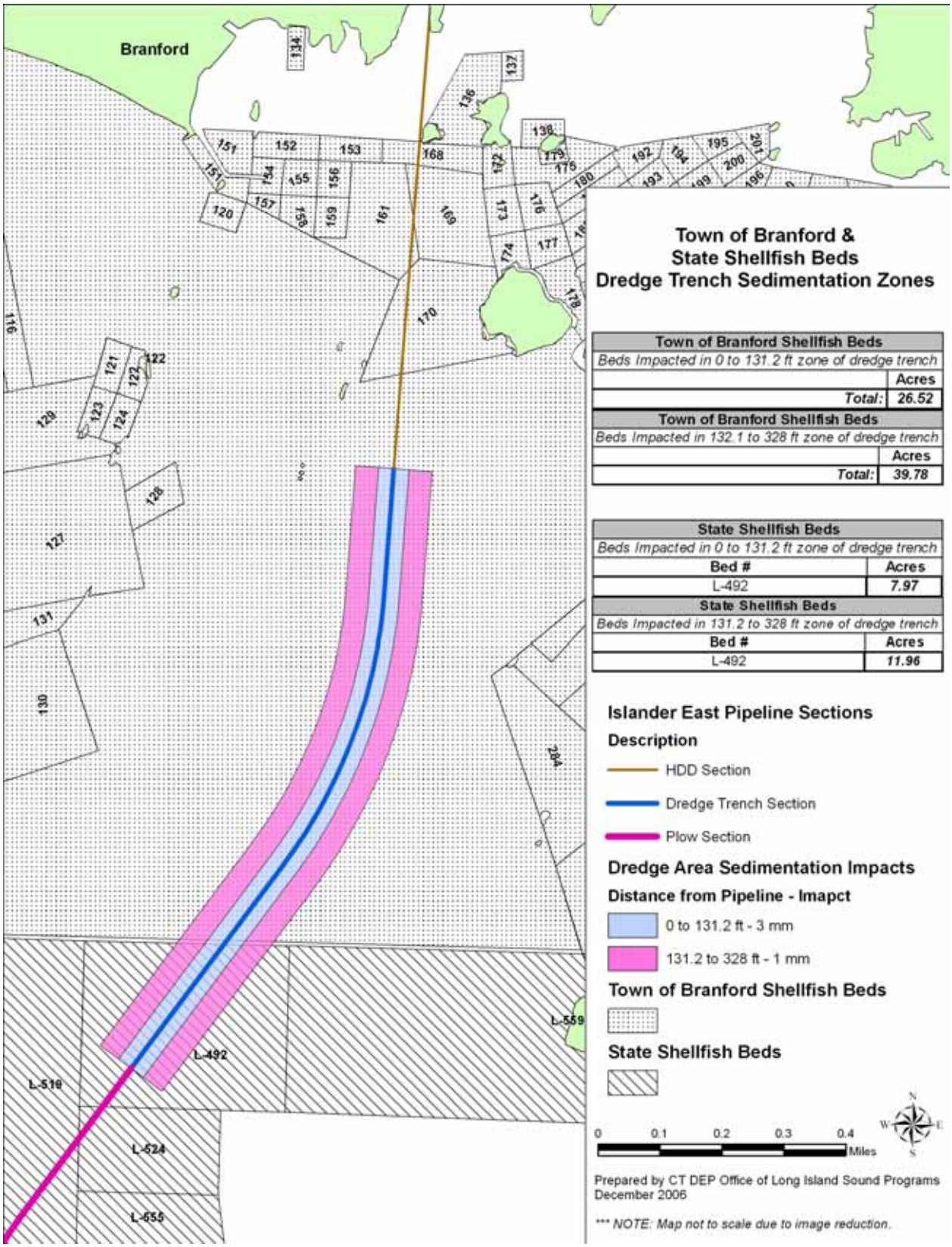

Figure 15. Sedimentation zones.

Drilling Mud Releases

The following table (Figure 16) of anticipated drilling mud volumes for the proposed project was provided in Appendix A of the Marine Pipeline Installation Methodology (in DEP R. 7):

Drilling Fluid Discharge Estimate

Islander East Connecticut Landfall

Bentonite Yield = 200 barrels/ton
Bentonite Dry Weight = 55 pounds/ft 3
Spoil % by Volume = 2%
Prereaming Recovery = 60%

	Drilling Fluid (barrels)	Drilling Fluid (gallons)	Bentonite (cubic yards)	Spoil (cubic yards)
Pilot Hole	455	19,110	3	2
Prereaming	175,409	7,367,178	1,181	730
Swab Pass	1,655	69,510	11	7
Pullback	5,171	217,182	35	22
Totals	**182,690**	**7,672,980**	**1,230**	**760**

Figure 16. Anticipated drilling mud volumes from DEP R. 7.

For comparison, 7,672,980 gallons of drilling fluid is equivalent to 37,989 cubic yards or enough fluid to fill the rotunda of the U.S. Capitol Building.[72] As previously discussed in the Pipeline Installation Methodology section of this Decision, the drilling fluid is highly pressurized. This factor contributes to the creation of a situation with potentially hazardous environmental consequences. Once released from the drill hole either intentionally or by accident, large volumes of drilling fluid may enter the water. When exposed to saltwater,

[72] From www.aoc.gov/aoc/frequently-asked-questions.cfm.

"drilling fluids flocculate [lump together] and settle to the bottom" (FEIS at 3-53). Dispersion by dilution of this gel-like mud into the water column is unlikely (FEIS at 3-54).[73]

Michael Ludwig (NMFS), in an e-mail to Sue Jacobson (Department) dated September 29, 2003 (DEP R. 103), provided the following summary of benthic organism response to drilling mud exposure:

> "[d]rilling mud is made up from freshwater and bentonite clays. As a result, the stuff tends to be resistant to dispersion [meaning dilution] when placed in saline waters. Its BOTH the freshwater and the clay that can create the suffocation. Shellfish can close down for several days to almost two weeks dependent on water temperature. The warmer the water the higher the metabolism rate of the organism and the shorter the time it can 'hold its breath.' BUT, it's not holding its breath, even in the dead of winter. Rather, they are trying to use the overlying water to get oxygen. It samples the water, senses the freshwater and re-closes. During the sampling some clay is pulled in and settles on the gills and abrades them. This causes the organism to try and clear the clay by forming 'pseudo feces' wrapped in 'mucus.' The effort to clear the lamellibranch gill structures requires energy and further increases the metabolic needs of the organism. Sometimes the clearing looks like/ is related to the 'coughing' action in humans. Each cough draws in more drilling mud mixture. These events continue until the frac out [accidental drilling mud release] problem is resolved by removal or dispersion or the shellfish exhausts its internal supplies of oxygen and suffocates. Compounding these problems is the fact that warmer water holds less oxygen so the shellfish can start the process already stressed. For softer bodied organisms such as worms and crustaceans there are fewer options. After a modest and highly variable metabolic slowdown or 'shutdown,' the organism must cho[o]se flight or death from the freshwater and clay. Climbing upward is possible for some but the density of the drilling mud isn't sufficient to support them all. One of my favorite questions about the flight option is how does a worm determine which way is out? The worms and to a variable extent crabs don't osmoadapt[74] to lowered salinity too well it at all. So, moving through the freshwater based drilling mud is killing them as they move."

Mr. Ludwig's entire email and further references that he provides are included in Appendix H.

