# The London Resort Development Consent Order

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Environmental Statement
**Volume 2: Appendices**

## Appendix 13.5 – Subtidal Benthic Ecology Survey

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Planning Act 2008
The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
Regulation 5(2)(a)
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Regulation 12(1)

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# Revisions

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# Executive Summary

APEM Ltd was commissioned by the Environmental Dimension Partnership Ltd (EDP) on behalf of the London Resort Holding Company to undertake a series of marine ecology surveys to inform an Ecological Impact Assessment (EIA) for the London Resort Proposed Development. This report provides details of subtidal benthic ecology surveys conducted in August and September 2020.

Subtidal surveys were conducted off the western shore of the Swanscombe Peninsula (the 'Kent Project Site') and at the Port of Tilbury Jetty (the 'Essex Project Site'), with sampling conducted at a total of 22 stations.

Due to the substrate present at different locations two surveys were undertaken, with subtidal samples collected using a 0.1 $m^2$ mini-Hamon grab for the first survey and a 0.1 $m^2$ Day grab for the second survey. A further sample was collected at each station for Particle Size Analysis (PSA) and chemistry analysis. Consultation was held with the Environment Agency (EA) to agree the survey array, survey methods and an appropriate chemical analysis suite ensuring inclusion of chemicals that the EA have previously investigated, or are currently investigating locally (in light of local Thames water quality and biota issues).

Sediment type within the Kent survey area was found to be fairly homogenous with eight of the 14 stations classified as Gravelly Mud (the other six stations were classified as Muddy Sandy Gravel (two stations); Sandy Mud (two stations); Muddy Gravel; and Mud). This was also the case for the Essex survey area with four of the eight stations classified as Muddy Sand (other stations were classified as either Muddy Sand, Gravelly Muddy Sand or Gravel).

The tentacled lagoon worm *Alkmaria romijni* was recorded at three stations (Stations 3, 6 and 22) within the Kent survey area. This species is protected under the Wildlife and Countryside Act 1981 and is a protected feature of the Swanscombe Marine Conservation Zone. Densities of tentacled lagoon worm were relatively low with 20 individuals $m^{-2}$ recorded at Stations 3 and 6 and 40 individuals $m^{-2}$ recorded at Station 22.

Six non-native species were recorded during the subtidal survey (*Cordylophora caspia, Eusarsiella zostericola, Magallana gigas, Melita nitida, Palaemon macrodactylus and Ruditapes philippinarum*) and *Austrominius modestus* was recorded within wall scrape samples only. A total of nine species considered to be cryptogenic were recorded (*Alitta succinea, Amphibalanus improvisus, Apocorophium lacustre, Boccardiella ligerica, Eteone lighti, Monocorophium insidiosum, Polydora cornuta, Teredo navalis and Tubificoides heterochaetus*).

Overall, the habitats recorded at the Kent and Essex project sites are considered to be widespread within the Thames Estuary and with the exception of *A. romijni* which is restricted to the Swanscombe MCZ area, species recorded are considered to be widespread within the wider mid and lower Thames Estuary.

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# Glossary

| | |
|---|---|
| AQC | Analytical Quality Control |
| BTEX | Benzene, Toluene, Ethylbenzene and Xylene |
| cAL1 | Chemical Action Level 1 |
| cAL2 | Chemical Action Level 2 |
| CSEMP | Clean Seas Environmental Monitoring Programme |
| EA | Environmental Agency |
| EAC | Environmental Assessment Criteria |
| EIA | Environmental Impact Assessment |
| ERL | Effects Range Low |
| GRO | Gasoline Range Organics |
| IDA | Industrial Denatured Alcohol |
| ISQC | Interim Sediment Quality Guidelines |
| MCZ | Marine Conservation Zone |
| MDS | MultiDimensional Scaling |
| MMO | Marine Management Organisation |
| MTBE | Methyl Tert-Butyl Ether |
| NMBAQC | North-East Atlantic Marine Biological Analytical Quality Control |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated biphenyls |
| PEL | Probable Effects Level |
| PSA | Particle Size Analysis |
| TEL | Threshold Effects Level |
| TDP | Taxonomic Discrimination Protocol |
| TPH | Total Petroleum Hydrocarbons |
| TRWL | Temporary River Works License |
| WoRMS | World Register of Marine Species |

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# Chapter One ◆ Introduction

## BACKGROUND

1.1. APEM Ltd was commissioned by the Environmental Dimension Partnership Ltd (EDP) on behalf of the London Resort Holding Company to undertake subtidal benthic ecology surveys to provide site characterisation data to inform the marine ecology assessment for an Environmental Impact Assessment (EIA) for the London Resort Project. The overall survey programme has provided site-specific data for intertidal fish, benthos (intertidal and subtidal), saltmarsh and sediment chemistry.

1.2. This report provides the methodology of the subtidal benthic surveys which were conducted in August and September 2020.

## SURVEY OBJECTIVES

1.3. The objective of the surveys was to characterise the subtidal benthic assemblages present within the survey area in August and September 2020. Samples were analysed to provide data for biota, sediment/habitat type and sediment chemistry.

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# Chapter Two ◆ Methodology

## SURVEY AREA

2.1 The survey area included both the 'Kent Project Site' (Figure 13.5.1) and the 'Essex Project Site' (Figure 13.5.2) of the London Resort.

## SURVEY TIMINGS

2.2 The subtidal surveys were conducted between the 25th and 26th August and on 29th September 2020 with tide times provided in Table 2-1.

2.3 Two surveys were conducted as a number of stations could not be sampled using the 0.1 $m^2$ mini-Hamon grab deployed during the first survey due to the soft sediment present. Consequently, these stations were sampled with a 0.1 $m^2$ Day grab during the second survey.

