APPENDIX F

Macrobenthic Community Structure Along The Proposed Islander East Pipeline Route In Long Island Sound

MACROBENTHIC COMMUNITY STRUCTURE ALONG THE PROPOSED ISLANDER EAST GAS PIPELINE ROUTE IN LONG ISLAND SOUND

FINAL REPORT

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SUBMITTED TO:
ISLAN EAST PIPELINE COMPANY
BRANFORD, CT

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1.0 INTRODUCTION

A benthic survey was conducted in October of 2001 along the proposed Islander East gas pipeline route in Long Island Sound. The purpose of the study was to document existing benthic community structure and to provide a benthic baseline against which future changes may be detected.

1.1 BENTHOS

Soft sediment habitats comprise the greatest area of seafloor in central and western Long Island Sound (Pellegrino and Hubbard, 1983). Benthic biomass in soft sediment habitats is usually dominated by macrofaunal (greater the 0.5 mm) invertebrates such as polychaete worms, crustaceans and molluscs. These animals have substantial influences on the physical, chemical, and biological structure of their sedimentary environment (Lenihan and Micheli, 2001).

Communities of soft sediment organisms provide important ecological goods and services. Soft sediment invertebrates recycle nutrients, detoxify pollutants, and represent trophic links in coastal ecosystems. These invertebrates provide essential food for larger invertebrates, fishes, and marine mammals, and thus provide important energy pathways in marine ecosystems (Lenihan and Micheli, 2001). Generally, the most abundant soft sediments macrofaunal group is composed of polychaete worms with crustaceans (amphipods, isopods, and decapods) usually ranking second in importance.

1.2 PREVIOUS REVIEWS

Zajac et al. (2000) provide an excellent review of major benthic studies conducted in Long Island Sound (LIS). The two most significant studies were those conducted by Reid et al. (1979) and Pellegrino and Hubbard (1983). Reid et al. 1979 recognized three infaunal assemblages in the central and western basins of Long Island Sound. They found no consistent groups, however, for the eastern basin of LIS. The three defined groups consisted of: 1) a muddy, deep water assemblage distributed throughout much of the central and western basins; 2) a shallow sandy assemblage along most of the north shore of Long Island NY; and 3) a transitional shallow water assemblage in the western portion of the Sound. The 3 groups were each comprised of a mixture of species with varying life modes and life histories. Species richness was lower in the muddy deepwater and shallow sandy group than in the transitional group (Zajac et al., 2000).

Pellegrino and Hubbard (1983) conducted a benthic survey of Connecticut waters in LIS that was comprised of 413 stations. They found that infaunal assemblages varied considerably throughout the Sound. Zajac et al. (2000) reanalyzed these data via classification analysis using the 35 most abundant species that Pellegrino and Hubbard found throughout the Sound. Twelve community types were identified, with similarities among communities ranging between 5% and 30%. Depositional environments exhibited a community dominated by *Nephtys incisa*, *Pectinaria gouldii*, *Mulinia lateralis*, *Nucula annulata*, and *Pitar morhuanna*. These communities correspond to the mud assemblage identified by Reid et al. (1979) and are similar to the *Nephtys-Yoldia* community identified by Sanders (1956).

2.0 METHODS

2.1 STATIONS

Station coordinates sampled in this survey are provided in Table 6 and shown on Figure 1. Samples were taken at 12 locations along the proposed Islander East gas pipeline route in LIS. Water depths ranged from 14 to 138 feet. Stations were located more frequently nearshore since habitat conditions are more heterogeneous compared to the deeper open water section of the route across the Sound.

2.2 SAMPLING

Benthic sampling was conducted by Ocean Surveys, Inc. of Old Saybrook, CT on October 24, 29,and 30, 2001. A total of 4 replicate grab samples were taken at each station. 3 replicates were taken with a 0.05m^2 shipek grab and 1 with a 0.05m^2 Ponar grab. Substrate type was visually described with digital photos of each grab sample taken. Benthic station water depths and sediment descriptions can be found in Table 6. Sediment samples were sieved through a 1.0 mm mesh screen and fixed in 10% buffered formalin. Samples were stained with rose bengal prior to fixing.