The record developed by Islander East submissions glosses over these significant impacts to benthic organisms, especially when the impacts would occur in the Town of Branford shellfish lease beds. Further, the Department disagrees with Islander East regarding the proposed definition of a significant impact after a release. In DEP R. 7, the Directional Drilling

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[73] Dispersion and dilution are inappropriately interchanged throughout the record. Dispersion, in the context of drilling mud in saltwater, is the spreading of the material by wave energy. Dilution is the process of making it thinner by adding liquid. Drilling mud does not dilute in saltwater.

[74] Osmoadpation is an organism's ability to adapt to fluctuations in external osmotic pressure.

Monitoring and Operation Program at 4-9 offers some threshold values for determining the level of impact and whether a certain release would constitute a "significant impact" based on several factors as follows:

- the ability to contain the release within a 200 foot wide corridor centered on the HDD drill path;
- drilling fluid deposits on the seafloor, which do not exceed 24 inches in depth;
- the presence and operation of the vacuum system equipment; and
- removal of drilling fluid deposits must exceed the rate of deposition from a continuing source.

TRC indicates that if an inadvertent spill spreads up to but not beyond 200 feet in width, it may not qualify to be considered "significant." Similarly, an inadvertent spill up to 24 inches in depth, may not qualify as "significant" either. As discussed above in the Sedimentation section of this Decision, as little coverage as 1- 2 millimeter of silt can adversely impact benthic organisms, and, therefore, the Department finds that this threshold for "significant impact" is too high. The Department would like to call attention to the fact that the Directional Drilling Monitoring and Operation Program at 4-9 continues with "the decision as to conditions which constitute a significant impact will be based on discussions between the USACOE [Corps], the CTDEP [Department], Islander East, the monitoring supervisor and the driller. The USACOE and CTDEP shall make the final determination or ruling concerning impact decision and further course of action." The Department notes that these discussions have never taken place and are not on record. In this regard, the submission is inadequate.

Exit Pit

The record leaves no doubt that drilling fluid will be released into the water column from the HDD exit pit. In completing the first pilot hole drill path, Islander East indicates that there would be approximately 455 barrels of drilling fluid released when the drill bit first breaches the seafloor (FEIS at 3-53, DEP R.123). The FEIS also indicates that if they allowed "local currents to disperse the mud [it] would result in the coverage of a circular area approximately 444 feet in diameter to a depth of 5 millimeters" (at 3-53). A "circular area" with a diameter of 444 feet translates into a "circular area" with 154,830 square feet or 3.55 acres of impact. Figure 17 shows the anticipated area of shellfish beds covered by drilling mud.

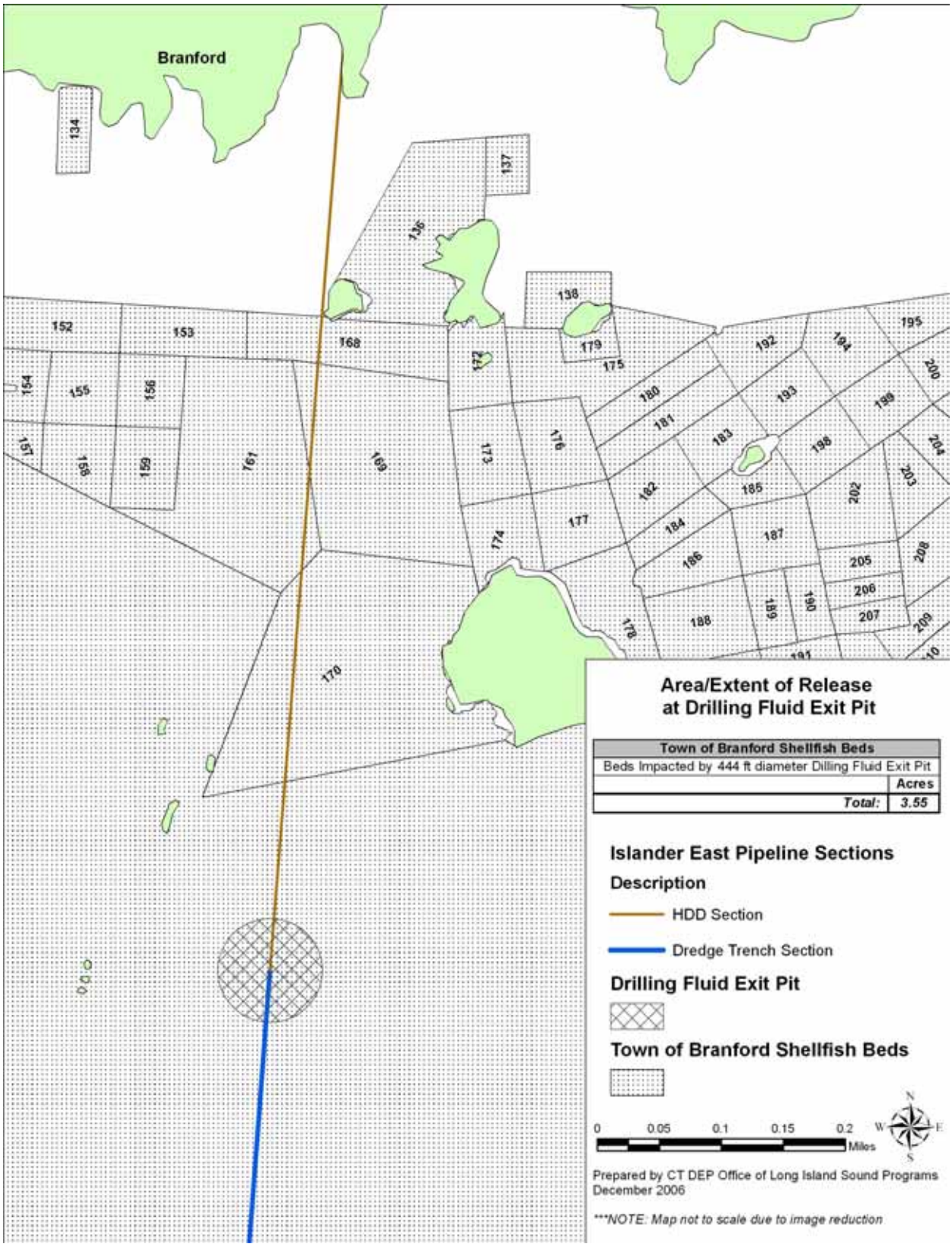

Figure 17. Anticipated release of drilling fluid at exit pit.

The Department finds that Islander East's proposed bentonite release over 154,830 square feet to a thickness of 5 millimeters would create a lethal situation (based on information provided in DEP R. 103) for nearly all epifaunal and infaunal species within a 3.55 acre circular area in the vicinity of the release. This release would occur within Town of Branford shellfish lease beds as shown in Figure 17. Based on the existing currents in this area (described earlier in this Decision), there is little doubt that drilling mud would be spread into surrounding shellfish beds. Islander East has indicated no intent to mitigate or otherwise respond to the release of these drilling fluids associated with the pilot hole breach of the seafloor.

Upon completion of the pilot hole, Islander East has proposed to excavate a sizable (18 foot deep by 130 foot wide by 301 foot long) exit pit. The creation of this exit pit will help to contain the anticipated release of drilling fluids from the reaming passes and the final pipeline pullback. (DEP R. 7, Directional Drilling Monitoring and Operation Program at 1-2). As previously mentioned in the Pipeline Installation Methodology section of this Decision, a plan to control and capture drilling fluid is being considered. Appendix B of the Marine Pipeline Installation Methodology (DEP R. 7) is a document on "Concepts For Subsea Containment of Drilling Fluid" which introduces two potential methods of recovering the drilling fluid. The final decision and development of the system would not be made until after an HDD contractor has been selected. This component of the application is inadequate and insufficient for the Department to determine impacts for water quality certification purposes.