**Table 2-1: Tide information for the subtidal survey days.**

| Date | Low tide | | High tide | | Low tide | | High tide | |
|---|---|---|---|---|---|---|---|---|
| | Time (BST) | Height (m) | Time (BST) | Height (m) | Time (BST) | Height (m) | Time (BST) | Height (m) |
| 25/08/2020 | 0:00 | 0.4 | 6:17 | 6.2 | 12:09 | 0.8 | 18:27 | 6.2 |
| 26/08/2020 | 0:44 | 0.6 | 7:07 | 5.9 | 15:56 | 1.0 | 19:22 | 5.9 |
| 29/09/2020 | 6:14 | 1.1 | 0:01 | 6.1 | 18:43 | 6.0 | 12:24 | 6.0 |

## LICENCES AND PERMISSIONS

2.4 A Temporary River Works Licence (TRWL) was provided by the Port of London Authority. The works were exempt from a Marine Management Organisation (MMO) Marine Licence and an exemption form was completed (Issued: 21/08/2020).

2.5 The survey design for the subtidal benthic ecology survey was approved by the Environment Agency prior to deployment (approved: 24/06/2020).

## SURVEY VESSEL

2.6 The subtidal sampling was conducted using the 22 m survey vessel Dalby Venture for the first survey and the 19 m vessel Emilia D. for the second survey (Figure 13.5.3 and Figure 13.5.4). Survey operations mobilised from the Town Hall wharf at Gravesend and from Greenwich.

## SURVEY DESIGN

2.7 A total of 22 grab samples were collected in total over the course of both surveys (Appendix 1.0; Figure 13.5.1 and Figure 13.5.2); coordinates are provided in Appendix 2.0). Samples for chemical analysis were collected at each of the benthic sample stations.

## SURVEY METHODOLOGY

2.8 The first survey was conducted using a 0.1 m² mini-Hamon grab (due to large areas of mixed substrate (mud, sand and gravel) within the survey area). At many of the stations near Bell Wharf (Stations 3 to 9) sediment was too soft for the mini-Hamon grab to operate effectively, so they were sampled during a second survey using a 0.1 m² Day grab. All grab sampling followed best practice guidance (e.g. Ware & Kenny 2011).

2.9 At each station a single grab sample was taken for biotic analysis. A second sample was taken for Particle Size Analysis (PSA) and sediment chemistry. These samples were transferred to a suitable container labelled both internally and externally and kept cool before transportation to a third-party laboratory.

2.10 All samples were assessed on retrieval for suitability. Those showing obvious evidence of the grab not operating correctly or having low sample volumes (i.e. <5 litres for the mini-Hamon grab, less than 7 cm deep for mud or 5 cm deep for sand for the Day grab (Davies *et al*. 2001; Ware & Kenny 2011)) were rejected and another sampling attempt was made. At each station up to five attempts were made to collect a valid sample. If after five attempts a valid sample could not be collected, then a decision was made whether to relocate or abandon the station.

2.11 Grabs were photographed with notes made on colour, smell, redox layer, texture and surface features. Information relating to the success rates for grab deployment and volumes of samples are provided below.

2.12 Biological samples were processed in the field in accordance with the guidance provided in Cooper & Mason (2017). Samples were sieved using a 0.5 mm sieve and all material retained on the sieves was fixed with 4% buffered formaldehyde solution in seawater and placed in sample containers (labelled inside and outside) following guidance in Ware & Kenny (2011) and Davies *et al*. (2001). Once the sieved samples were labelled and preserved all apparatus and sieves were thoroughly cleaned to prevent cross-contamination before moving to the next station. The sample was securely stored prior to the deployment of the grab at the next sampling station to ensure a clear working area and prevent potential damage or contamination of the sample. The samples were then transported to APEM's Marine Biolabs for analysis.

2.13 A further replicate grab sample was taken at each station to obtain an appropriate sediment subsample of 500-1,000 g for PSA which was transferred to a suitable container (labelled both internally and externally) and transported to a third-party laboratory for analysis.

2.14 For chemical analysis approximately 2.68 kg of sediment was collected; 1,180 g was collected using a metal spoon and put into glass containers for analysis of a range of chemicals (see Appendix 3.0) and 1,500 g was placed in plastic containers for analysis of asbestos and cyanide (free/total) using a plastic scoop.

2.15 The PSA and sediment chemistry samples were then kept cool (with the exception of some sediment that needed to be frozen for specific analyses) before being subsequently transported to a third-party laboratory for analysis.

## LABORATORY PROCESSING

### Microbiota

2.16 Sample analysis was conducted according to APEM's standard operating procedure for marine benthic sample analysis which is fully compliant with the North-East Atlantic Marine Biological Analytical Quality Control (NMBAQC) Scheme's Processing Requirement Protocol (PRP), (Worsfold *et al*. 2010).

2.17 To standardise the sizes of organisms and improve sorting efficiency, samples were sieved through a stack of sieves of 4.0, 2.0, 1.0 and 0.5 mm meshes in a fume cupboard following UKTAG guidance for benthic invertebrate sample analysis for transitional waters (WFD-UKTAG 2014). All biota retained in the sieves were then extracted under low power microscopes, identified and enumerated, where applicable.

2.18 Taxa were identified to the lowest practicable taxonomic level (usually species), using appropriate taxonomic literature. For certain taxonomic groups (e.g. nemerteans, nematodes, and certain oligochaetes), higher taxonomic levels were used due to the widely acknowledged lack of appropriate identification tools for these groups. The NMBAQC Scheme's Taxonomic Discrimination Protocol (TDP) (Worsfold *et al*. 2010), which gives guidance on the most appropriate level to which different marine taxa should be identified, was adhered to for the laboratory analysis. Where required, specimens were also compared with material maintained within the laboratory reference collection. Nomenclature followed the World Register of Marine Species (WoRMS; WoRMS Editorial Board 2017), except where more recent published literature that had not yet been incorporated into the WoRMS list was known to exist.