2.3 SAMPLE PROCESSING

The benthic samples were transferred into 80% denatured alcohol within 7 days after collection. The samples were transferred to Dr. Peter E. Pellegrino who then sorted, identified, and counted infaunal organisms. Dr. Pellegrino was also responsible for all statistical analyses. Each organism was removed from the sediment residue and identified to the lowest possible identification level (LPIL). A shipek and ponar sample from each station was processed while the remaining two remain preserved for future use.

3.0 SAMPLING RESULTS

3.1 GENERAL COMMUNITY COMPOSITION

Polychaetes were the dominant taxonomic group of the twelve (12) sampling stations accounting for 47% of all species collected. Bivalves and gastropods were the next most important groups accounting for 15.0 % and 13 %, respectively.

3.2 SPECIES RICHNESS

A total of 60 invertebrate species (Tables 1-4) were reported from the 12 sampling stations (24 grab samples. Species richness values were highest at station 7C (23), 7F (21) and 7I (21) and lowest at 7L (9) and 7K (11). The overall mean for the entire 12 stations was 17.1 species per station.

3.3 COMMUNITY DENSITY

The density of individuals was low for all 12 sampling stations with highest values occurring at station 7C (219) and 7B (193) and lowest at station 7L (58) and 7K (69). The overall mean for the 12 sampling stations was 120.1 individuals per station.

3.4 DOMINANCE

A total of 60 species were recovered from the benthic sampling stations with 11 species accounting for 75% of all individuals collected (Table 5). The 4 most dominant species in decreasing order of importance were the redline worm, *Nephtys incisa*; the channel-barrel bubble, *Retusa canaliculata*; the nut clam, *Nucula annulata*: and the tellin clam, *Tellina agilis*. Species composition was very similar to that reported by Pellegrino and Hubbard (1983) in their benthic survey of Long Island Sound.

3.5 SPECIES DIVERSITY

Species diversity (Shannon-Weiner Index) (H') of macrobenthic communities along the proposed pipeline ranged from 1.658 at Site 7K to 2.552 at Site 7I (Table 7.). High diversity at site 7I was due to the high number of species relative to the total number of individuals in the sample. Conversely, the low diversity value at Site 7K was due to the low number of species and total individuals sampled and the numerical dominance of two species, *Nephtys picta* and *Tellina agilis*. Evenness (J) values for macrobenthic communities ranged from 0.6094 at Site 7B to 0.8383 at Site 7I. The low evenness value at Site 7B was due to the high abundances of *Nephtys incisa* and *Retusa canaliculata*, which together comprised greater than 66% of the total number of individuals. In general, it appeared that diversity and evenness values were higher at Sites 7C-7J than at the two sites at either end of the pipeline transect.

3.6 CLUSTER ANALYSIS

Several taxa exhibited spatial trends in abundance while others were common to a majority of the benthic sites. Each of these species represents one component of a complex community affected by many biological and physical structuring factors. To provide a more complete characterization of communities, a multivariate Bray-Curtis similarity index was calculated for each pair of sites and grab samples using all species collected at each site. Relationships based on comparison of this index are illustrated as a clustering dendrogram for all sites (Fig. 2), and different grabs used at benthic sites (Fig. 3).

The dendrogram generated from Islander East benthic data show a similarity among the twelve sites ranging from <20% to approximately 70%. One major Group (I) was evident with most sites forming as pair-groups and single linkages. Group I contained sites 7B-7G, with site 7A as a single link. The highest similarity overall occurred within this group >70%. In general, Group I similarity was high because of the high abundances of *Nephtys incisa, Retusa canaliculata* and *Nucula annulata*. Although the many of the same species were present at Site 7A, it was slightly dissimilar to other Group I sites because abundances were lower than other members of the group. Other sites revealed a decreasing similarity to Group I. Sites 7(H) and 7(I) were only 40% similar because of lower *N. incisa* abundances and the presence of *Cerantheopsis americanus* and *Pherusa affinis*. Site 7(J) linked at 30% because of high abundances of *Spiophanes bombyx* and *Ampelisca macrocephala*. Sites 7(K) and 7(L) clustered at the lowest overall similarity, (<20%) because of high abundances of *Tellina agilis* and low abundances of *N. incisa*.

