



**PWGSC PROJECT #R.076185.002
UNDERWATER BENTHIC HABITAT SURVEY
BACK BAY DFO-SCH
BACK BAY, DEER ISLAND, NEW BRUNSWICK**

FINAL REPORT

Submitted to:

Public Works and Government Services Canada
Saint John, New Brunswick

Submitted by:

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited
Saint John, New Brunswick

August 2015

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18 August, 2015

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Mr. Jason Keys
Environmental Officer
Environmental Services
Public Works and Government Services Canada
189 Prince William Street
Saint John, New Brunswick
E2L 2B9

Dear Mr. Keys:

**Re: Underwater Benthic Habitat Survey at the Back Bay Fisheries and Oceans Canada
Small Craft Harbour, Back Bay, New Brunswick – Final Report**

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), is pleased to provide Public Works and Government Services Canada with the findings of an Underwater Benthic Habitat Survey undertaken within the footprint of proposed construction and dredge areas at the Back Bay Fisheries and Oceans Canada – Small Craft Harbour in Back Bay, New Brunswick.

Amec Foster Wheeler appreciates the opportunity to provide services to your organization. Please do not hesitate to call if you have any questions regarding this or any other matter.

Respectfully submitted,

**Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited**

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1.0 INTRODUCTION

At the request of Public Works and Government Services Canada (PWGSC), an Underwater Benthic Habitat Survey (UBHS) program was completed on 24 July, 2015 within the footprint of proposed dredge areas at the Back Bay Fisheries and Oceans Canada (DFO) – Small Craft Harbour (SCH) in Back Bay, New Brunswick (NB).

2.0 SCOPE AND METHODOLOGY

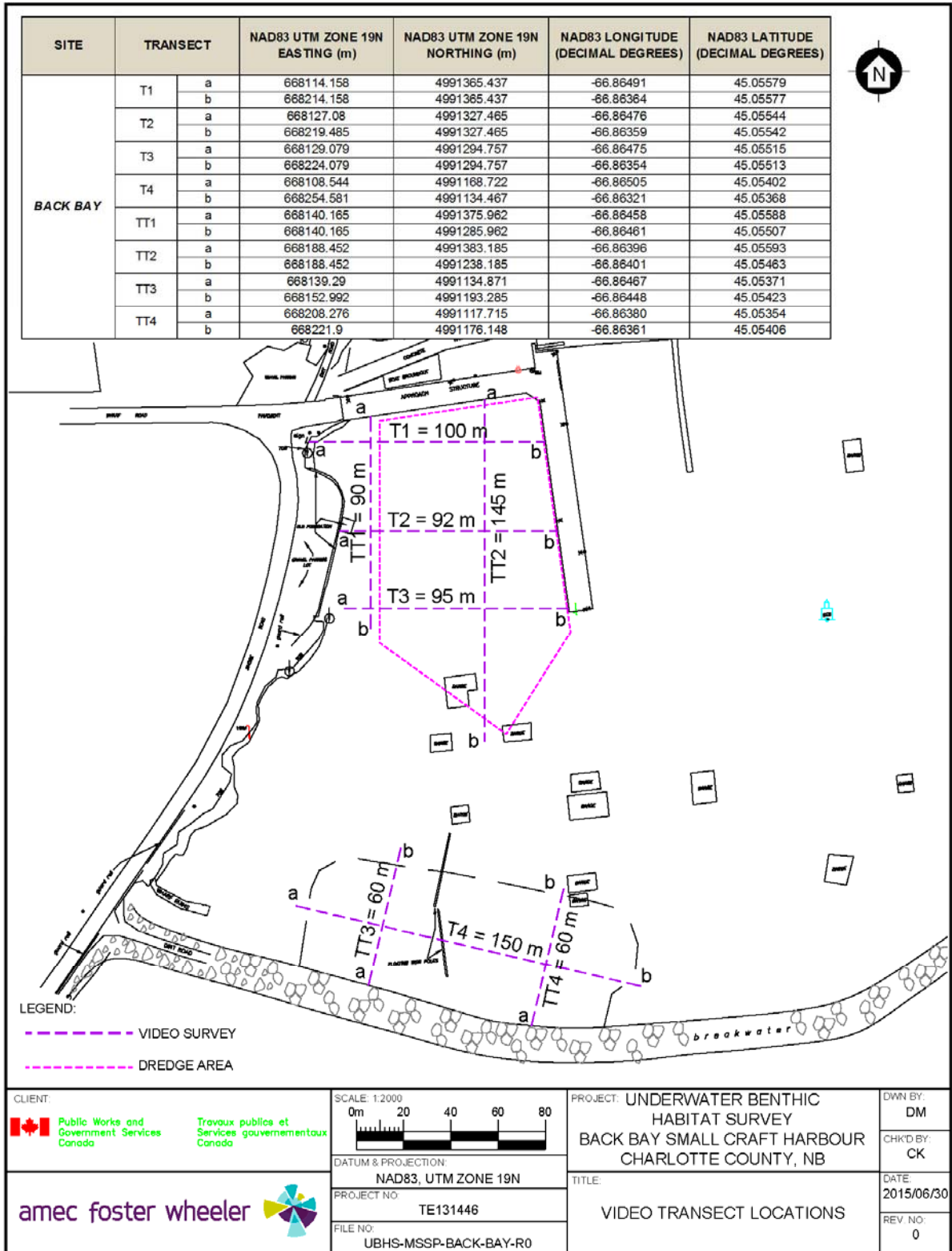
Qualitative and quantitative observations were obtained from the footprint of the proposed construction and dredge areas using video survey techniques to map substrate types and document macrofaunal and macrofloral species presence and abundance. Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler) contracted Diversified Divers Inc. to perform the diving and video surveillance services. An Amec Foster Wheeler representative was on-site to guide the dive crew in the event that any issues arose and to obtain supporting habitat and biological information.