2.19 All samples were subject to internal quality assurance procedures and, following analysis, 10% of samples were subject to formal Analytical Quality Control (AQC). For archiving purposes, all samples were stored in 70% industrial denatured alcohol (IDA) solution. At least one example of each taxon recorded from the surveys was set aside for inclusion in APEM's in-house reference collection. This collection acts as a permanent record of the biota recorded.

### Biomass estimations

2.20 Biomass analysis was undertaken according to APEM's standard operating procedure and the NMBAQC Scheme guidance and TDP (Worsfold *et al*. 2010). APEM used a non-destructive biomass procedure that is fully compliant with the methods outlined in the

Clean Seas Environmental Monitoring Programme (CSEMP) Green Book (CSEMP 2012). Animals were blotted dry before transfer to a tared analytical balance. Biomass values were recorded as blotted wet-weight, +/- 0.0001 g. Taxa weighing less than 0.0001 g were given a nominal weight of 0.0001 g. Barnacles, ascidians, cnidarians and non-countable taxa were not weighed.

2.21 Biomass was determined at species level and specimens set aside for inclusion in the reference collection were weighed separately with their weight being added to the relevant group.

### Particle size analysis

2.22 PSA was performed in accordance with NMBAQC Scheme best practice guidance for PSA for supporting biological analysis (Mason 2016), with the modification that the wet separation was performed at 2.0 mm rather than 1.0 mm, to determine the 'gravel' to 'sand and mud' proportions by weight. A combination of dry sieving and laser diffraction was used due to the range of particle sizes present in the samples.

### Sediment chemistry

2.23 A list of chemicals to be analysed was determined following consultation with the Environment Agency and additional project-specific requirements (see Appendix 3.0). Chemical analyses were conducted according to UKAS accredited methods where appropriate by a Marine Management Organisation (MMO) approved laboratory.

## Data analysis

### Macrobiota

2.24 Before analysis, all data were checked for errors. Summary statistics were calculated and outlying values investigated to identify possible data transcription errors. As is standard practice, truncation of the biological data was undertaken before calculation of summary statistics and other statistical analyses (see Table 2-2). Univariate and multivariate analyses were undertaken using the PRIMER software package (Clarke & Warwick 2001).

2.25 For analyses based on numbers of individuals, any non-countable taxa and fragments of individuals were also omitted from analysis.

**Table 2-2: Data and tidal information for the subtidal survey days.**

| **Taxon / Records** | **Details of truncation performed** |
|---|---|
| *Alitta succinea* | Fragments removed from sample 20 |
| *Corophium volutator* | Fragments removed from sample 19 |
| *Eteone lighti* | Fragments removed from sample 8 |
| *Heteromastus filiformis* | Fragments removed from samples 4, 9, 11 and 19 |
| *Melitia palmata* | Fragments removed from sample 9 |
| *Monocorophium insidiosum* | Fragments removed from sample 4 |
| Nephtys spp. | Fragments removed from sample 18 |
| *Tubificoides benedii* | Fragments removed from sample 10 |
| *Tubificoides diazi* | Fragments removed from sample 1 |
| *Magallana gigas* | Adult and juvenile records combined |
| *Scrobiculara plana* | Adult and juvenile records combined |

2.26 Biological diversity within a community was assessed based on taxon richness (total number of taxa present) and evenness (considers relative abundances of different taxa). The following metrics were calculated:

- **Taxon richness:** the total number of taxa in a sample.
- **Density:** the number of individuals per unit area (e.g. per square metre).
- **Shannon-Wiener Diversity Index (*H'*(log$_e$):** a widely used measure of diversity accounting for both the number of taxa present and the evenness of distribution of the taxa (Clarke & Warwick 2001).
- **Margalef's species richness (*d*):** a measure of the number of species present for a given number of individuals.
- **Pielou's Evenness Index (*J'*):** represents the uniformity in distribution of individuals spread between species in a sample. The output range is from 0 to 1 with higher values indicating more evenness or more uniform distribution of individuals.
- **Simpson's Dominance Index (1-λ):** a dominance index derived from the probability of picking two individuals from a community at random that are from the same species. Simpson's dominance index ranges from 0 to 1 with higher values representing a more diverse community without dominant taxa.

2.27 Multivariate analyses were conducted using resemblance (similarity) matrices. Sample similarity calculations using raw abundance data can easily be dominated by a few highly abundant taxa (Clarke and Warwick 2001), masking the influence of less abundant species. Consequently, a square root transformation was applied to the data prior to the calculation of Bray-Curtis similarity to reduce the influence of the most numerically dominant taxa, following the recommendations in Clarke & Gorley (2006).

2.28 A two-stage analysis of the resemblance matrices for different transformation options was conducted based on consideration of no transformation, square root transformation, 4$^{th}$ root transformation, log (x + 1) transformation and ‘presence/absence’, in order of increasing strength of the transformation. Spearman rank correlations of 4$^{th}$ root and Log (x+1) transformation resemblance matrices with the square root transformation resemblance matrix were very close to 1 (0.960 and 0.980 respectively, Appendix 6.0). The strong correlation indicates square root transformation is a robust choice and more severe transformations would correlate more closely with a ‘presence/absence’ transformation of data.

**Cluster Analysis**

2.29 Cluster analysis was utilised to provide a visual representation of sample similarity in the form of a dendrogram. Cluster analysis was conducted in conjunction with a SIMPROF (similarity profile) test to determine whether groups of samples were statistically indistinguishable at the 5% significance level, or whether any trends in groupings were apparent. Black lines on the dendrogram indicate statistical distinctions between sampling stations, whilst red lines indicate that the samples were statistically inseparable.