The clustering of separate grab samples from Islander East benthic data resulted in a relatively low similarity between the different sampling gear within a site (Fig. 3). Only five of the twelve sampling sites were joined together in couplets with the different sampling methods. This indicates that small-scale spatial variation exists at a site or the efficiency of the grabs is not the same. However, the overall similarity of community composition appears similar as indicated by the sites contained within Group I.

3.7 NON-METRIC MULTIDIMENSIONAL SCALING (MDS)

The purpose of MDS is to represent the samples, (in this case sites for combined grab samples and separate grab samples) as points in low-dimensional space such that the relative distances apart of all points are in the same rank order as the relative dissimilarities of the samples (as calculated by Bray-Curtis coefficients on the assemblage data). Points that are close together represent samples that are very similar in species composition; conversely, points that are far apart correspond to very different communities. The 'stress' indicates how faithfully the high-dimensional relationships among samples are represented in the 2-dimensional ordination plot. Stress values of 0.10 or less indicate a highly reliable representation of the data. Stress values between 0.10 and 0.20 represent an accurate and reliable representation of the data in 2-dimensional space.

MDS analysis of the Islander East Pipeline data of sites resulted in one major island (Sites 7A-7G) of communities relatively close in composition (Fig. 4). The stress for the data was 0.08 that indicates a highly reliable ordination. The major island sites exhibited high abundance of several taxa, including the polychaete *Nephtys incisa*, the gastropod, *Retusa canaliculata* and the bivalve *Nucula annulata*. These sites were also generally high in overall abundance and total numbers of species. The remaining sites, 7H through 7L were less similar to the main island. Sites 7H and 7I were closest to the main island with lower abundances of *N. incisa*. Unique to these sites, *Pherusa affinis*, caused separation from the other sites along with *Ceriantheopsis americanus*. Site 7J, although in the vicinity of the above sites was separated by the presence of *Spiophanes bombyx, Ampelisca macrocephala, Monticellina dorsobranchialis, Leitoscoloplos robustus* and *Oribinia kupffersi*. Low abundances of *N. incisa* and high abundance of *Tellina agilis* was responsible for the distinct separation of 7K and 7L from other sites and proximity to each other.

MDS ordination of separate grab samples was similar to that of the Site ordination (Fig. 5). The stress value of 0.12, although higher than that for sites still indicates a reliable representation for separate grab samples. The distance between grab samples at a site in this plot can be interpreted as a measure of variation between the two different types of sampling equipment.

4.0 CONCLUSIONS

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. 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).

Most opportunistic species are surface and shallow-subsurface deposit feeders that bioturbate and irrigate the top few millimeters of sediment. Opportunistic species are so named because they are usually pioneers that first occupy a disturbed patch. Opportunists are usually small, short-lived animals that are highly fecund, producing many eggs per female and several annual cohorts (Lenihan and Micheli, 2001).

Late successional species (Stage III) are larger, deeper living, and predatory or suspension feeding. Most opportunistic species are poor competitors for food and space and do not possess advanced defenses against predators, so are easily displaced by Stage III species. Stage III species represent the climax or equilibrium assemblage in LIS. Many representatives of these high-order stages are deep burrowing errant or tube dwelling infauna which feed head down or conveyor belt style. These infauna are capable of moving sediment particles over vertical dimensions of several centimeters. Dominants in these Stage III assemblages include Maldanid, Pectinid, and Orbinid polychaetes, caudate holothurians, and protobranch bivalves. These taxa typically have larger body sizes and longer mean life spans than earlier successional stages (Rhoads and Germano, 1986).