Unplanned Releases

The Directional Drilling Monitoring and Operations Program (DEP R. 7 at 1-1) addresses the likelihood of an unplanned release:

> "While the bentonite drilling fluid is usually contained within the borehole, an unplanned release may occur. This unplanned release can occur when a geologic fault or fissure is initially penetrated, as the drilling fluid is pumped into the borehole under pressure. The occurrence of an unplanned release is dependent upon many factors including: geology, depth of borehole, pressure, borehole diameter, drilling fluid consistency and rate of drilling."

Also, the FEIS indicates there is "a potential that drilling fluids could inadvertently be released to the Sound along portions of the drilled segment through fractures in the bedrock" (at 3-54, DEP. R. 123). This type of accidental release is termed a "frac-out." It has been the experience of the

Department that frac-outs occur in at least half of the HDD projects[75] it has regulated (DEP R. 94). It is important to note that this statistic is based only upon reported releases and that the actual rate of frac-outs may be somewhat higher. In fact, many applicants undertaking regulated projects in Connecticut have reported multiple frac-outs on a given project.

Also, it should be noted that the Department's past experience with the HDD technology has generally been with projects that have both entry and exit points located on the upland – for example, at river and pond crossings. Considering the ease of accessibility to the land directly above the drill path in upland-to-upland projects, it is reasonable to anticipate that these projects would provide more suitable conditions for thorough pre-construction geotechnical survey work. Yet, even in these situations the rate of frac-outs remains high. In Islander East's case, the proposed route was planned without the benefit of complete pre-construction geological surveys. This information is necessary for the Department to conduct an accidental release assessment and identify the most vulnerable areas within the proposed HDD drill path. It is the Department's opinion that the FEIS review of this particular component of the installation process was inadequate and gave minimal consideration to the issue in light of the significant shellfish resources found in the HDD area.

In general, most frac-outs occur either in unconsolidated overburden soils or in geological transition areas, that is, at the interface between different substrate materials. Of particular concern regarding the use of HDD in the Thimble Islands region is the occurrence of bedrock outcroppings, which further increase the potential for frac-outs. The Thimble Islands are composed of 141 islands and rock outcroppings and it is logically anticipated that the subsurface area is similarly composed of variable geological and bedrock features. See Figure 18 and refer to Figure 3. Though the applicant has yet to provide the Department with a deep subsurface data analysis of the HDD corridor, we anticipate construction-related problems utilizing the HDD methodology in this area. In conceiving and developing the project, the applicant's own consultant, in the Marine Geophysical Survey, recommended that the proposed pipeline route avoid areas of near surface glacial till and bedrock (DEP R. 7 at 58). The same survey also recommended that further coring and probing of the surface be conducted. Yet, this is the route that is proposed by Islander East. It appears that these recommendations were

[75] Appendix I, attached hereto, provides a list of HDD activities in coastal/tidal waterbodies and indicates frac-out occurrence.

offered in an attempt to reduce the probability of a frac-out and increase the likelihood of a successful HDD.

Figure 18. Photograph of Thimble Islands showing bedrock outcroppings.

The Department reviewed survey maps submitted by Islander East that show their proposed HDD route in relation to the initial subsurface geological conditions (DEP R. 7, Sheet 111 of 120, dated 12-4-01). Please refer to Figure 19. Despite recommendations made by OSI in the Marine Geophysical Survey, Islander East proposed the pipeline through an area of near surface glacial till and bedrock. However, since Islander East has not completed or otherwise submitted their final subsurface geological surveys, the geological profile shown on this plan is incomplete. Without Islander East having submitted the geological surveys, the Department is unable to determine the likelihood of a successful drilling operation or to evaluate alterative routes which may have a higher likelihood of success and therefore a lower risk to the marine environment associated with either (a) a bentonite release, or (b) an alternative (more invasive) construction methodology.

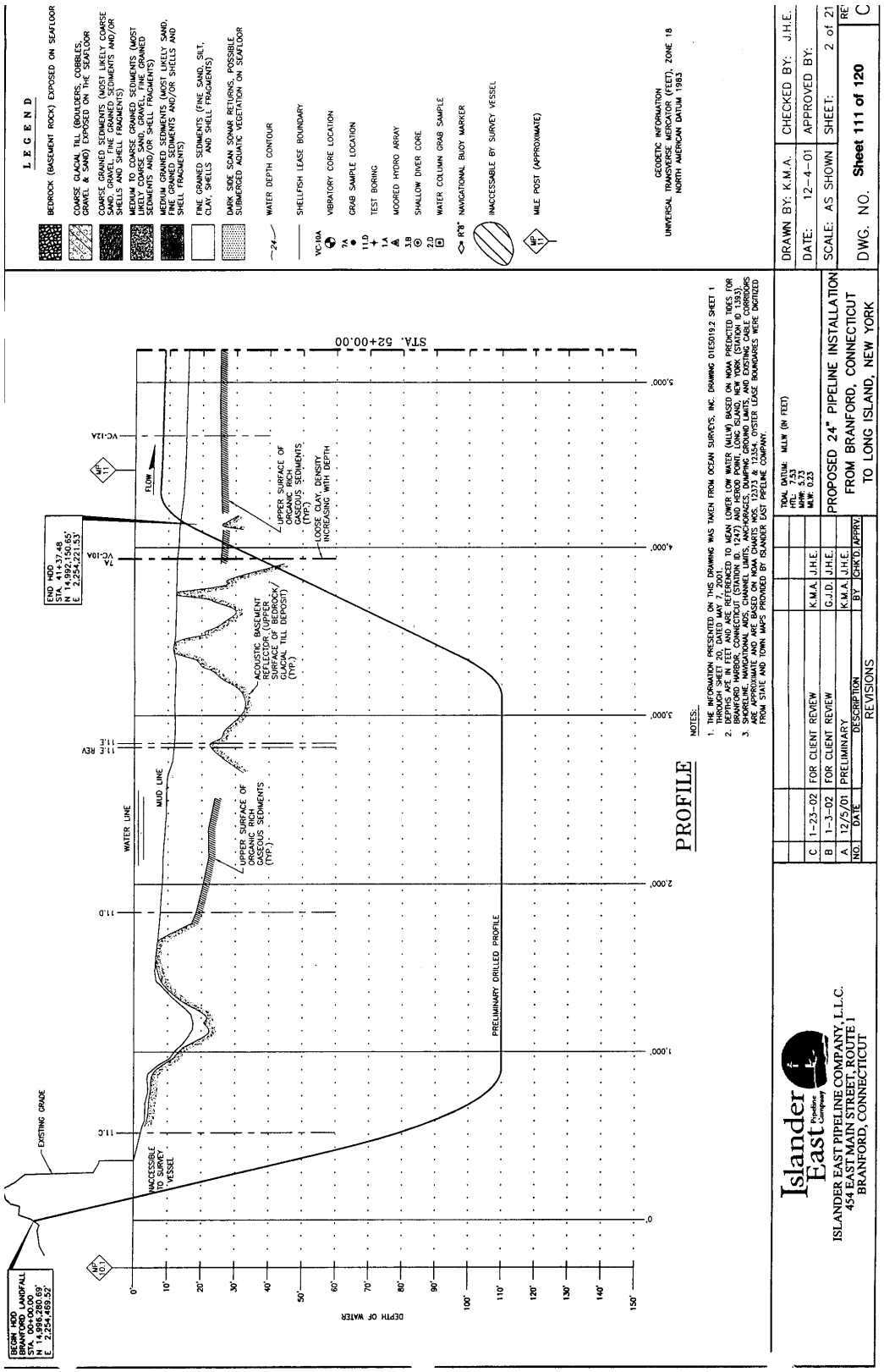

Figure 19. Preliminary survey of subsurface geological conditions from DEP R. 7.