**Ordination Analysis using non-Metric Multidimensional Scaling**

2.30 Non-metric multidimensional scaling (MDS) is a type of ordination method which creates a 2- or 3-dimensional ‘map’ or plot of the samples from the PRIMER resemblance matrix. The plot generated is a representation of the dissimilarity of the samples (or replicates), with distances between the replicates indicating the extent of the dissimilarity. For example, replicates that are more dissimilar are further apart on the MDS plot. No axes are present on the MDS plots as the scales and orientations of the plots are arbitrary in nature.

2.31 Each MDS plot provides a stress value which is a broad-scale indication of the usefulness of plots, with a general guide indicated below (Clarke & Warwick 2001):

- <0.05 Almost perfect representation of rank similarities;
- 0.05 to <0.1 Good representation;
- 0.1 to <0.2 Still useful;
- 0.2 to <0.3 Should be treated with caution; and
- >0.3 Little better than random points.

**SIMPER**

2.32 Where differences between groups of samples were found, SIMPER analysis (in PRIMER) was used to determine which taxa were principally responsible for the differences between the statistically distinct groups of stations.

**Particle size analysis**

2.33 The PSA data were entered into GRADISTAT (Blott & Pye 2001) to produce sediment classifications, following Folk (1954), (Figure 13.5.5). Summary statistics were also calculated including mean particle size, sorting, skewness and kurtosis (following Blott & Pye 2001).

**Habitat allocation**

2.34 The invertebrate count data and PSA results, and outputs of the cluster analysis, SIMPROF and SIMPER analysis, were interpreted to allocate habitats to each replicate sample. Habitats were allocated following EUNIS (EEA 2017). Equivalent codes based on Joint Nature Conservation Committee's (JNCC) National Marine Habitat Classification for Britain and Ireland: Version 04.05 (Connor *et al*. 2004) have also been provided (JNCC 2010) in Table 3-1.

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# Chapter Three ◆ Results

3.1 Photographs of subtidal grab and wall scrape samples are provided in Appendices 4.0 and 5.0, respectively. Full PSA data for the subtidal sediments are presented in Appendix 7.0 and summary data are provided in Table 3-1.

## PARTICLE SIZE ANALYSIS

### Kent Project Site

3.2 Sediment at eight of the 14 subtidal grab stations within the Kent survey area was classified as Gravelly Mud (stations 4, 5, 6, 7, 8, 9, 10 and 22). Stations 11 and 12 were classified as Muddy Sandy Gravel; stations 2 and 13 were classified as Sandy Mud; and stations 1 and 3 were classified as Muddy Gravel and Mud respectively. The majority of stations were classified as Extremely Poorly Sorted with the exception of four stations (2, 11, 12 and 13) which were classified as Very Poorly Sorted, and station 3 which was Poorly Sorted.

### Essex Project Site

3.3 Sediment at the majority of the subtidal grab stations within the Essex survey area was classified as Muddy Sand (stations 15, 18, 19 and 21). Stations 16 and 17 were classified as Sandy Mud and Station 20 was classified as Gravelly Muddy Sand. The PSA sample taken from station 14 just south of the Port of Tilbury terminal was classified as Gravel. All stations were classified as Very Poorly Sorted with the exception of station 14 which was Poorly Sorted.

**Table 3-1: Summary particle size data from each Kent and Essex subtidal sample station.**

| Station | Mean particle diameter (µm) | Gravel (%) | Sand (%) | Mud (%) | Folk classification | Sorting |
|---|---|---|---|---|---|---|
| **Kent Project Site** | | | | | | |
| 1 | 4785.0 | 77.1 | 9.8 | 13.1 | Muddy Gravel | Extremely Poorly Sorted |
| 2 | 14.8 | 0.0 | 24.7 | 75.3 | Sandy Mud | Very Poorly Sorted |
| 3 | 10.4 | 0.0 | 3.5 | 96.5 | Mud | Poorly Sorted |
| 4 | 111.6 | 20.7 | 22.7 | 56.6 | Gravelly Mud | Extremely Poorly Sorted |
| 5 | 2274.1 | 63.6 | 13.7 | 22.7 | Gravelly Mud | Extremely Poorly Sorted |

| Station | Mean particle diameter (µm) | Gravel (%) | Sand (%) | Mud (%) | Folk classification | Sorting |
|---|---|---|---|---|---|---|
| 6 | 3508.9 | 71.9 | 9.8 | 18.3 | Gravelly Mud | Extremely Poorly Sorted |
| 7 | 256.8 | 46.1 | 11.7 | 42.2 | Gravelly Mud | Extremely Poorly Sorted |
| 8 | 1998.0 | 62.7 | 16.3 | 21.1 | Gravelly Mud | Extremely Poorly Sorted |
| 9 | 1230.4 | 52.5 | 13.3 | 34.2 | Gravelly Mud | Extremely Poorly Sorted |
| 10 | 62.6 | 17.7 | 15.0 | 67.3 | Gravelly Mud | Extremely Poorly Sorted |
| 11 | 3871.5 | 64.9 | 23.2 | 11.9 | Muddy Sandy Gravel | Very Poorly Sorted |
| 12 | 3853.6 | 71.1 | 20.7 | 8.2 | Muddy Sandy Gravel | Very Poorly Sorted |
| 13 | 27.8 | 0.0 | 34.3 | 65.7 | Sandy Mud | Very Poorly Sorted |
| 22 | 222.1 | 40.5 | 12.0 | 47.5 | Gravelly Mud | Extremely Poorly Sorted |
| **Essex Project Site** | | | | | | |
| 14 | 15225.6 | 91.1 | 7.2 | 1.7 | Gravel | Poorly Sorted |
| 15 | 38.2 | 0.0 | 54.8 | 45.2 | Muddy Sand | Very Poorly Sorted |
| 16 | 30.8 | 0.0 | 45.5 | 54.5 | Sandy Mud | Very Poorly Sorted |
| 17 | 21.3 | 0.0 | 33.3 | 66.7 | Sandy Mud | Very Poorly Sorted |
| 18 | 37.8 | 0.0 | 52.5 | 47.5 | Muddy Sand | Very Poorly Sorted |
| 19 | 49.7 | 0.0 | 63.6 | 36.4 | Muddy Sand | Very Poorly Sorted |
| 20 | 73.9 | 12.6 | 51.7 | 35.7 | Gravelly Muddy Sand | Very Poorly Sorted |
| 21 | 53.2 | 0.0 | 63.2 | 36.8 | Muddy Sand | Very Poorly Sorted |