A total of 795 metres (m) of video surveillance was divided into three transects (T1, T2 and T3) and four transect tie lines (TT1 to TT4) of various lengths from the footprint of the proposed construction and dredge areas at the Back Bay DFO-SCH (Figure 2.1).

A handheld Global Positioning System (GPS) was used to locate the pre-determined start and finish points of the transects.

The survey of the transects required the use of a video camera, operated by a Canadian Standards Association (CSA)-certified diver. Video at the Back Bay DFO-SCH was collected both on land and in the water. The intertidal portions of the breakwater in TT3 and TT4 were not captured in the video, but were assessed both on-site and with photographs. Seabed characterization involved field observations made by the field crew and a review of the video survey recording. Observations along the video transect were made for every 5 m segment.

Figure 2.1 Benthic Transect Locations – Back Bay DFO-SCH, Back Bay, NB



3.0 UNDERWATER HABITAT SURVEY RESULTS

The results of the transect surveys for the proposed project footprint are presented in Appendix A (Tables A.1 to A.8), including the following information for each 5 m increment of transect line:

- visual determination of substrate type (in order of dominance);
- macrofaunal species identification and abundance; and
- macrofloral species identification and percent coverage.

A summary of the information provided in Tables A.1 to A.8 (Appendix A) is described in the following paragraphs. An annotated species list has been included in Appendix B. Photographs of the site and portions of TT3 and TT4 at low tide have been included in Appendix C.

For the purposes of the video survey review and macrofaunal species identification and enumeration, four categories were developed to characterize the observed abundance levels. The categories are as follows:

A = Abundant

Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common

Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional

Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon

Quantifiable observations made infrequently along the 5 m segment.

Observations of macrofaunal life were common and noted along all eight transects as further described in this section.

Macrofloral life was noted in all eight of the transects as further described below and in the associated tables in Appendix A (where encountered). Macrofloral debris (i.e., detritus from macrofloral species) was noted along segments of all transects except T1 and TT1.

3.1 Transect 1 (T1)

Transect 1 (T1) was 100 m long, starting at the wharf parallel with the shore and proceeded in a westerly orientation to the high tide line. The high tide mark appeared to be around the 85 m mark; however, the video ran for the entire 100 m (Figure 2.1).

Substrate:

The first ten metres from the wharf was predominantly silty with lesser amounts of sand, rock, and cobble. The next ten metres went over a bedrock ledge that was followed by ten metres of a silt/rock mix with lesser amounts of cobble and sand which was again followed by ten metres of rock and cobble. The last 60 m of the transect were predominantly cobble with lesser amounts of gravel and one instance each of rock and bedrock.

Macrofauna:

Macrofaunal life was only observed in the first half of the transect and was composed primarily of abundant and common occurrences of Northern rock barnacle (*Semibalanus balanoides*) and occasional to abundant occurrences of periwinkles (*Littorina* sp.). Occasional to abundant occurrences of green sea urchin (*Strongylocentrotus droebachiensis*) were noted in three segments with uncommon occurrences of green crab (*Carcinus maenas*) and rock crab (*Cancer irroratus*) the only other species noted in the transect. Shell hash was noted throughout the first 50 m of the transect.

Macroflora:

Macrofloral life was noted in 65% of the transect with cover ranging between 5 and 70%; however, much of the transect had cover of less than 10%. The most extensive community existed in the 30-45 m range and consisted of rockweed (*Ascophyllum nodosum*), bladderwrack (*Fucus vesiculosus*), and a brown alga (*Pilayella littoralis*). Outside of that range, macroflora consisted of 5% cover of rockweed, bladderwrack, or green alga (*Spongomorpha* sp.). Macrofloral debris was not noted in the transect.

3.2 Transect 2 (T2)

Transect 2 (T2) was 90 m long, starting at the wharf parallel with the shore and proceeded in a westerly orientation to the high tide line (Figure 2.1).

Substrate:

The first 35 m of T2 was comprised predominantly of silt with lesser amounts of sand. The remainder of the transect was predominantly cobble with lesser amounts of rock, gravel and silt, and sand.

Macrofauna:

The first 35 m of the transect were noted by the uncommon to occasional occurrence of green sea urchin with uncommon occurrences of green crab, rock crab and periwinkle. Where hard bottom was present, common to abundant occurrences of Northern rock barnacle and occasional to abundant occurrences of periwinkles were noted. Uncommon occurrences of green crab were also noted through this area. No fauna was observed in the last fifteen metres of the transect. Shell hash was noted throughout the first 70 m of the transect.

Macroflora:

Macroflora was noted in 65% of the segments but overall cover was greater than 20% in only one segment; 50-55 m with 55% cover. Sugar kelp (*Laminaria saccharina*) was noted through the first 20 m with rockweed and bladderwrack noted between the 45 m and the end of the transect. Macrofloral debris was noted throughout the first 45 m of the transect with cover in some areas of 90%.

3.3 Transect 3 (T3)

Transect 3 (T3) was 95 m long, starting at the wharf parallel with the shore and proceeded in a westerly orientation to the high tide line (Figure 2.1).

Substrate:

The first 55 m of T3 was comprised predominantly of silt with lesser amounts of sand, clay, cobble, and rock. The remainder of the transect was predominantly cobble with lesser amounts of rock, gravel and silt, and sand.

Macrofauna:

Macrofaunal life was noted by the occasional to abundant occurrence of periwinkles with occasional to common occurrence of Northern rock barnacle. Other species included occasional occurrence of blue mussel (*Mytilus edulis*) and uncommon occurrences of green sea urchin and green crab. Shell hash was noted throughout the transect.