In reviewing this plan (Figure 19) and reading the FEIS, the Department found a troubling discrepancy in the record. The plan shows the pipeline route exiting the "bedrock/glacial till deposit" at approximately 3,900 feet from the upland staging area. The pipeline then enters an area identified as "rich gaseous sediments," which are not uncommon in the Sound. At the point where the pipeline makes the transition from bedrock to the rich gaseous sediments, there is a thickness of approximately 25 feet of total overburden sediments between this point and the seafloor. As the pipeline extends to the south, away from the bedrock and approaches the exit pit, the pipeline moves through the rich gaseous sediments and enters an area identified as "mud." According to this drawing, the mud layer is approximately 12 feet to 15 feet in thickness.

However, the FEIS at page 3-54 states that the "results of the geotechnical investigation conducted to date indicate that overburden (primarily silt, overlying the bedrock) thickness along the HDD route varies from 25 to 90 feet. It is thus expected that any drilling mud released through the fractures in the bedrock would be contained within the overburden and would not be released to the Sound." However, Figure 19 shows the overburden atop the bedrock/glacial till a maximum depth of 45 feet along the first 3,500 feet of HDD at the Connecticut shoreline, not 90 feet as stated in the FEIS. Therefore, the Department finds the FEIS unreliable on this point and it remains skeptical that any frac-outs over the last several hundred feet of the HDD path where the drill leaves the bedrock and where there is less than 40 feet of overburden would be contained within the subsurface materials.

The Department concurs with the FEIS assessment discussed earlier in the Drilling Mud Release section of this Decision that any bentonite released into the marine environment would readily flocculate and not dilute in the saltwater. Therein lies the environmental ramification. The area through which the HDD path is located contains Town of Branford shellfish beds. The risks associated with expected or inadvertent drilling mud releases are particularly high at this location since more than half of the HDD corridor is proposed to pass directly under these locally-managed shellfish leases. Considering the suffocating and smothering effects of the drilling fluid if released onto the seafloor, an inadvertent release in the area of the productive shellfish beds would be devastating. Based on the information provided in DEP R. 103, any frac-out that occurred in this area would be expected to eliminate any shellfish being produced upon those beds. Again, as the Corps study raised in the Roberge Report dated February 4, 2004

indicates, "sediment deposits of up to 2 mm will cause 100% mortality." As shown in Figure 16, there are Town of Branford lease beds directly above the HDD path and susceptible to damage from a frac-out.

Benthic Recovery

As mentioned earlier in this Decision, the ever-evolving nature of the Islander East project and the numerous amendments have left a patchwork of application materials. Comments regarding generalized benthic recovery predictions related to the original construction methodology that proposed reuse of the native substrate ARE NOT applicable to the revised installation methodology that includes the placement of engineered backfill. The Department has carefully reviewed the record and would like to make the following clarifications:

- There are no studies or reports in the record submissions of Islander East that address benthic colonization in the engineered backfill;

- A scientific study in ecology always involves utilization of the scientific method which incorporates: observation, hypothesis, prediction, experiment and conclusion.[76] Neither Islander East nor its consultants have conducted any scientific studies to predict the benthic colonization in an engineered backfill activity within a background of soft fine-grained cohesive sediments; and

- An ecological baseline inventory is an investigation involving a series of field surveys for plant and animal species at a designated site. Islander East's consultants have provided, and the record contains, several thorough ecological inventories of the pipeline corridor (DEP R. 7, DEP R. 38 and DEP R. 121), but as inventories, they only describe baseline conditions.

General commentary has been misinterpreted and mistaken as "scientific studies." The Department is familiar with the studies referenced early on in the application process regarding benthic organism response to dredging and disturbance in various habitats.[77] These referenced

[76] Scientific studies are reproducible. A thorough evaluation of methods and results should lead to the same conclusions by an unbiased third party.
[77] The Department has dedicated staff that focuses on dredging related issues including dredging and dredge disposal impact analysis as part of the regulatory process. Sediment testing plans and suitability determinations seek input from a variety of agencies requiring close coordination with state and federal regulatory and resource agencies, including, but not limited to, the Corps, EPA, NMFS, and DA/BA. Projects originating in NY also involve coordination with the appropriate NY state agencies.

scientific studies in TRC's 2002 Impacts Analysis Report at 39 include: Newell et al. 1998, Zajac and Whitlatch 1982a,b, 1988, 1989, 2001, McCall 1975, and Rhoads et al. 1978. Also, the Garrett Group report (DEP R. 99/100)[78] similarly cites LaSalle et al. 1991, an investigation focusing on the benthic impacts from dredging and dredge disposal operations. These studies do not consider the colonization of benthic organisms in engineered backfill that has been placed in an area that is composed of primarily fine-grained cohesive sediments.

The Department has considered the Garrett Group, Ltd. report and has given it little weight. The executive summary of the report indicates that no field efforts were conducted in preparation of the report and the conclusions reached by Mr. Garrett were based on a review of documents provided to him by Islander East.[79] While the summary acknowledges that the applicant modified the proposal to eliminate mounding around the trench, there is no mention of the placement of engineered backfill. That said, the Department evaluated Mr. Garrett's findings in the "Preliminary Report on the Anticipated Biological Impacts Associated with the Proposed Islander East Pipeline Project" at ES-2 where he indicates that bottom damage caused by construction would "alter an existing productive shellfish habitat, and an existing invertebrate community structure" but that "[a]fter all project related activities and secondary conditions associated with the construction have ceased, the bottom will recover after several years and return to the existing condition." This assumption cannot be sustained by the evidence in the record. Islander East's own expert, Dr. Zajac, points out that the benthic impacts of filling in the trenched area have yet to be studied. (See discussion below.) The benthic conditions where the engineered backfill is proposed would be unable to return to the existing condition since the existing substrate will be dredged out and replaced with engineered backfill. The previous benthic community that inhabited that area of the natural sea floor which developed over thousands of years is unlikely to use the engineered backfill since it provides an entirely different type of habitat. For example, many of the benthic infaunal species such as bivalves, crustaceans, polychaetes, and annelids, that burrow into the existing sediment would not be able to do so into an engineered backfill. (As discussed below, DA/BA staff believe that a rocky substrate will attract starfish, a shellfish predator.) For Mr. Garrett to suggest an inevitable return to the existing conditions is just not appropriate.

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[78] In the certified record, the documents for DEP R. 99 and DEP R. 100 may have been inadvertently switched.
[79] Mr. Garrett is not a noted benthic ecologist with whom the Department is familiar. His name, however, is associated with several wetland-related publications.