## Biotic data

**Community summary statistics for microbenthic assemblages structure**

3.4 The complete benthic dataset for the subtidal grab and wall scrape samples are provided in Appendices 8.0 and 9.0, respectively.

***Kent project site***

3.5 A total of 38 benthic taxa were identified from the 14 subtidal grab stations of which four were non-countable (e.g. colonial organisms). A total of 4,347 individuals were recorded for the countable taxa. Sessilia was the most abundant taxon recorded within grab samples. The taxon had a total abundance of 1,216 individuals (27.9% of the total number of countable organisms recorded for the subtidal grabs) and a mean density of 868.6 ± 1,713.9 individuals $m^{-2}$. Abundant taxa other than Sessilia were the bay barnacle

*Amphibalanus improvisus* (959 individuals; mean density of 685 ± 1,655.2 individuals $m^{-2}$), *Streblospio* spp. (758 individuals; mean density of 541.4 ± 1,285.6 individuals $m^{-2}$), the mud shrimp *Corophium volutator* (505 individuals; mean density of 3607 ± 663.6 individuals $m^{-2}$), the polychaete *Polydora cornuta* (337 individuals; mean density of 240.7 ± 260.5 individuals $m^{-2}$), the pile worm *Alitta succinea* (204 individuals; mean density of 145.7 ± 172.9 individuals $m^{-2}$) and the oligochaete *Tubificoides heterochaetus* (121 individuals; mean density of 86.4 ± 155.5 individuals $m^{-2}$).

3.6 The lowest number of taxa was recorded at station 10 (four taxa) and station 6 had the highest number of taxa (23), (see Table 3-2). The greatest density of individuals was recorded at station 11 with 14,270 individuals $m^{-2}$ whilst station 10 had the lowest density with 50 individuals $m^{-2}$. Margalef's species richness varied from 1.12 at station 5 to 3.67 at station 8. Pielou's Evenness varied from 0.26 at station 5 (lower evenness was primarily influenced by high numbers of *C. volutator*) to 0.96 at stations 8 and 10 (high evenness due to low or similarly high numbers of most taxa). The Shannon Weiner Diversity index also indicated low diversity at station 10 (value of 1.33), while the highest value was recorded at station 8 (value of 2.39). Simpson's dominance varied from 0.22 at station 5 to 0.95 at station 8. The lower Simpson's dominance values were largely influenced by low numbers of individuals for most taxa and high numbers of *C. volutator* relative to other taxa.

***Essex Project Site***

3.7 A total of 41 benthic taxa were identified from the eight subtidal grab stations of which nine were non-countable (e.g. colonial organisms). A total of 5,020 individuals were recorded for the countable taxa. The oligochaete *Tubificoides benedii* was the most abundant taxon recorded within grab samples. The taxon had a total abundance of 1,752 individuals (34.9% of the total number of countable organisms recorded for the subtidal grabs) and a mean density of 2,190 ± 5,719.6 individuals $m^{-2}$. Abundant taxa other than *T. benedii* were *C. volutator* (1,262 individuals; mean density of 1,577.5 ± 3,442.5 individuals $m^{-2}$), *A. improvisus* (939 individuals; mean density of 1,173.8 ± 3,255.7 individuals $m^{-2}$), *P. cornuta* (251 individuals; mean density of 313.8 ± 726.3 individuals $m^{-2}$), *Tharyx* 'species A' (244 individuals; mean density of 305 ± 385.8 individuals $m^{-2}$) and *Streblospio* spp. (170 individuals; mean density of 212.5 ± 284.6 individuals $m^{-2}$).

3.8 The lowest number of taxa was recorded at station 19 (3 taxa) and station 14 had the highest number of taxa (27 taxa), (see Table 3-2). The greatest density of individuals was found at station 18 with 27,510 individuals $m^{-2}$ whilst station 19 had the lowest density with 80 individuals $m^{-2}$. Margalef's species richness varied from 1.10 at station 16 to 5.83 at station 14. Pielou's Evenness varied from 0.71 at station 18 (lower evenness was primarily influenced by high numbers of *T. benedii*) to 0.97 at station 20 (high evenness due to low or similarly high numbers of most taxa). The Shannon Weiner Diversity index also indicated low diversity at station 19 (value of 1.00), while the highest value was recorded at station 14 (value of 2.59). Simpson's dominance varied from 0.62 at station 16 to 0.95 at station 20. The lower Simpson's dominance values were largely influenced by low numbers of individuals for most taxa and high numbers of *T. benedii* relative to other taxa.