The macrobenthic communities along the proposed Islander East gas pipeline route in Long Island Sound were dominated by a suite of high-order or late successional stage (Stage III) species. Some transitional stage (Stage II) species were present at some stations. The assemblages found associated with the proposed gas pipeline route are typical of most soft sediment habitats in central and western LIS.

5.0 LITERATURE CITED

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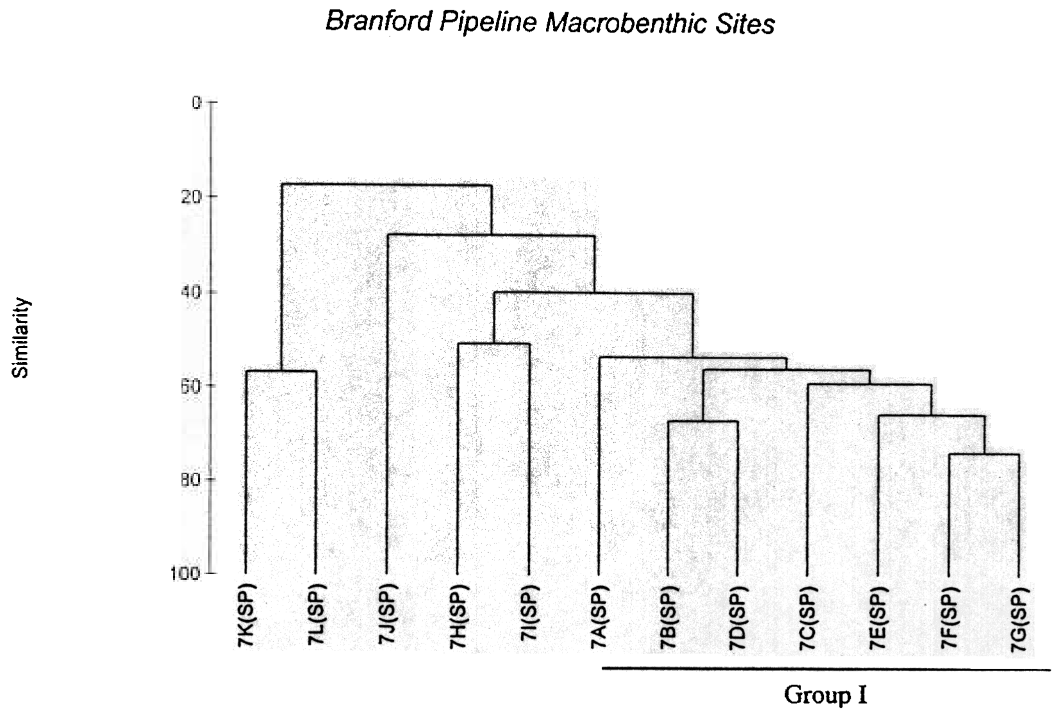

Figure 2. Dendrogram resulting from Classification and Cluster Analysis of macrobenthic community data from combined grab samples along the proposed route for the Islander East Pipeline in Long Island Sound (S) = Shipex grab sample; (P) = Ponar grab sample.