Macroflora:

Macroflora was noted was noted in almost 75% of the segments with cover varying greatly between segments. The community was a mix of spiny sour weed (*Desmarestia aculeata*), rockweed, green alga, sugar kelp, and bladderwrack. In some instances the cover was 5-10% and in others was as high as 55%. Generally the higher cover could be attributed to a patch of rockweed. Macrofloral debris was noted throughout the first 55 m of the transect with cover up to 50%.

3.4 Transect 4 (T4)

Transect 4 (T4) was 150 m long and ran in a west to east orientation parallel to the armourstone breakwater (Figure 2.1).

Substrate:

The first ten metres of T4 was predominantly silt with lesser amounts of sand. The remainder of the transect the substrate was comprised of a mix of clay and silt with lesser amounts of sand and in few instances, a small amount of rock.

Macrofauna:

Macrofaunal life was limited to approximately one third of the transect. Species were limited to a single uncommon observance of periwinkle and ten uncommon observances of green crab. Shell hash was noted throughout the transect but only in a third of the segments.

Macroflora:

Macroflora was noted in every segment of the transect with cover between 5 and 70%. The segments with the highest cover were spread throughout the transect, interspersed with areas of lower cover. The predominant species observed were green alga, sugar kelp and rockweed with rare observances of brown alga, spiny sour weed, and bladderwrack. Macrofloral debris was noted throughout the transect but at a lower level than seen in T2 and T3.

3.5 Transect Tie Line 1 (TT1)

Transect tie line 1 (TT1) was 90 m long, starting at the wharf perpendicular to the shore and proceeded in a southerly orientation (Figure 2.1).

Substrate:

The transect was predominantly cobble with lesser amounts of gravel, rock, silt, and sand except the last two segments that were a mix of gravel and cobble.

Macrofauna:

Northern rock barnacle was the predominant species observed with occasional to common occurrences throughout the length of the transect. Uncommon occurrences of green crab were noted in twelve segments and periwinkle was noted in six segments with uncommon to occasional occurrence. The only other fauna noted was a single uncommon occurrence of rock crab. Shell hash was observed in all but one segment.

Macrofloral:

Macrofloral life was noted in 85% of the segments but overall the community was sparse with coverage ranging between 5 and 25%. The only species noted were rockweed and bladderwrack. Macrofloral debris was not observed in TT1.

3.6 Transect Tie Line 2 (TT2)

Transect tie line 1 (TT1) was 150 m long, starting at the wharf perpendicular to the shore and proceeded in a southerly orientation (Figure 2.1).

Substrate:

The first fifteen metres were a mix of hard bottom including cobble, rock, gravel, and bedrock with small amounts of sand and silt. The next 65 m were predominantly silt with lesser amounts of sand, clay, cobble, gravel, and rock. From this point to the end of the transect the substrate was a mix of clay and silt with lesser amounts of sand and rock.

Macrofauna:

Green crab was the predominant macrofaunal life observed with uncommon occurrences in 60% of the segments in TT2. Northern rock barnacle (occasional to abundant occurrence) and periwinkle (uncommon to abundant occurrence) were noted in approximately one third of the segments. Other species noted were two uncommon observances of seastars (*Asterias* sp.) and a single uncommon observance each of moon jellyfish (*Aurelia aurita*), green sea urchin and rock crab. Shell hash was observed throughout the transect.

Macroflora:

Macrofloral life was noted in 75% of the segments with coverage ranging between 5 and 30%. Except for the last fifteen metres which has individual species cover between 25 and 30% the remainder of the transect rarely had cover over 10%. Sugar kelp was the most common species noted with rockweed, bladderwrack, and green alga less prominent. Macrofloral debris was observed between the 35 and 150 m marks with coverage up to 50% in some segments.

3.7 Transect Tie Line 3 (TT3)

Transect tie line 3 (TT3) was 60 m long. It began at the toe of the armourstone breakwater and proceeded north (Figure 2.1). A photograph of the intertidal portion of the breakwater has been included in Appendix C.

Substrate:

The intertidal zone was comprised entirely of boulder. The substrate of the transect was a mix of clay and silt with lesser amounts of sand. In rare instances there was also a lesser amount of boulder or rock.

Macrofauna:

Macrofaunal life was restricted to six observances of a single green crab and one single rock crab. Shell hash was only noted in two segments.

Macroflora:

Macrofloral life was noted in every segment of the transect with cover ranging between 10 and 60%. The algal community was dominated by green alga and sugar kelp with less common instances of rockweed, bladderwrack, sea lettuce, and spiny sour weed. The intertidal portion of the breakwater was almost completely covered in rockweed. Macrofloral debris was noted in the first 35 m.

3.8 Transect Tie Line 4 (TT4)

Transect tie line 4 (TT4) was 65 m long. It began at the toe of the armourstone breakwater and proceeded north (Figure 2.1). A photograph of the intertidal portion of the breakwater has been included in Appendix C.

Substrate:

The intertidal zone was comprised entirely of boulder. The substrate of the transect was a mix of clay and silt with lesser amounts of sand.

Macrofauna:

Macrofaunal life was restricted to five observances of a single green crab. Shell hash was only noted in two segments.

Macroflora:

Macrofloral life was noted in every segment of the transect with cover ranging between 5 and 60%, although the turbidity in the first segment precluded characterization of that area. Green alga was noted throughout the transect with lesser appearances of spiny sour weed and sugar kelp. Macrofloral debris was noted throughout the transect with cover of 35-60% in the last 20 m.