**Table 3-2: Summary particle size data from each Kent and Essex subtidal sample station.**

| Station | Total no. taxa (per station) | No. individuals per $m^2$ | Margalef's species richness (*d*) | Pielou's Evenness (*J'*) | Shannon Wiener Diversity (*H'*($log_e$)) | Simpson's Dominance (1-λ) |
|---|---|---|---|---|---|---|
| **Swanscombe** | | | | | | |
| 1 | 8 | 270 | 2.10 | 0.80 | 1.67 | 0.79 |
| 2 | 6 | 590 | 1.22 | 0.49 | 0.88 | 0.44 |
| 3 | 15 | 2,960 | 2.46 | 0.61 | 1.64 | 0.67 |
| 4 | 7 | 370 | 1.65 | 0.71 | 1.38 | 0.68 |
| 5 | 7 | 2,140 | 1.12 | 0.26 | 0.52 | 0.22 |
| 6 | 23 | 5,950 | 3.44 | 0.50 | 1.56 | 0.66 |
| 7 | 7 | 250 | 1.84 | 0.71 | 1.38 | 0.65 |
| 8 | 12 | 180 | 3.67 | 0.96 | 2.39 | 0.95 |
| 9 | 13 | 3,290 | 2.07 | 0.69 | 1.78 | 0.76 |
| 10 | 4 | 50 | 1.86 | 0.96 | 1.33 | 0.90 |
| 11 | 15 | 14,270 | 1.93 | 0.48 | 1.30 | 0.64 |
| 12 | 13 | 1,740 | 2.32 | 0.73 | 1.88 | 0.81 |
| 13 | 9 | 2,780 | 1.42 | 0.53 | 1.16 | 0.52 |
| 22 | 15 | 8,360 | 2.07 | 0.53 | 1.43 | 0.63 |
| **Min** | **4** | **50** | **1.12** | **0.26** | **0.52** | **0.22** |
| **Max** | **23** | **14,270** | **3.67** | **0.96** | **2.39** | **0.95** |
| **Tilbury** | | | | | | |
| 14 | 27 | 11,200 | 5.83 | 0.78 | 2.59 | 0.86 |
| 15 | 12 | 900 | 3.33 | 0.92 | 2.29 | 0.91 |
| 16 | 4 | 960 | 1.10 | 0.78 | 1.08 | 0.62 |
| 17 | 13 | 8,130 | 2.67 | 0.95 | 2.43 | 0.91 |
| 18 | 10 | 27,510 | 1.95 | 0.71 | 1.64 | 0.74 |
| 19 | 3 | 80 | 1.34 | 0.91 | 1.00 | 0.77 |
| 20 | 9 | 180 | 3.10 | 0.97 | 2.13 | 0.95 |
| 21 | 8 | 1,240 | 2.27 | 0.81 | 1.69 | 0.77 |
| **Min** | **3** | **80** | **1.10** | **0.71** | **1.00** | **0.62** |
| **Max** | **27** | **27,510** | **5.83** | **0.97** | **2.59** | **0.95** |

**Wall scrapes**

3.9 A total of five taxa made up of 44 individuals were identified from the two wall scrape stations, of which two taxa were non-countable. The barnacle *Austominius modestus* was the most abundant taxon recorded within grab samples. The taxon had a total abundance of individuals (75% of the total number of countable organisms recorded), followed by Sessilia (10 individuals) and *Chrironomidae* spp. (one individual).

**Notable microbenthic taxa**

3.10 The tentacled lagoon worm *Alkmaria romijni* is protected under the Wildlife and Countryside Act 1981 and is a protected feature of the Swanscombe Marine Conservation Zone. The species was recorded in subtidal grabs at stations 3, 6 and 22 within the Kent survey area (Figure 13.5.6). *A. romijni* had a total abundance of 8 individuals (two individuals at Stations 3 and 6 and 4 individuals at Station 22) and a mean density of 5.7 ± 12.2 individuals $m^{-2}$.

3.11 A total of seven non-native species were recorded within samples collected during the subtidal survey (*A. modestus, Cordylophora caspia, Eusarsiella zostericola, Magallana gigas, Melita nitida, Palaemon macrodactylus* and *Ruditapes philippinarum*). *A. modestus* was recorded within wall scrapes, *C. caspia* was recorded as a non-countable species at station 14, *E. zostericola* was recorded at stations 8, 12, 21 and 22, *M. gigas* was recorded at stations 6 and 11, *M. nitida* was recorded at station 22, *P. macrodactylus* was recorded at station 6 and *R. philippinarum* was recorded at station 14.

3.12 *Streblospio* sp. was found in 16 of the grab samples, Sessilia was found in eight of the grab samples and one of the wall scrape samples; Gammaridae was found in two of the grab samples and Chironomidae was found in one of the wall scrape samples. At least one species of these taxa are considered non-native in the UK, however, *Streblospio,* Sessilia*,* Gammaridae and Chironomidae are taxonomically problematic and individuals were not identified to species in this study.

3.13 There were nine species considered to be cryptogenic (i.e. that are neither demonstrably native nor non-native) were recorded (*Alitta succinea, A. improvisus, Apocorophium lacustre, Boccardiella ligerica, Eteone lighti, , Monocorophium insidiosum, P. cornuta, Teredo navali*s and *Tubificoides heterochaetus.*

**Biomass analysis**

3.14 The complete benthic biomass dataset for subtidal grabs is provided in Appendix 10.0 and biomass tables for major groups are provided in Appendix 11.0.

***Kent project site***

3.15 Faunal biomass in the subtidal grabs within the Kent survey area was dominated by annelids at nine of the 14 stations (2, 3, 4, 7, 8, 10, 12, 13 and 22), followed by crustaceans which dominated two of the 14 stations (5 and 9). Faunal biomass at station 1 was primarily comprised of annelids and crustaceans. Particularly high values for molluscs were recorded at stations 6 and 11 (see Figure 13.5.7). This was largely influenced by a small number of *M. gigas* individuals which contributed to 63.33 g of total biomass at station 6 and 3.30 g at station 11. Biomass values for molluscs at Stations 6 and 11 have been removed in Figure 13.5.8 to show biomass values for other major groups at grab sample stations.