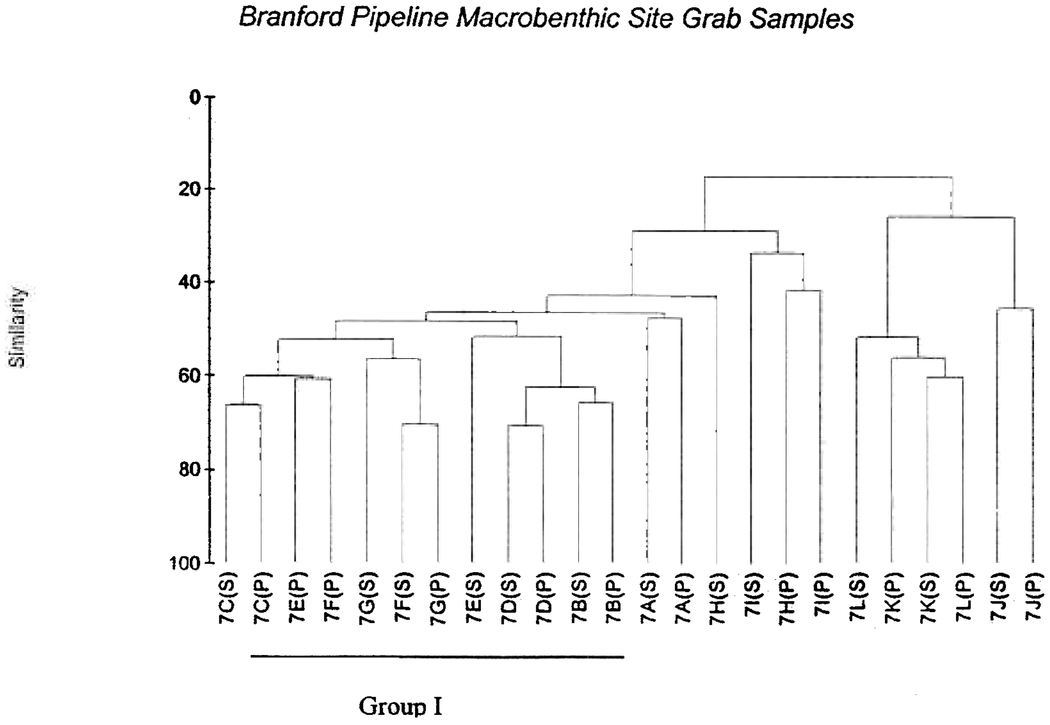

Figure 3. Dendrogram resulting from Classification and Cluster Analysis of macrobenthic community data from separate grab samples along the proposed route for the Islander East Pipeline in Long Island Sound (S) = Shipex grab sample; (P) = Ponar grab sample.

Branford Pipeline Data Grabs Combined

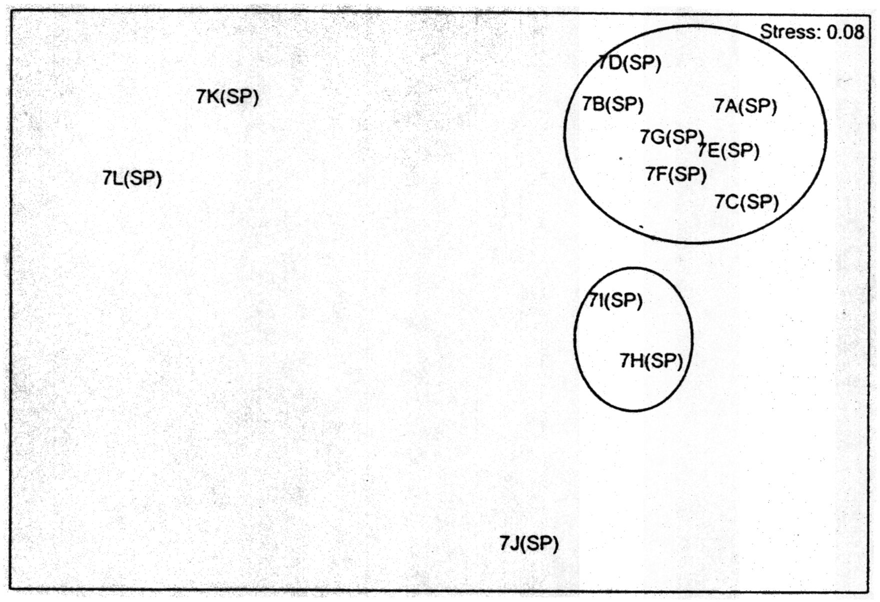

Figure 4. Non-metric Multidimensional Scaling (MDS) of macrobenthic community data from combined grab samples along the proposed route for the Islander East Pipeline in Long Island Sound (S) = Shipex grab sample; (P) = Ponar grab sample.