4.0 FISH HABITAT

Transects T4, TT2, TT3, and TT4 had predominantly silt or silt/clay substrates with low to moderate algal cover. The algal cover in those transects was also comprised of wispy green algae that offers fair habitat but is not as robust as kelp or fucoids are. The intertidal portion of the breakwater offers a high degree of algal coverage and refuge but this area, in the context of the assessed area, is minimal. These areas provide little habitat to any fauna other than scavengers such as crabs. Transects T1, T2, and T3 were similar in their habitats with a portion of soft bottom and minimal algal cover similar to that discussed above. The remainder of the transects were predominantly cobble with little rock. These transects showed small areas of high algal cover but overall, the intertidal zone had patchy coverage. The habitat covered by these transects would be considered mediocre. Transect TT1 runs near the bottom of the intertidal zone and offers little algal cover. It had predominantly hard substrate that provided habitat for barnacles and periwinkles. As with the intertidal portions of T1, T2, and T3, the area covered by this transect would be considered mediocre because of a low to moderate level of refuge and cover.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The diving crew was directed by an on-site Amec Foster Wheeler representative (Mr. Bruce Moore, B.Sc.) who is experienced in data collection for environmental assessment project components. Mr. Moore was responsible for the data collection and overall data quality as well as for ensuring that all standard operating procedures were followed and that adequate health and safety measures were taken.

A Project Reviewer (Ms. Kerry Higgins, B.Sc, EP) has reviewed this report prior to its release. The limitations of this document are provided in Appendix D.

6.0 SUMMARY

Characterization of the substrate and benthic communities along eight transects within the footprint of dredge areas at the Back Bay DFO–SCH in Back Bay, NB was completed using a combination of visual field observations and underwater video survey techniques. A portion of the intertidal zone of TT3 and TT4 were not included in the video, but photographs are included in Appendix C.

There were two distinct areas of habitat within the assessed area. A large portion of the survey including portions of T1, T2, T3, and the entirety of T4, TT2, TT3, and TT4, have substrates that are predominantly silty or a mix of silt and clay with lesser amounts of sand and rare instances of rock or cobble. The nearshore and intertidal portions of T1, T2, T3 and the entirety of TT1 were predominantly cobble with lesser amounts of rock and gravel with instances of bedrock.

Macrofaunal life was observed in all eight of the transects with a total of seven species. In areas with hard bottom, Northern rock barnacles and periwinkles were prevalent with uncommon to abundant occurrences. In areas dominated by silt, green sea urchins were observed with uncommon to abundant occurrences. The remainder of the species were limited to uncommon

or occasional occurrences and included green crab, moon jellyfish, rock crab, seastar, and blue mussels. Shell hash was observed throughout all eight transects.

Macrofloral life was observed in all eight transects surveyed with varying degrees of cover. Macrofloral cover in the silty substrates of T4, TT3, and TT4 supported a moderate amount of cover comprised mainly of green alga with lesser cover of sugar kelp, spiny sour weed, and sea lettuce. The silty areas of T1, T2, T3, and TT2 displayed a low percentage of cover with occasional patches of rockweed and bladderwrack and rare instances of brown and green alga. Areas of transects with hard bottom (T1, T2, T3, and TT1) supported patches of rockweed and bladderwrack with a moderate amount of cover.

Portions of the harbour basin with predominantly silt substrates supported little life with moderate algal cover. These areas would be considered to be generally poor habitat. The areas of the basin with hard substrate, mainly the upper subtidal and intertidal zones showed a moderate level of cover via patchy instances of rockweed and bladderwrack. These areas would be considered to be of mediocre habitat. The intertidal portions of the armourstone breakwater have a high degree of cover and refuge and provide a small area of quality habitat.

7.0 CLOSING

This document has been prepared and reviewed by the following people:

Prepared by:



Bruce Moore, B.Sc.
Marine Biologist /
Intermediate Project Professional

Reviewed by:



Kerry Higgins, B.Sc., EP
NB/PE Operations Manager /
Senior Project Professional



APPENDIX A
Transcript of Video and On-Site Observations

Table A.1 100 m Survey – Transect T1, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|---|---|
| 0-5 T1 Start | 0-5 | Silt (70%); Sand (25%); Rock (5%) | Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (A); Barnacles (<i>Semibalanus balanoides</i>) (C) | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 5-10 | 5-10 | Silt (50%); Sand (25%); Cobble (20%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 10-15 | 10-15 | Bedrock (100%) | Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (O: 10-15 individuals); Periwinkle (<i>Littorina</i> sp.) (O: 5-10 individuals); Shell hash | Green alga (<i>Spongomorpha</i> sp.) |
| 15-20 | 15-20 | Bedrock (100%) | Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (A); Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 20-25 | 20-25 | Silt (40%); Sand (20%); Cobble (15%); Bedrock (15%); Rock (10%) | Periwinkle (<i>Littorina</i> sp.) (C); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Rock crab (<i>Cancer irroratus</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 25-30 | 25-30 | Silt (40%); Rock (30%); Sand (20%); Cobble (10%) | Periwinkle (<i>Littorina</i> sp.) (C); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 30-35 | 30-35 | Rock (30%); Cobble (30%); Silt (25%); Sand (15%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (A); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (35%); Bladderwrack (<i>Fucus</i> sp.) (10%) |
| 35-40 | 35-40 | Rock (50%); Cobble (25%); Silt (15%); Sand (10%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 15-20 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (45%); Brown alga (<i>Pilayella littoralis</i>) (15%); Bladderwrack (<i>Fucus</i> sp.) (10%) |
| 40-45 | 40-45 | Cobble (45%); Silt (25%); Sand (15%); Bedrock (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 15-20 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (40%); Brown alga (<i>Pilayella littoralis</i>) (10%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 45-50 | 45-50 | Bedrock (40%); Cobble (30%); Silt (15%); Gravel (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 5-10 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Macrofloral debris (5%) |
| 50-55 | 50-55 | Cobble (60%); Sand (15%); Gravel (15%); Silt (10%) | No fauna observed | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 55-60 | 55-60 | Cobble (75%); Gravel (15%); Sand (5%); Silt (5%) | No fauna observed | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 60-65 | 60-65 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |
| 65-70 | 65-70 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |
| 70-75 | 70-75 | Cobble (75%); Gravel (15%); Rock (10%) | No fauna observed | No flora observed |
| 75-80 | 75-80 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |
| 80-85 | 80-85 | Cobble (75%); Gravel (25%) | No fauna observed | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 85-90 | 85-90 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|----------------------------------|---|--|
| 90-95 | 90-95 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |
| 95-100 T1 End | 95-100 | Cobble (75%); Gravel (25%) | No fauna observed | No flora observed |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.2 90 m Survey – Transect T2, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|---|--|---|
| 0-5 T2 Start | 0-5 | Silt (80%); Sand (20%) | Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (O: 10-15 individuals); Shell hash | Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 5-10 | 5-10 | Silt (80%); Sand (20%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (90%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 10-15 | 10-15 | Silt (75%); Sand (20%); Rock (5%) | Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (U: 1 individual); Periwinkle (<i>Littorina</i> sp.) (U: 1 individual); Rock crab (<i>Cancer irroratus</i>) (U: 1 individual); Shell hash | Macrofloral debris (90%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 15-20 | 15-20 | Silt (80%); Sand (20%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (90%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 20-25 | 20-25 | Silt (80%); Sand (20%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Rock crab (<i>Cancer irroratus</i>) (U: 1 individual); Shell hash | Macrofloral debris (90%) |
| 25-30 | 25-30 | Silt (80%); Sand (20%) | Shell hash | Macrofloral debris (90%) |
| 30-35 | 30-35 | Silt (80%); Sand (20%) | Periwinkle (<i>Littorina</i> sp.) (O: 5-10 individuals); Shell hash | Macrofloral debris (90%) |
| 35-40 | 35-40 | Sand (40%); Cobble (35%); Silt (25%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (40%) |
| 40-45 | 40-45 | Cobble (50%); Silt (30%); Sand (15%); Rock (5%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Macrofloral debris (15%) |
| 45-50 | 45-50 | Cobble (30%); Gravel (25%); Silt (25%); Sand (15%); Rock (5%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 50-55 | 50-55 | Cobble (30%); Gravel (25%); Silt (25%); Sand (15%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 20-25 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (30%); Bladderwrack (<i>Fucus</i> sp.) (25%) |
| 55-60 | 55-60 | Cobble (65%); Gravel (35%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 15-20 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 60-65 | 60-65 | Cobble (60%); Rock (25%); Gravel (15%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (O: 15-20 individuals); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%); Brown alga (<i>Pilayella littoralis</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|---|--|---|
| 65-70 | 65-70 | Cobble (70%); Rock (15%); Gravel (15%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%); Bladderwrack (<i>Fucus</i> sp.) (5%); Green alga (<i>Spongomorpha</i> sp.) |
| 70-75 | 70-75 | Cobble (65%); Gravel (15%); Sand (15%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (A) | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 75-80 | 75-80 | Cobble (85%); Gravel (10%); Rock (5%) | No fauna observed | No flora observed |
| 80-85 | 80-85 | Cobble (85%); Gravel (10%); Rock (5%) | No fauna observed | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 85-90 T2 End | 85-90 | Rock (45%); Cobble (40%); Gravel (15%) | No fauna observed | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.3 95 m Survey – Transect T3, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|---|--|---|
| 0-5 T3 Start | 0-5 | No visibility | No visibility | No visibility |
| 5-10 | 5-10 | Silt (80%); Sand (20%) | Periwinkle (<i>Littorina</i> sp.) (A); Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (U: 1 individual); Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (40%) |
| 10-15 | 10-15 | Silt (80%); Sand (20%) | Periwinkle (<i>Littorina</i> sp.) (A); Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (40%) |
| 15-20 | 15-20 | Silt (80%); Sand (20%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (O: 10-15 individuals); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Macrofloral debris (40%) |
| 20-25 | 20-25 | Silt (70%); Clay (20%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Macrofloral debris (30%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 25-30 | 25-30 | Silt (70%); Clay (20%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (40%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 30-35 | 30-35 | Silt (70%); Clay (20%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Macrofloral debris (50%); Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 35-40 | 35-40 | Silt (70%); Clay (20%); Sand (10%) | Shell hash | Macrofloral debris (50%) |
| 40-45 | 40-45 | Silt (70%); Clay (20%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Macrofloral debris (50%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 45-50 | 45-50 | Silt (70%); Clay (20%); Sand (10%) | Periwinkle (<i>Littorina</i> sp.) (O: 10-15 individuals); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Macrofloral debris (50%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 50-55 | 50-55 | Silt (60%); Clay (15%); Sand (10%); Cobble (10%); Rock (5%) | Periwinkle (<i>Littorina</i> sp.) (A); Barnacles (<i>Semibalanus balanoides</i>) (O: 25-30 individuals); Blue mussels (<i>Mytilus edulis</i>) (O: 5-10 individuals); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Macrofloral debris (30%); Sugar kelp (<i>Laminaria saccharina</i>) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|--|---|
| 55-60 | 55-60 | Cobble (35%); Silt (35%); Sand (15%); Gravel (15%) | Periwinkle (<i>Littorina</i> sp.) (C); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 60-65 | 60-65 | Cobble (50%); Silt (25%); Gravel (15%); Sand (10%) | Periwinkle (<i>Littorina</i> sp.) (C); Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (40%); Bladderwrack (<i>Fucus</i> sp.) (15%) |
| 65-70 | 65-70 | Cobble (50%); Silt (25%); Gravel (15%); Sand (10%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 20-25 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (30%); Bladderwrack (<i>Fucus</i> sp.) (10%) |
| 70-75 | 70-75 | Cobble (70%); Gravel (15%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (30%); Spiny sour weed (<i>Desmarestia aculeata</i>) (5%) |
| 75-80 | 75-80 | Cobble (70%); Gravel (15%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 80-85 | 80-85 | Cobble (55%); Gravel (25%); Sand (15%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%) |
| 85-90 | 85-90 | Cobble (50%); Gravel (25%); Sand (25%) | Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (15%) |
| 90-95 T3 End | 90-95 | Cobble (60%); Gravel (20%); Sand (15%); Bedrock (5%) | Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (40%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.4 150 m Survey – Transect T4, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|--|--|
| 0-5 T4 Start | 0-5 | Silt (85%); Sand (15%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 5-10 | 5-10 | Silt (85%); Sand (15%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (20%); Spiny sour weed (<i>Desmarestia aculeata</i>) (5%) |
| 10-15 | 10-15 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (40%); Spiny sour weed (<i>Desmarestia aculeata</i>) (15%); Sugar kelp (<i>Laminaria saccharina</i>) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%); Brown alga (<i>Pilayella littoralis</i>) (5%) |
| 15-20 | 15-20 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Green alga (<i>Spongomorpha</i> sp.) (15%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 20-25 | 20-25 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Sugar kelp (<i>Laminaria saccharina</i>) (15%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 25-30 | 25-30 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Macrofloral debris (15%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 30-35 | 30-35 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (10%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 35-40 | 35-40 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (20%); Green alga (<i>Spongomorpha</i> sp.) (10%) |
| 40-45 | 40-45 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (20%); Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (10%) |
| 45-50 | 45-50 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (30%) |
| 50-55 | 50-55 | Clay (40%); Silt (40%); Sand (10%); Rock (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (35%); Bladderwrack (<i>Fucus</i> sp.) (10%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|---|--|---|
| 55-60 | 55-60 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Green alga (<i>Spongomorpha</i> sp.) (10%); Macrofloral debris (10%); Sugar kelp (<i>Laminaria saccharina</i>) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 60-65 | 60-65 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (30%); Macrofloral debris (10%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 65-70 | 65-70 | Clay (50%); Silt (40%); Sand (10%) | Periwinkle (<i>Littorina</i> sp.) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (10%); Macrofloral debris (10%); |
| 70-75 | 70-75 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Shell hash | Green alga (<i>Spongomorpha</i> sp.) (25%); Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (10%) |
| 75-80 | 75-80 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (15%); Green alga (<i>Spongomorpha</i> sp.) (10%) |
| 80-85 | 80-85 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (20%); Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 85-90 | 85-90 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (15%) |