***Essex Project Site***

3.16 Faunal biomass in the subtidal grabs within the Essex survey area was dominated by annelids at four of the eight stations (16, 17, 19 and 20), followed by molluscs which dominated at two stations (15 and 18) and finally crustaceans which dominated biomass at station 21. A particularly high biomass value was recorded for 'other' taxa at station 14 (see Figure 13.5.9). This was primarily influenced by the presence of large individuals of *Actiniaria* spp. at this station.

**Multivariate analysis**

3.17 The results of the SIMPROF cluster analysis on the microbenthic data for subtidal samples are presented in the cluster dendrogram (Figure 13.5.10) and MDS plot (Figure 13.5.12). A dendrogram and MDS plot is also provided in Figure 13.5.11 and Figure 13.5.13 respectively, indicating the grouping of stations by Project Site. Black lines denote significant structure within the group to that point and red lines connect samples that cannot be significantly differentiated at the 95% confidence interval. The SIMPROF test identified eight groups (Group a-h) that can be considered statistically distinct from one-another at the 95% confidence level, three of which consisted of a single station. The stress value of the MDS plot is low (0.17), indicating a good two-dimensional representation of the higher dimensional relationships between samples with no real prospect of a misleading interpretation (Clarke & Warwick, 2001). The results of SIMPER analysis presenting percentage contributions of different taxa to within-group similarity and between group dissimilarity are provided in Appendix 12.0.

3.18 **Group a** consisted of two samples from the Kent survey area (stations 1 and 2), which separated from the other groups on the dendrogram at just under 30% similarity and are placed towards the top right of the MDS plot. This group was characterised by a relatively high abundance of *A. succinea* which contributed 45.86% to within group similarity; and lower abundances of *Amphibalanus improvisus*, *Einhornia crustulenta* and *Cyathura carinata.*

3.19 **Group b** was the largest SIMPROF group consisting of seven sample stations, six from the Kent survey area (stations 3, 6, 9, 11, 12 and 22) and one from the Essex survey area (station 14), which separated from the other groups at approximately 35% similarity. This group was characterised primarily by Sessilia, *A. improvisus, P. cornuta and A. succinea* which contributed to 65.48% within-group similarity.

3.20 **Group c** was consisted of just one sample taken from the Essex survey area (station 17), separating from other groups at approximately 43% similarity.

3.21 **Group d** was comprised of two samples taken from the Kent survey area (Stations 5 and 13), separating from other groups at approximately 70% similarity. This group was characterised by a relatively high abundance of *C. volutator* which contributed 63.68% to within-group similarity.

3.22 **Group e** was made up of just one sample taken from the Essex survey area (Station 10), separating from other groups at approximately 25% similarity.

3.23 **Group f** consisted of three sample stations taken from the Kent survey area (Stations 4, 7 and 8), separated from other groups at just under 60% similarity. This group was categorised primarily by *T. heterochaetus* and *Streblospio* spp. which contributed 47.28% to within-group similarity.

3.24 **Group g** was made up of four samples taken from the Essex survey area (Stations 15, 16, 19 and 20) and separated from other groups at approximately 17% similarity. This group was categorised by relatively high abundances of *T. benedii* and Tharyx 'species A' which contributed 68.69% to within-group similarity.

3.25 **Group h** was made up of two samples taken from the Essex survey area (Stations 18 and 21) and separated from other groups at approximately 17% similarity. This group was categorised by high abundances of Tharyx 'species A' which contributed 61.34% to within-group similarity.

**Habitat allocation**

3.26 The subtidal grab samples from the Kent and Essex survey areas had broadly overlapping species composition with the main differences between cluster groups resulting from differences in sediment composition or relative abundances of individual taxa. The eight SIMPROF cluster groups were assigned to one of four EUNIS habitat types (Table 3-3). All cluster groups were assigned as a variant of their standard descriptions (Connor et al. 2004).

3.27 A variant of Polydora ciliata and Corophium volutator in variable salinity infralittoral firm mud or clay (EUNIS code: A5.321) was the most common habitat characterising three cluster groups (a, d and f) and seven stations (Table 3-3). This was closely followed by a variant of *Aphelochaeta* spp. and *Polydora* spp. in variable salinity infralittoral mixed sediment (A5.421) which was characterised for just one cluster group (b) and six stations (Table 3-3). The locations of these two habitats (Figure 13.5.14) suggests a patchy distribution of habitats across the survey area. Finally, a variant of *Crepidula fornicata* and *Mediomastus fragilis* in variable salinity infralittoral mixed sediment (A5.422) was characterised for a single cluster group (e) and a single station (Table 3-3)), and was located adjacent to White's jetty (Figure 13.5.14).

3.28 Habitats within the Essex survey area were fairly homogenous, with majority of stations assigned to a variant of the habitat '*Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud' (A5.322) which characterised two cluster groups (g and h) and six stations (Table 3-3; Figure 13.5.15).

3.29 The remaining two stations within the Essex survey area were assigned to either variants of either '*Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay' (A5.321) (cluster group c) or '*Aphelochaeta* spp. and *Polydora* spp. in variable salinity infralittoral mixed sediment' (A5.421) (cluster group b). Habitat A5.321 was located towards to the western region of the Essex survey area close to stations assigned to A5.322 (Figure 13.5.15) and was characterised differently due to increased abundance of *C. volutator* and fewer individuals of *T. benedii*. The habitat A5.421 was located furthest west of the survey area, just south of the Port of Tilbury ferry terminal and closer towards the centre of the Thames estuary (Figure 13.5.15). The habitat was characterised by increased numbers of *Aphelochaeta* spp. and *Polydora* spp., and coarser sediments compared to the rest of the survey area.