Islander East's consultants acknowledge that substrate modifications can have significant habitat impacts. In the 2002 Impact Analysis Report at 36, TRC discussed potential impacts to essential fish habitat from the originally proposed native material backfill and offered that pipeline construction "will not result in a permanent loss of substrate. Following the temporary disturbances of construction, the project is not expected to convert existing soft-bottom substrate types to hard substrate types or vice versa." Obviously, this statement is no longer applicable and the habitat WILL change. This confusion results from Islander East proposing a modified construction methodology subsequent to both the FERC FEIS review and the original WQC application to the Department.

The Department has no reason to doubt that, under perfect circumstances, *in the native substrate*, benthic organisms would eventually recover. The three to five year recovery predictions offered in the above-referenced scientific studies are generally based on observations of benthic community succession following dredging or other disturbances such as storm events which redeposits naturally-occurring sediment which is not the case with the activity proposed by Islander East. The habitat needs to recover before the benthic organisms can recolonize the area. The FEIS at 3-70 acknowledges this. Although the following citations refer specifically to shellfish recovery in relation to harvesting, they emphasize that the primary factor in recovery time is first obtaining habitat suitability:

> "The recovery of disruption of shellfish lease areas could result in a long-term impact. Once construction is complete, recruitment by larval stages of affected shellfish species (i.e., primarily hard clams) from adjacent communities would take place during the next spawning period. However, the disturbed sediment would require time to reconsolidate to provide adequate shellfish habitat. Once the sediment provides suitable habitat, recovery of shellfish beds would take at least 3 to 5 years which is the time it takes for a settled clam or oyster to reach marketable size (Stanley and Dewitt, 1983). As evidence for this long term impact, the State of Connecticut, Department of Agriculture, Bureau of Aquaculture indicated that there are still unproductive areas in nearby shellfish habitat that was impacted by a pipeline construction project that occurred over ten years ago (Volk, 2002). Therefore some long-term impacts to the shellfish lease areas can be expected from construction of the pipeline. Islander East proposes to seed disturbed shellfish habitat with juvenile clams, which may reduce the recovery time. Nevertheless, based on observed impacts form prior construction activities *through similar habitat*, some portions of shellfish habitat may remain unproductive for many years due to trenching activities." (FEIS at 3-70)

And, in a discussion on "Anchor Placement and Cable Sweep Impacts On Shellfish Habitat," the FEIS at 3-71 specifically notes:

> "Due to the weight of the anchor and the depth of the scar, the impact on shellfish likely would be complete mortality within the footprint of the scar. As previously mentioned, recovery of anchor scars depend on the local conditions and may occur within a year or would take several years. Recovery of shellfish resources would depend on the rate of natural sedimentation to fill the scar. Once the scar was filled and the sediment provided adequate habitat shellfish could be expected to take 3 to 5 years to reach marketable size. However, if the anchor pits did not refill adequately, they might persist as depressions, accumulate fine grained materials and organics, develop poor water quality and different benthic communities than the original, and would not be suitable shellfish habitat. This would represent a long-term conversion of shellfish habitat."

There are numerous variables to be considered in habitat recovery and species colonization following large-scale disturbances such as that proposed by pipeline installation. To the Department's knowledge, there are no studies available that offer predictions on benthic colonization in an entirely new, and very different material than the native substrate. There is certainly no evidence in the record to help the Department assess the changes that will likely occur in the existing species composition by creating a new habitat. Islander East's own consultant, Dr. Zajac, noted in a memo[80] to Paul Martin at TRC:

> "The potential impacts of alternative pipeline dredging and sediment removal scenarios discussed here do not take into account the disposal of the sediment, which is assumed to be off site, nor habitat changes / benthic organism impacts associated with filling in of the trench after the pipeline [in is] place. These also need to be considered in order to get a full and integrated assessment of the alternative construction scenarios."

The only evidence in the record about colonization of a rocky substrate is that predators of shellfish will colonize the area. (See below for further discussion.)

In regards to benthic community response to infrequent severe events, Dr. Pellegrino's Community Structure Survey concludes:

> "The structure of benthic communities is usually controlled by infrequent severe events (disturbances) that disrupt the community and return the successional process to an earlier stage. Disturbances can be physical, biotic, or chemical in nature and may have multiple direct and indirect impacts on community structure.

[80] DEP R. 60, Appendix J, attached hereto.

> The recovery process in soft-sediment communities is characterized by a succession of community types, usually beginning with the appearance of opportunistic species (Stage I) and progressing to the establishment of high order (Stage III) successional assemblages (Lenihan and Micheli, 2001)."

The Department generally concurs with Dr. Pellegrino's assessment. Natural disturbances do occur at some predictable frequency and natural communities have evolved mechanisms to deal with these stressors. However, comparing regularly occurring storm events to the pipeline installation is not reasonable. While storm damage can be particularly harmful to existing benthic communities by causing mass movement of native sediments capable of damaging shellfish, particularly oysters, the habitat typically remains in tact after the storm event. The Department is aware of instances where federal crop-disaster relief funds where made available for aquaculture following severe storm events. The Department notes that while Dr. Pellegrino's conclusion regarding community succession may be applicable to minor sedimentation impacts, it is not appropriate to conclude that a benthic community will have such a response to the wholesale replacement of an existing habitat with engineered backfill. As Dr. Pellegrino noted, the predicted recovery process is for soft sediment communities and his opinion is not applicable to the Islander East project where hard substrate will be replaced.

There is no doubt that new habitat would be created with the placement of 5½ acres of engineered backfill; old habitat would not recover. As previously noted throughout this Decision and referenced by Islander East's consultants, the fine-grained sediments in the region of the proposed pipeline are fairly homogenous and tend to be plastic and cohesive. At a March 4, 2003 technical meeting with the agencies, Islander East suggested a backfill of rock obtained from nearby Tilcon. John Volk (DA/BA) encouraged consideration of a backfill that would not attract shellfish predators (the Tilcon rock would attract starfish, which prey upon shellfish). The March 4, 2003 meeting notes (DEP R. 58) further summarize:

> "It was also discussed that habitat modification would affect the coastal zone policy and would need to be considered in the review if Islander East is proposing to alter the existing habitat. It was indicated by George Wisker (CTDEP) and John Volk (Bureau of Aquaculture) that sand would be a better backfill material than rock but not as good as silts. The goal is to restore the clam habitat that would consist of up to a foot of silty material rather than courser material."

In correspondence dated March 14, 2003[81] from Islander East, the proposed backfill is described as "[r]ock or gravel of less than 4 inches in diameter"[82] and it would have "value as hard substrate for attachment of organisms and plants, which could promote habitat diversity . . . In time, the rock backfill area along the length of the pipeline trench will become a mosaic of several substrate type combinations." The Department agrees that both the habitat type and the resulting biological integrity of this area would be changed.[83]

Shellfish Harvesting Impacts From Installation

As discussed above, the proposed 5½ acres of backfill will change existing shellfish habitat. This direct habitat conversion, in addition to the direct bottom disturbances, as defined earlier in this Decision, will destroy shellfish beds and preclude both existing and future shellfish harvesting[84] for an extended and unidentified period of time. Based on similar impacts in Connecticut, this preclusion of harvesting activity may be as long as 30 years based on scarring impacts. Of the 4,045 acres calculated in the Anchor Sweep Impact section of this Decision, the Department finds that approximately 1,120 of those acres are in existing and potential shellfish lease bed areas. Since commercial shellfish harvesting is conducted in water depths to a maximum of –50 feet, the 2,400 foot wide anchor corridor was multiplied by that area below the –50 foot contour. Please refer to Figure 13 for reference. For the reasons outlined below, the Department believes that these 1,120 acres in the anchor corridor will be eliminated from shellfish harvesting.