Branford Pipeline Data

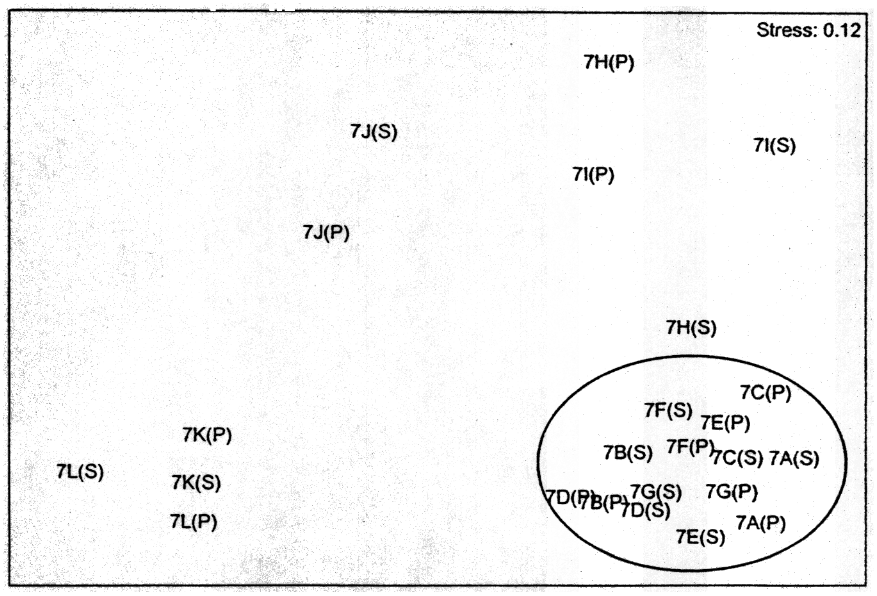

Figure 5. Non-metric Multidimensional Scaling (MDS) of macrobenthic community data from separate grab samples along the proposed route for the Islander East Pipeline in Long Island Sound (S) = Shipex grab sample; (P) = Ponar grab.

TABLE 1. Macrobenthic community structure of sampling stations 7A, 7B, 7C, 7D, 7E, 7F, 7G, 7H, 7I, 7J, 7K, and 7L along the proposed route for the Islander East Gas Pipeline in Long Island Sound ((S) = Shipex grab sample; (P) = Ponar grab sample).