| 90-95 | 90-95 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (60%); Macrofloral debris (10%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 95-100 | 95-100 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (20%); Macrofloral debris (10%); Sugar kelp (<i>Laminaria saccharina</i>) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 100-105 | 100-105 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (15%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 105-110 | 105-110 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (15%); Green alga (<i>Spongomorpha</i> sp.) (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 110-115 | 110-115 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (15%); Green alga (<i>Spongomorpha</i> sp.) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 115-120 | 115-120 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (15%); Green alga (<i>Spongomorpha</i> sp.) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 120-125 | 120-125 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (10%) |
| 125-130 | 125-130 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (10%) |
| 130-135 | 130-135 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (10%); Macrofloral debris (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 135-140 | 135-140 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (10%) |
| 140-145 | 140-145 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 145-150 T4 End | 145-150 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.5 90 m Survey – Transect TT1, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|--|--|
| 0-5 TT1 Start | 0-5 | Cobble (50%); Silt (25%); Gravel (15%); Sand (10%) | Shell hash | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 5-10 | 5-10 | Cobble (70%); Gravel (15%); Silt (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 25-30 individuals); Shell hash | No flora observed |
| 10-15 | 10-15 | Cobble (80%); Silt (15%); Sand (5%) | Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 15-20 | 15-20 | Cobble (80%); Silt (15%); Sand (5%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | No flora observed |
| 20-25 | 20-25 | Cobble (70%); Sand (15%); Gravel (15%); Silt (5%) | Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 25-30 | 25-30 | Cobble (70%); Sand (15%); Gravel (15%); Silt (5%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 25-30 individuals); Shell hash | No flora observed |
| 30-35 | 30-35 | Cobble (65%); Rock (10%); Gravel (10%); Silt (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 10-15 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 35-40 | 35-40 | Cobble (40%); Rock (30%); Gravel (15%); Silt (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 25-30 individuals); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 40-45 | 40-45 | Cobble (65%); Rock (10%); Gravel (10%); Silt (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 45-50 | 45-50 | Cobble (50%); Gravel (25%); Rock (10%); Silt (10%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (U: 3 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 50-55 | 50-55 | Cobble (40%); Gravel (20%); Rock (15%); Silt (15%); Sand (10%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (25%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 55-60 | 55-60 | Cobble (45%); Gravel (30%); Silt (15%); Sand (10%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (U: 2 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (25%) |
| 60-65 | 60-65 | Cobble (40%); Gravel (25%); Rock (15%); Silt (15%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 10-15 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Bladderwrack (<i>Fucus</i> sp.) (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 65-70 | 65-70 | Cobble (35%); Gravel (30%); Silt (20%); Sand (15%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (25%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 70-75 | 70-75 | Cobble (35%); Gravel (30%); Silt (20%); Sand (15%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Periwinkle (<i>Littorina</i> sp.) (O: 10-15 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (25%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|---|---|
| 75-80 | 75-80 | Cobble (35%); Sand (20%); Gravel (15%); Rock (15%); Silt (15%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (20%) |
| 80-85 | 80-85 | Gravel (40%); Cobble (25%); Silt (20%); Sand (15%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 40-50 individuals); Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Rock crab (<i>Cancer irroratus</i>); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (15%) |
| 85-90 TT1 End | 85-90 | Gravel (40%); Cobble (25%); Silt (20%); Sand (15%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.6 150 m Survey – Transect TT2, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|---|---|
| 0-5 TT2 Start | 0-5 | Cobble (40%); Gravel (30%); Rock (15%); Silt (15%); Sand (5%) | Barnacles (<i>Semibalanus balanoides</i>) (C); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%) |
| 5-10 | 5-10 | Bedrock (30%); Silt (25%); Gravel (20%); Cobble (10%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (A); Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (10%); Bladderwrack (<i>Fucus</i> sp.) (5%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 10-15 | 10-15 | Bedrock (100%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (A); Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Shell hash | Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 15-20 | 15-20 | Silt (45%); Sand (25%); Cobble (15%); Rock (15%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (A); Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Shell hash | Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 20-25 | 20-25 | Silt (35%); Cobble (35%); Rock (15%); Sand (15%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (A); Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 25-30 | 25-30 | Clay (45%); Silt (35%); Sand (10%); Rock (5%); Cobble (5%) | Barnacles (<i>Semibalanus balanoides</i>) (A); Periwinkle (<i>Littorina</i> sp.) (U: 2 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (15%) |
| 30-35 | 30-35 | Silt (60%); Clay (25%); Sand (10%); Gravel (5%) | No fauna observed | Macrofloral debris (15%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 35-40 | 35-40 | Silt (60%); Clay (25%); Sand (10%); Gravel (5%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals); Green sea urchin (<i>Strongylocentrotus droebachiensis</i>) (U: 1 individual); Moon jellyfish (<i>Aurelia aurita</i>) (U: 1 individual) | Macrofloral debris (45%); Bladderwrack (<i>Fucus</i> sp.) (5%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 40-45 | 40-45 | Silt (60%); Clay (25%); Sand (10%); Gravel (5%) | Periwinkle (<i>Littorina</i> sp.) (U: 1 individual); Shell hash | Macrofloral debris (50%) |
| 45-50 | 45-50 | Silt (60%); Clay (25%); Sand (10%); Gravel (5%) | Shell hash | Macrofloral debris (50%) |
| 50-55 | 50-55 | Silt (60%); Clay (25%); Sand (10%); Cobble (5%) | Rock crab (<i>Cancer irroratus</i>) (U: 1 individual); Shell hash | Macrofloral debris (30%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 55-60 | 55-60 | Silt (65%); Clay (25%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (40%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|---|--|--|
| 60-65 | 60-65 | Silt (65%); Clay (25%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (50%) |
| 65-70 | 65-70 | Silt (65%); Clay (25%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 3 individuals) | Macrofloral debris (50%) |
| 70-75 | 70-75 | Silt (65%); Clay (25%); Sand (10%) | Periwinkle (<i>Littorina</i> sp.) (C); Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (50%) |
| 75-80 | 75-80 | Silt (65%); Clay (25%); Sand (10%) | Shell hash | Macrofloral debris (20%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 80-85 | 80-85 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Macrofloral debris (20%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 85-90 | 85-90 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual); Shell hash | Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 90-95 | 90-95 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 5-10 individuals); Green crab (<i>Carcinus maenas</i>) (U: 3 individuals) | Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 95-100 | 95-100 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (15%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 100-105 | 100-105 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 3 individuals); Seastar (<i>Asterias</i> sp.) (U: 1 individual) | Macrofloral debris (20%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 105-110 | 105-110 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Macrofloral debris (15%); Bladderwrack (<i>Fucus</i> sp.) (5%) |
| 110-115 | 110-115 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Macrofloral debris (15%); Bladderwrack (<i>Fucus</i> sp.) (5%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 115-120 | 115-120 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Macrofloral debris (20%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 120-125 | 120-125 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | No fauna observed | Macrofloral debris (20%); Sugar kelp (<i>Laminaria saccharina</i>) (10%) |
| 125-130 | 125-130 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (25%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 130-135 | 130-135 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Shell hash | Macrofloral debris (25%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 135-140 | 135-140 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 15-20 individuals); Shell hash | Sugar kelp (<i>Laminaria saccharina</i>) (30%); Macrofloral debris (25%) |
| 140-145 | 140-145 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Barnacles (<i>Semibalanus balanoides</i>) (O: 10-15 individuals); Seastar (<i>Asterias</i> sp.) (U: 2 individuals) | Sugar kelp (<i>Laminaria saccharina</i>) (25%); Macrofloral debris (25%) |
| 145-150 TT2 End | 145-150 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Blue mussel (<i>Mytilus edulis</i>) (U: 2 individuals); Seastar (<i>Asterias</i> sp.) (U: 2 individuals); Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Sugar kelp (<i>Laminaria saccharina</i>) (25%); Macrofloral debris (20%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.7 60 m Survey – Transect TT3, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|--|--|---|
| 0-5 TT3 Start | 0-5 | Clay (45%); Silt (40%); Sand (10%); Boulder (5%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (15%); Rockweed (<i>Ascophyllum nodosum</i>) (5%); Bladderwrack (<i>Fucus</i> sp.) (5%); Sea lettuce (<i>Ulva lactuca</i>) (5%) |
| 5-10 | 5-10 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (5%); Sea lettuce (<i>Ulva lactuca</i>) (5%) |
| 10-15 | 10-15 | Clay (50%); Silt (40%); Sand (10%) | Rock crab (<i>Cancer irroratus</i>) (U: 1 individual) | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%); Brown alga (<i>Pilayella littoralis</i>) (5%); Sea lettuce (<i>Ulva lactuca</i>) (5%) |
| 15-20 | 15-20 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (10%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 20-25 | 20-25 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (10%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |
| 25-30 | 25-30 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Green alga (<i>Spongomorpha</i> sp.) (5%); Macrofloral debris (5%) |
| 30-35 | 30-35 | Clay (45%); Silt (40%); Sand (10%); Rock (5%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (5%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 35-40 | 35-40 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 3 individuals) | Sugar kelp (<i>Laminaria saccharina</i>) (40%); Green alga (<i>Spongomorpha</i> sp.) (20%) |
| 40-45 | 40-45 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Sugar kelp (<i>Laminaria saccharina</i>) (25%); Green alga (<i>Spongomorpha</i> sp.) (25%) |
| 45-50 | 45-50 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Sugar kelp (<i>Laminaria saccharina</i>) (10%); Spiny sour weed (<i>Desmarestia aculeata</i>) (5%) |
| 50-55 | 50-55 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Sugar kelp (<i>Laminaria saccharina</i>) (25%) |
| 55-60 TT3 End | 55-60 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Sugar kelp (<i>Laminaria saccharina</i>) (10%); Green alga (<i>Spongomorpha</i> sp.) (5%); Rockweed (<i>Ascophyllum nodosum</i>) (5%) |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.8 65 m Survey – Transect TT4, 24 July, 2015