Shellfish beds are equivalent to farm fields that have been smoothed and plowed for harvesting. The substrate disturbance created by the anchor strikes, cable sweep, plowing and mounding within this corridor would create significant topographic irregularities and scars (DEP

[81] DEP R. 60, Attachment 8, "Evaluation of Benthic Impacts Associated with Islander East's Modified Offshore Construction Techniques" at 6.
[82] It has been previously noted in this Decision that this material was not that approved in Islander East's Engineered Backfill Plan which recommended cobble of 2 inches or less. Nevertheless, either backfill would be considered a new habitat type.
[83] Even without the addition of engineered backfill, the Milford Iroquois installation changed existing hard bottom oyster habitat into soft bottom clam habitat because of sedimentation most likely resulting from a combination of equipment disturbance on the bottom and a major storm event. Please see the Shellfish Harvesting Impacts section for a further discussion of this habitat conversion.
[84] Shellfish habitat and shellfish beds are not interchangeable terms. This terminology is confusing in the record because shellfish recovery discussions include phrases such as "commercially valuable" and "marketable size." While shellfish may eventually inhabit the new substrate and recolonize the disturbed areas after an unspecified period of time, shellfish harvesting will not be possible because of the backfill and associated equipment related bottom disturbances.

R. 41, 45 and 124). Please refer to Figure 12 in the Anchor Sweep Impacts section of this Decision. As stated on page 7 of the Department's July 29, 2003 WQC denial, "Even in the unlikely event that the bottom could eventually reestablish its former grade and habitat value, shellfishermen would most likely avoid the area for fear of damaging or losing gear thereby exacerbating the adverse impacts on use of this area for water-dependent shellfishing activities resulting form Islander East's alignment at this location."

Similar to the fact that is not possible to recreate prime upland farm soils once lost to erosion, it is not possible to recreate benthic substrate that was created by the compression of a mile-thick glacier and the accumulation of compressed silt over thousands of years. The Department does not doubt that after an unspecified period of time, some shellfish may recolonize this disturbed sediment. Certain species (most likely oysters) would be able to colonize on the new 5 ½ acres of hard gravel bottom. However, because of the craters, mounds, moguls and abrupt substrate changes on the seafloor, shellfish harvesting could not occur in these areas. As previously discussed in the Existing Use section of this Decision, the harvesting equipment used in this area of Long Island Sound is not large. Critical to a "perfect" clam dredge tow is achieving the proper balance between teeth, manifold angle, water pressure for the type of bottom, boat speed, line length and current flow. Factors influencing an oyster dredge tow include current, substrate, boat speed and maintenance of a 45 degree angle on the tooth bar. An uneven surface or abrupt change in sediment type will create problems with the tow. The front of the dredge may sink into a pit and possibly hang–up on the depression wall or the baskets may fill with sediment. Since some of the baskets have holes approximately one inch wide, dredging through an area of bank-run gravel up to 2 inches in diameter will result in a basket full of gravel. Shellfish harvesters will avoid these areas because of gear complications resulting in the inefficient and unsafe operation and handling of harvesting equipment. The Department is aware that this situation has occurred in the shellfish beds in the vicinity of the Milford Iroquois installation. While the beds along the pipeline route are still harvested, the shellfishermen avoid the impacted areas and only use those portions of the lease bed that are not within the previous anchor corridor.

Another result of the Milford Iroquois installation was the conversion of bottom habitat from a hard substrate suitable for oysters to a soft sediment suitable for clams. This habitat

change resulted from a combination of equipment disturbance on the bottom and a major storm event. A severe storm on March 23, 1991 partially filled an open trench and dispersed mounded sediment up to 3,280 feet from the trench. Suspended sediment in the water column remained elevated during the four days including and just after the storm event with a mass approximately 65% higher than that suspended during normal dredging operations (DEP R. 113). As a result of this habitat conversion, former oyster lease bed areas are now used for clamming.

Islander East has offered compensation to the shellfishermen that may be impacted by the proposed pipeline installation. The FERC FEIS at 3-105 explains "Islander East has been negotiating with shellfish bed leaseholders regarding crossing agreements to compensate the leaseholders for potential damage to their business and shellfish that they own, similar to payments made to farmers for crop damages."[85] However, this economic compensation does not mitigate resource damage, nor can it restore the shellfish beds to their former condition once the substrate has been scarred by the pipeline installation. Thus, any financial compensation to individual shellfishermen or leaseholders is not relevant to the project's consistency with the Water Quality Standards.

Outstanding Application Issues

As previously noted throughout this Decision, the Department finds numerous sections of the Islander East application inadequate. Of the missing items listed below, the absence of geological survey data is the most significant to the Department's most recent water quality certification review. Based on the Department's experiences, the other items have significant water quality implications and should be addressed in a thorough and inclusive water quality certification application.

<u>Incomplete Geological Survey Data</u>

OSI's Marine Geophysical Survey recommended additional probing and coring to determine geological conditions along the proposed pipeline route. To date, Islander East has yet to provide the results collected from pre-construction geotechnical surveys. This information is necessary for the Department to conduct an accidental release assessment and identify the most vulnerable areas within the proposed HDD drill path.

HDD Failure Alternative

It is noted in the FEIS that HDD should be feasible at the Connecticut landfall based on preliminary geologic testing. The FEIS at 3-36 also notes:

> "Once begun, an HDD can fail for various reasons, including failure to complete the pilot hole, inability to maintain a stable open hole, loss of the hole opening tool because it becomes lodged or twists off, inability to pull the pipe back through the hole, or loss of the drill head due to obstacles encountered that push the drill out of alignment during drilling."

In the event of HDD failure, Islander East has identified an alternative for the Long Island landfall which is dredge trenching (FEIS 2-41) through the shallow waters to shore. In correspondence dated May 5, 2003 (DEP R. 78 at 5), the Department asked Islander East for project alternatives in the event that HDD was unsuccessful at the Connecticut landfall. Islander East's response was provided in DEP R. 84 at 14-2: "In the event that Islander East determines that an alternate location or new installation technique must be utilized for the nearshore crossing, Islander East will seek all required regulatory approvals." No alternatives were discussed.

Recognizing the importance of having an acceptable alternative plan, FERC at 3-53, recommended the following:

> "In the event that the directional drill is unsuccessful, Islander East should file with the CT DEP and the Secretary a plan for the crossing of the Connecticut shore. This should be a site-specific plan that includes scaled drawings identifying all areas that would be disturbed by construction. Islander East should file this plan concurrent with its application to the COE for a permit to construct using this plan. The Director of OEP must review and approve this plan in writing before construction of the crossing."

As explained in DEP R. 78 at 5, the Department requested that Islander East identify and provide necessary information regarding alternate locations and installation techniques so that conditional authorization could be granted in the case of HDD failure. If conditional locations and techniques are not approved up-front, significant delays or total project termination could result.

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[85] This analogy is not appropriate as the shellfish beds will be damaged for an undefined period of time.

With no alternatives presented to the Department, it is reasonable to assume that Islander East would use the same alternative as that proposed for Long Island – dredge trenching. If this assumption is accurate, the installation technology would be the same as that utilized in the Milford Iroquois project. Refer to DEP R. 120 for video footage of the Milford Iroquois installation. It is also reasonable for the Department to assume that the fate of the Branford shellfish beds would be the same as those shellfish beds impacted by the Milford Iroquois pipeline installation. Employment of dredge trenching would be catastrophic to the nearshore shellfishery since these are existing, worked shellfish beds. Trenching would go directly through shellfish beds under the jurisdiction of the Town of Branford Shellfish Commission. Please refer to Figure 20 showing this potential trench area. A trench width of 100 feet is shown to accommodate the draft of the laybarge. The Department believes that this width is both conservative and reasonable to provide an impact estimate.