Species	7A (S)	7A (P)	7B (S)	7B (P)	7C (S)	7C (P)	7D (S)	7D (P)	7E (S)	7E (P)	7F (S)	7F (P)	7G (S)	7G (P)	7H (S)	7H (P)	7I (S)	7I (P)	7J (S)	7J (P)	7K (S)	7K (P)	7L (S)	7L (P)
ANNELIDA																								
POLYCHAETA																								
Clymenella torquata	4	2	1	1	-	7	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Mediomastus ambiseta	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Streblospio benedicti	3	-	2	-	2	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Spiochaetopterus oculatus	2	1	2	-	1	-	4	3	2	1	-	-	-	-	-	-	-	1	4	-	-	-	-	-
Asychis elongata	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Nephtys picta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	12	1	3
Nephtys incisa	13	19	18	16	22	26	20	13	21	23	24	27	5	25	14	16	2	6	12	4	-	2	-	-
Podarke obscura	1	-	-	-	1	1	-	-	1	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
Eudymene sp.	-	1	-	1	13	22	1	-	-	7	-	-	6	-	5	-	1	-	-	-	-	-	-	-
Pectinaria gouldii	-	-	-	-	-	-	2	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Amphitrite johnsoni	-	-	-	-	-	2	-	-	3	-	2	2	1	1	-	-	-	-	-	-	-	-	-	-
Asabellides oculata	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scolelepis sqamata	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glycera capitata	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ampharete arctica	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	1	-	-	-	-	-	-
Pista palmata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-
Arabella iricolor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Spiophanes bombyx	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	11	-	-	-	-
Monticellina dorsobranchialius	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-
Orbinia kupfferi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-
Owenia fusiformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	5	-	-	1	1	5
Leitoscoloplos robustus	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-
Thrayx acutus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
Glycera americana	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paranitius speciosa	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pherusa affinus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	-	-	-	-
Macroclymene sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Ninoe nigripes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
MOLLUSCA																								
GASTROPODA																								
Turbonilla interupta	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbonilla elegantula	1	-	2	1	8	3	-	-	1	-	-	1	-	-	1	-	1	-	1	-	-	-	-	-
Retusa canaliculata	19	3	58	37	34	14	8	7	13	35	4	13	7	4	2	-	4	-	-	-	1	-	-	3
Reaxis punctostriatus	4	-	1	18	-	-	5	5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nassarius trivitatus	-	-	3	1	3	6	2	1	3	2	1	2	1	1	1	-	-	2	-	1	1	2	-	-
Mellanella intermedia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Mitrella lunata	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crepidula plana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
BIVALVIA																								
Nucula annulata	13	4	-	1	4	3	31	-	-	18	5	12	6	14	-	-	-	-	-	-	-	-	-	-
Yoldia limatula	-	-	1	8	1	0	4	1	-	2	6	-	1	4	-	-	1	1	-	-	-	-	-	-
Tellina agilis	-	-	6	6	-	-	4	7	-	-	2	-	2	-	-	-	-	3	9	12	8	18	13	9
Pitar morrhuana	-	-	1	-	-	1	1	4	-	-	1	3	-	6	7	-	-	1	-	-	-	-	-	-
Pandora gouldiana	-	-	1	1	1	4	2	2	-	1	-	1	1	-	-	-	-	-	-	-	-	2	-	-
Mulinia lateralis	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	4	6	5	2
Anadara transversa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Lyonsia hyalina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-
Gemma gemma	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	2

Species	7A (S)	7A (P)	7B (S)	7B (P)	7C (S)	7C (P)	7D (S)	7D (P)	7E (S)	7E (P)	7F (S)	7F (P)	7G (S)	7G (P)	7H (S)	7H (P)	7I (S)	7I (P)	7J (S)	7J (P)	7K (S)	7K (P)	7L (S)	7L (P)
ANNELIDA																								
POLYCHAETA																								
ARTHROPODA																								
DECAPODA																								
Pinnixa sayi	3	•	•	•	1	7	•	•	•	9	7	1	•	1	6	21	2	3	•	2	•	•	•	•
ANOMURA																								
Pagurus longicarpus	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1	•	1	•	•	•
AMPHIPODA																								
Ampelisca macrocephala	•	•	•	1	4	16	•	•	•	•	•	3	•	•	•	•	•	•	10	8	1	•	•	•
Ampelisca vadorum	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5	•	•	•	•
Unciola irrorata	•	•	•	•	1	•	•	•	•	•	•	•	•	•	•	•	2	•	1	•	•	•	•	•
ISOPODA																								
Sphaeroma quadridentata	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	1	•	•	•	•	•	•
CNIDARIA																								
Edwardsia elegans	1	•	•	•	3	•	•	•	•	•	•	•	•	1	•	•	•	•	•	•	•	•	•	•
Nematostyla vectensis	•	•	•	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Cerianthiopsis americanus	•	•	•	•	•	1	•	•	•	•	•	1	•	•	1	5	13	8	6	•	•	•	•	•
PHORONIDA																								
	•	•	•	•	•	•	•	•	•	1	•	•	•	•	•	•	•	7	•	•	•	•	•	•
	•	•	•	•	1	•	•	•	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•	•
	•	•	•	•	•	•	•	•	•	•	1	•	•	1	•	•	•	•	•	•	•	•	•	•
Nemerta sp A	•	2	3	•	•	•	•	•	3	•	4	•	1	•	2	•	•	8	•	•	•	•	•	•
Nemerta sp b	•	•	•	•	•	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PLATYHELMINTHES																								
Styloccus sp.	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Table 2. Dominant benthic infaunal species at stations along the proposed Islander East gas pipeline in Long Island Sound.