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|------------------------------------|--|--|
| 0-5 TT4 Start | 0-5 | Clay (50%); Silt (40%); Sand (10%) | No visibility | No visibility |
| 5-10 | 5-10 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 2 individuals) | Green alga (<i>Spongomorpha</i> sp.) (25%); Sugar kelp (<i>Laminaria saccharina</i>) (10%); Macrofloral debris (10%) |
| 10-15 | 10-15 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (20%); Spiny sour weed (<i>Desmarestia aculeata</i>) (20%); Macrofloral debris (5%) |
| 15-20 | 15-20 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Spiny sour weed (<i>Desmarestia aculeata</i>) (35%); Green alga (<i>Spongomorpha</i> sp.) (25%); Macrofloral debris (10%) |
| 20-25 | 20-25 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Spiny sour weed (<i>Desmarestia aculeata</i>) (25%); Sugar kelp (<i>Laminaria saccharina</i>) (15%); Green alga (<i>Spongomorpha</i> sp.) (10%); Macrofloral debris (10%) |
| 25-30 | 25-30 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Green alga (<i>Spongomorpha</i> sp.) (10%); Macrofloral debris (10%); Sugar kelp (<i>Laminaria saccharina</i>) (5%) |
| 30-35 | 30-35 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Sugar kelp (<i>Laminaria saccharina</i>) (20%); Green alga (<i>Spongomorpha</i> sp.) (15%); Macrofloral debris (5%); Sea lettuce (<i>Ulva lactuca</i>) (5%) |