Additionally, trenching through this area would temporarily impede navigation into Tilcon's commercial quarry operation. Obviously, no discussions have occurred regarding the burial depth or type of pipeline cover for this assumed alternative. A shallow burial depth would expose the pipeline to damage from anchors belonging to heavy rock-laden barges which regularly travel to and from the Tilcon site.

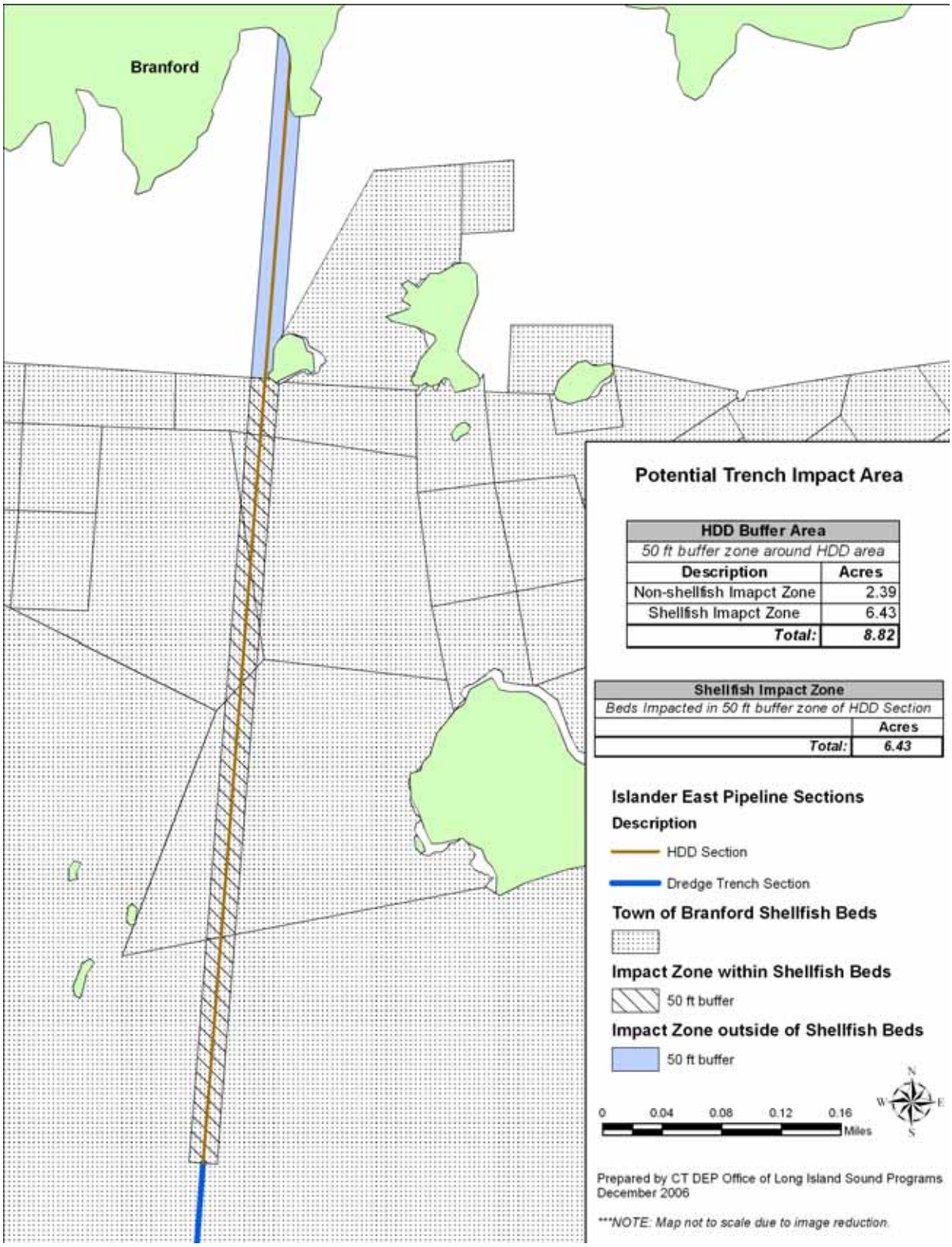

Figure 20. Potential trench impact area.

Advanced HDD Technology

The Department knows of a number of advanced, alternative HDD technologies that Islander East has neither proposed nor discussed. The use of these technologies could potentially minimize impacts to water quality by eliminating the risk of frac-outs; eliminate the need for a trench and engineered backfill; and reduce the need for an anchor corridor through shellfish lease beds. These technologies not considered by the applicant include, but are not limited to:

- HDD conducted up to distances of more than 20,000 linear feet;
- two-drill intersections successful up to distances of approximately 10,000 linear feet;
- advanced pressure-monitoring equipment that can predict frac-outs before they occur;
- a foam substitute for drilling mud; and
- the use of magma fiber to prevent frac-outs.

Based on the record, these emerging, yet proven technologies have not been investigated by Islander East. The Department strongly feels that the use of all, or at least some of these technologies could greatly minimize the risk of nearshore impacts by preventing frac-outs and/or eliminating the proposed mile long trench with engineered backfill.

Ocean Dumping Act

As previously discussed in this Decision, the proposed dredging volumes for the exit pit and mile long trench will be between 19,300 and 28,300 cubic yards of sediment.[86] The final volume will be determined on-site during installation operations depending on a stable angle of repose for the trench edges. Islander East has proposed an acceptable disposal option for 24,000 cubic yards of this material.

The Marine Protection, Research and Sanctuaries Act (MPRSA 33 U.S.C. Sec. 1401 et seq., commonly referred to as the Ocean Dumping Act), as amended, specifically requires that all projects disposing of 25,000 cubic yards or greater must be evaluated to determine the potential environmental impact of such activities and must be authorized by the Corps. This authorization

[86] This volume does not include dredging proposed on the Long Island shore approach. Any dredge material from New York should be included in the final dredge volume estimate.

is subject to U.S. Environmental Protection Agency review and concurrence. Environmental evaluations must be conducted in accordance with the requirements and criteria promulgated in Title 40, Code of Federal Regulations, Parts 220-228 (40 CFR 220-228).

With no other viable options presented for the material in excess of 24,000 cubic yards, the dredge operator would presumably have to terminate operations upon reaching 24,000 cubic yards and Islander East would need to apply to the Department, EPA and the Army Corps of Engineers for authorization pursuant to the Ocean Dumping Act. As was discussed in the HDD Failure Alternative section, above, if conditional options are not approved up-front, significant delays or total project termination could result. The lack of authorization for dredge disposal options over 25,000 cubic yards is significant in the consideration of a water quality certification because the volume of sediment to be moved contributes to the amount of turbidity in the water column and the resulting sedimentation. More important, it is essential that the material be subject to specific biological assessments in order to sufficiently characterize the potential impacts to benthic organisms.