SPECIES	NUMBER OF INDIVIDUALS	PERCENT TOTAL	CUMULATIVE PERCENT	NUMBER OF STATIONS	PERCENT STATIONS
Nephtys incisa	328	23.00	23.00	11	91.7
Retusa canaliculata	266	18.65	41.65	11	91.7
Nucula annulata	111	7.78	49.43	7	58.3
Tellina agilis	99	6.94	56.37	8	66.7
Pinnixa sayi	63	4.42	60.79	8	66.7
Euclymene sp.	57	3.99	64.78	8	66.7
Ampelisca macrocephala	43	3.02	67.80	5	41.7
Cerianthiopsis americana	35	2.45	70.25	5	41.7
Yoldia limatula	30	2.10	72.35	7	58.3
Pitar morhuanna	25	1.75	74.10	5	41.7
Nephtys picta	25	1.75	75.85	2	16.7
Spiophanes bombyx	24	1.68	77.53	1	14.3
Nemertea sp. A	23	1.61	79.14	7	58.3
Spiochaetopterus oculatus	21	1.47	80.61	7	58.3
Turbonilla elegantula	20	1.47	82.08	8	66.7
Mulinia lateralis	20	1.47	83.55	4	33.3
Clymenella torquata	16	1.12	84.67	4	33.3
Owenia fusiformis	16	1.12	85.79	4	33.3
Pandora gouldiana	16	1.12	86.91	6	50.0
Amphitrite johnsoni	11	0.77	87.68	4	33.3
Gemma gemma	11	0.77	88.45	1	14.3

Table 3. Geographical location, depth , and sediment observations from the Islander East benthic sampling locations.

STATION	POSITION (UTM Zone 18 NAD 83 feet)		DEPTH (feet)	COMMENTS
	Easting	Northing		
7A	2254187.0	14992071.0	14.5	Dark brown and gray fine grained mud with shell hash
7B	2253353.0	14990131.0	18.0	Fine gray and brown mud with shell hash
7C	2252728.0	14988676.0	21.5	Fine gray and brown mud with shell hash
7D	2252102.0	14987220.0	21.5	Black sticky mud covered by fine brown mud (1mm)
7E	2251309.0	14985849.0	33.0	Black and brown mud with shell hash
7F	2250552.0	14984463.0	31.5	Sticky dark gray mud
7G	2253137.0	14966254.0	60.5	Sticky mud with some worm tubes
7H	2244929.0	14936387.0	92.0	Brown and gray sticky mud
7I	2231370.0	14907870.0	135.0	Gray sticky mud
7J	2226667.0	14889315.0	40.5	Dark gray very fine sand
7K	2227167.0	14887812.0	20.5	Light brown sand
7L	2227667.0	14886309.0	19.5	Moderately coarse light gray sand

Table 4. Species diversity (H), evenness (J), numbers of species and total numbers of individuals for Macrobenthic sites along the proposed route for the Islander East Pipeline in Long Island Sound.

Site	Number of Species	Number of Individuals	Diversity (H)	Evenness (J)
7A	17	104	2.138	
7B	18	193	1.761	
7C	23	219	2.356	
7D	14	130	2.151	
7E	19	153	2.068	
7F	21	129	2.127	
7G	16	91	2.071	
7H	16	96	2.163	
7I	21	77	2.552	
7J	20	122	2.450	
7K	11	69	1.658	
7L	9	58	1.813	

PROPOSED 24" PIPELINE INSTALLATION
FROM BRANFORD, CONNECTICUT
TO LONG ISLAND SOUND, NEW YORK

Islander East Pipeline Company

BENTHIC GRAB STATION LOCATIONS

Date: 1/02 | Sheet 1 of 1