| Transect Distance (m) | Transect Tag Numbers | Substrate (Estimated % Coverage) | Macrofaunal Life Observed (Estimated Abundances*) | Macrofloral Life Observed (Estimated % Coverage) |
|-----------------------|----------------------|------------------------------------|---|---|
| 35-40 | 35-40 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Green alga (<i>Spongomorpha</i> sp.) (15%); Sugar kelp (<i>Laminaria saccharina</i>) (5%); Macrofloral debris (5%) |
| 40-45 | 40-45 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Sugar kelp (<i>Laminaria saccharina</i>) (10%); Green alga (<i>Spongomorpha</i> sp.) (5%); Macrofloral debris (5%) |
| 45-50 | 45-50 | Clay (50%); Silt (40%); Sand (10%) | Shell hash | Macrofloral debris (35%); Spiny sour weed (<i>Desmarestia aculeata</i>) (10%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 50-55 | 50-55 | Clay (50%); Silt (40%); Sand (10%) | Green crab (<i>Carcinus maenas</i>) (U: 1 individual) | Macrofloral debris (60%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| 55-60 | 55-60 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (60%); Green alga (<i>Spongomorpha</i> sp.) (10%) |
| 60-65 | 60-65 | Clay (50%); Silt (40%); Sand (10%) | No fauna observed | Macrofloral debris (60%); Green alga (<i>Spongomorpha</i> sp.) (5%) |
| TT4 End | | | | |

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

A = Abundant

Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common

Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional

Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon

Quantifiable observations made infrequently along the 5 m segment.



APPENDIX B
Annotated Species List

Table B1 Annotated Species List

| Classification | Common Name | Scientific Name |
|-------------------|------------------------|--|
| Macrofauna | | |
| Crustacea | Northern Rock Barnacle | <i>Semibalanus balanoides</i> |
| | Green crab | <i>Carcinus maenas</i> |
| | Rock crab | <i>Cancer irroratus</i> |
| Mollusca | Periwinkle | <i>Littorina</i> sp. |
| Enchinodermata | Seastar | <i>Asterias</i> sp. |
| | Green sea urchin | <i>Strongylocentrotus droebachiensis</i> |
| Cnidaria | Moon jellyfish | <i>Aurelia aurita</i> |
| Macroflora | | |
| Chlorophyta | Green alga | <i>Spongomorpha</i> sp. |
| | Sea lettuce | <i>Ulva lactuca</i> |
| Phaeophyta | Bladderwrack | <i>Fucus vesiculosus</i> |
| | Rockweed | <i>Ascophyllum nodosum</i> |
| | Sugar kelp | <i>Laminaria saccharina</i> |
| | Spiny sour weed | <i>Desmarestia aculeata</i> |
| | Brown alga | <i>Pilayella littoralis</i> |



APPENDIX C
Photo Log

General Site Photos



Looking east from road at intertidal zone and harbour basin



Looking south from road at intertidal zone and breakwater

General Site Photos



Looking south at intertidal portion of TT3



Looking south at intertidal portion of TT4



APPENDIX D

Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
 1. The Standard Terms and Conditions which form a part of our Professional Services Contract.
 2. The Scope of Services.
 3. Time and Budgetary limitations as described in our Contract.
 4. The Limitations stated herein.
2. The report has been prepared in accordance with generally accepted environmental study practices. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The objective of this report was solely to characterize the seabed footprint of the proposed Project area.
4. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Amec Foster Wheeler accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.