Drilling Fluid Containment Options

Because Islander has not established its proposed methodology, the Department has been unable to evaluate impacts associated with the installation of a hypothetical drilling fluid containment system as discussed in DEP R. 7 Appendix A, "Concepts for Subsea Containment of Drilling Fluid." The successful implementation of such a system could alleviate a portion of the impacts associated with the release of drilling fluid in sensitive nearshore shellfish beds. More information on this subject is necessary for the Department to assess impacts and predict the likelihood of drilling fluid containment success.

Pipeline Burial Obstructions

The Islander East application does not provide alternative methods of installation where those currently proposed may fail. While the shallow subsurface surveys included in the application material indicate that there should be no problems with achieving the proposed burial depths, these surveys provide only a minimal level of detail. Previously undetected boulders and bedrock outcrops or other unanticipated obstructions may present a challenge to the proposed installation methodologies. The Department notes that during the 2002 installation of the Cross

Sound Cable from New Haven, Connecticut to Shoreham, New York, several unexpected and unknown installation obstacles were encountered. Alternative installation methods required the use of different technologies and the need for additional authorizations. If conditional installation techniques are not considered up-front, significant delays could result as additional water quality certifications may be necessary.

FERC Approval of Modifications

The Department is concerned that FERC has not yet reviewed the modifications proposed by Islander East. It is the Department's understanding that Islander East will need to file an Implementation Plan with FERC that will require review and written approval. To date, no such approval has been forwarded to the Department. The Department is concerned with the absence of a FERC-approved Implementation Plan because if such plan is not approved, the applicant may have to consider alternate methodologies resulting in additional authorizations from this Department.

Connecticut Water Quality Standards and the Anti-Degradation Policy

EPA regulations require states to adopt an anti-degradation policy in their Water Quality Standards (40 C.F.R. §131.12). This policy directs that existing uses must be protected without exception and levels of water quality necessary to protect those uses be maintained. Connecticut's WQS contain such an anti-degradation policy. WQS Standard No. 2 reflects that policy, requiring that existing and designated uses "such as propagation of fish and shellfish, and wildlife" be "maintained and protected."

The classification for the waters at issue in this case is SB/SA, which "signifies that the water quality management goal is to achieve and maintain full support of all Class SA designated uses." Class SA waters are designated for the following uses: "habitat for marine fish, other aquatic life and wildlife; shellfish harvesting for direct human consumption; recreation; industrial water supply; and navigation." The existing high water quality conditions overlaying an area of fine-grained cohesive sediments currently supports extensive shellfish harvesting. This activity, which has been on-going for many years, establishes "shellfish harvesting" as an existing use for these waters. The stated objective of the Clean Water Act is to restore and

maintain the physical, chemical and biological integrity of the nation's water. These matters represent the core of water quality management. The Act specifies that "it is the policy of the Congress to recognize, preserve and protect the primary responsibilities and rights of States to prevent, reduce and eliminate pollution, to plan the development and use (including restoration, preservation, and enhancement) of land and water resources …" (33 U.S.C. §1251(b)). Thus an important function of a state's water law is to designate water uses and take necessary steps to achieve and maintain the water quality conditions, habitat characteristics and level of biological integrity that is necessary to sustain those uses for future generations. Further, the anti-degradation policy establishes an absolute prohibition on any action that would result in the loss of an existing use.

The Department has provided a thorough discussion of the Record items concluding that the existing habitat will be permanently altered, thus impacting the biological integrity of the region. The Connecticut Water Quality Standards define biological integrity as "the ability of any aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitats of a region" (DEP R. 112, Appendix A, A-2). As noted, it is the State's goal to maintain the chemical, physical and biological integrity of surface waters.

Conclusion

In accordance with the foregoing discussion, the Department finds that Islander East's proposal to construct and install a natural gas pipeline through the Thimble Islands region of Branford's coastal waters is inconsistent with the State of Connecticut's Water Quality Standards as approved by the EPA. Specifically, the project is inconsistent with Surface Water Quality Standards Numbers 1 and 2:

1. It is the State's goal to restore or maintain the chemical, physical, and biological integrity of surface waters. Where attainable, the level of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water shall be achieved.

2. Existing and designated uses such as propagation of fish, shellfish, and wildlife, recreation, public water supply, agriculture, industrial use and navigation, and the water necessary for their protection is to be maintained and protected.

The Department's finding is consistent with the anti-degradation provisions of Connecticut's Water Quality Standards as follows:

1. The project will result in an unacceptable impact to benthic habitats as a direct result of excavation and indirectly through sedimentation;

2. The biological integrity of the project area will be unacceptably reduced and changed as a result of the change in benthic substrate, including sedimentation and backfill with non-native material;

3. The project will result in the loss of an existing use, shellfish harvesting, over an unacceptably large area, approximately 588 acres (and eliminating an additional 531 acres of submerged land from potential shellfish harvesting); and

4. The potential for this project to result in unacceptable degradation of Water Quality Standards is too great (high risk of drilling mud release) and remediation, should degradation occur, is uncertain.

Islander East failed to provide evidence supporting their claim that the habitat disturbed or modified through the proposed work would be capable of recovery, while the Department has found that similar activities conducted elsewhere have had little recovery success even after long post-construction timeframes. Islander East provided many documents that identified or catalogued the existing environmental conditions in the project area. However, Islander East's application provided very little, if any, data relating to benthic recovery periods vis-a-vis the currently proposed project methodologies. It is the applicant's responsibility to provide the Department with the information necessary to fully evaluate the proposal, and the applicant has failed to meet that burden.[87]

The record reveals that the existing environmental conditions in the area of the project dictated the development of the Islander East's proposal. Specifically, the water current velocities, soil characteristics and shallow water depths in the area each played a critical part in the development of Islander East's final proposal. The current velocities through this shallow

[87] Section 22a-3a-6(f) of the Regulations on Connecticut State Agencies: "Unless otherwise provided by law, in a proceeding on an order to enforce a statute, regulation or license and in a proceeding on a notice to revoke, suspend or modify a license, the Staff and other proponents of the order or notice shall have the burden of going forward with evidence and the burden of persuasion. In a proceeding on an application, the applicant and other proponents of the application shall have the burden of going forward with evidence and the burden of persuasion with respect to each issue which the Commissioner is required by law to consider in deciding whether to grant or deny the application. Each factual issue in controversy shall be determined upon a preponderance of the evidence."

nearshore area prevent Islander East from stockpiling or mounding the native sediment along the dredged trench as such material would likely become suspended and migrate into the water column. Because of the sediment's characteristics, it cannot be stored offsite or reused as backfill in the trench or exit pit. Therefore, Islander East determined that only engineered backfill would work in replacing the soil moved off site. Because of the current velocities, the engineered backfill would have to be much coarser, or more substantial in size, than the existing fine clay sediment, as recommended by Haley & Aldrich's May 2003 report. In order for the engineered backfill to be erosion resistant, the material placed in the dredge trench must be the size of bank-run gravel to replicate the erosion-resistance exhibited by the undisturbed sediments. Removing the existing sediment off site and replacing it with engineered backfill in the form of bank-run gravel would create an entirely new habitat type. The existing substrate is composed of a fine-grained cohesive plastic compact clay while the proposed 5½ acres of backfill would be bank-run gravel. Islander East provided no documentation of possible benthic colonization of this new substrate. The use of the word "recovery" for the area where the engineered backfill is proposed is inappropriate, as the Department would not expect a return to the previous assemblage of benthic infauna or epifauna considering it would be an entirely new habitat type. Further, the record demonstrates that this new substrate type would become an obstacle to the existing water-dependent use of shellfish harvesting.

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