**Table 3-3: Summary particle size data from each Kent and Essex subtidal sample station.**

| Cluster Group | Description | EUNIS code | Habitat (JNCC code) | Stations |
|---|---|---|---|---|
| A | Variant of *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay. | A5.321 | c.f. SS.SMu.SMuVS.PolCvol | 1, 2 |
| B | Variant of *Aphelochaeta* spp. and *Polydora* spp. in variable salinity infralittoral mixed sediment. | A5.421 | c.f. SS.SMx.SMxVS.AphPol | 3, 6, 9, 11, 12, 14, 22 |
| C | Variant of *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay. | A5.321 | c.f. SS.SMu.SMuVS.PolCvol | 17 |
| D | Variant of *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay. | A5.321 | c.f. SS.SMu.SMuVS.PolCvol | 5, 13 |
| E | Variant of *Crepidula fornicata* and *Mediomastus fragilis* in variable salinity infralittoral mixed sediment. | A5.422 | c.f. SS.SMx.SMxVS | 10 |
| F | Variant of *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay. | A5.321 | c.f. SS.SMu.SMuVS.PolCvol | 4, 7, 8 |
| G | Variant of *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud. | A5.322 | c.f. SS.SMu.SMuVS.AphTubi | 15, 16, 19, 20 |
| H | Variant of *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud. | A5.322 | c.f. SS.SMu.SMuVS.AphTubi | 18, 21 |

## SEDIMENT CHEMISTRY DATA

3.30 For the subtidal stations at which samples were collected for chemical analyses a comparison of chemical concentrations against Chemical Action Levels (MMO 2015) and/or Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2002) is provided in Appendix 13.0. Not all chemicals have guidelines indicating thresholds for potential biological effects and the results for other selected chemical analyses are provided in Appendix 14.0.

### Kent Project Site

3.31 The only exceedances of the cAL2 concentrations were mercury and zinc at station 5 and mercury at station 9. The greatest number of exceedances were at stations 5, 6 and 9 (Appendix 13.0).

3.32 The heavy metals with the most frequent exceedances were nickel with cAL1 exceedances at 12 of the 14 stations (all of these were also above TEL but below PEL), lead with cAL1 exceedances at 11 stations (five above TEL but below PEL and six above PEL), and copper with cAL1 exceedances at nine stations (six above TEL but below PEL and three above PEL). Arsenic and chromium were the heavy metals with the least number of cAL1 exceedances (five stations each).

3.33 The greatest number of exceedances for PAHs were at stations 5, 6, 9 and 22. The PAHs with the most frequent exceedances were dibenzo[ah]anthracene which exceeded cAL1 at 10 of the 14 stations (six above TEL but below PEL and four above PEL), followed by benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[e]pyrene, chrysene, fluoranthene, indeno[1,2,3-cd]pyrene and pyrene which exceeded cAL1 at nine of the 14 stations.

3.34 For the majority of PAHs, concentrations were generally above both TEL and PEL, with some concentrations exceeding TEL only. Stations 12 and 13 were the only stations where no exceedances were observed for any PAHs.

3.35 For PCBs (Polychlorinated Biphenyls), sum of ICES 7 and sum of 25 congeners were below cAL1 at all stations. Similarly, no exceedances were observed for organichlorine pesticides.

### Essex Project Site

3.36 Unlike stations at the Kent Project Site, no exceedances of the cAL2 concentration were observed at any station within the Essex survey area. The greatest number of chemical exceedances was at Station 15 (Appendix 13.0).

3.37 The only heavy metal to exceed the cAL1 concentration was nickel at station 17. The concentration of nickel at this station also exceeded TEL but was below PEL. No other cAL1 exceedances were observed at any other station.

3.38 The greatest number of exceedances for PAHs was at station 15. The PAHs with the most frequent exceedances were benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[e]pyrene, chrysene, dibenzo[ah]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene and pyrene which exceeded cAL1 at six of the eight stations (Stations 15, 16, 18, 19, 20 and 21).

3.39 For most PAHs, concentrations were generally below PEL, however, where exceedances occurred for benzo[b]fluoranthene, benzo[e]pyrene, benzo[ghi]perylene, benzo[k]fluoranthene and indeno[1,2,3-cd]pyrene; exceedances were above PEL. Stations 14 and 17 were the only stations where no exceedances were observed for any PAHs.

3.40 For PCBs, sum of ICES 7 and sum of 25 congeners were below cAL1 at all stations. Similarly, no exceedances were observed for organichlorine pesticides.

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# Chapter Four ◆ Summary

## SUMMARY AND DISCUSSION

4.1 A subtidal benthic ecology survey was conducted in August and September 2020 with samples collected for biotic analysis, PSA and sediment chemistry. A total of 15 and eight stations were sampled form the Kent and Essex survey areas respectively.

4.2 The dominance of Gravelly Mud and Muddy Sand were noted for grab samples taken from the Kent and Essex survey areas respectively. Within the Kent survey area, eight of 14 stations were classified as Gravelly Mud whilst remaining stations were classified as either Muddy Sandy Gravel, Sandy Mud, Muddy Gravel and Mud. Most stations were classified as 'extremely poorly sorted' with the exception of four stations. Four of the eight stations from Essex were classified as Muddy Sand whilst remaining stations were classified as either Muddy Sand, Gravelly Muddy Sand and Gravel. All stations except one were considered to be 'poorly sorted'. Sediment type can often be closely correlated to chemical concentrations with some chemicals tending to exhibit higher concentrations in muddier sediment fractions (due to adsorption preference). There was some evidence of this within sediment samples as Stations 11 and 12 (Muddy Sandy Gravel) and Station 14 (Gravel) exceeded very few or none of the chemical thresholds tested for chemicals compared to other stations which contained higher proportions of mud. The heavy metals that exceeded thresholds at most stations within the Kent survey area were nickel and lead (12 and 11 stations respectively). Nickel was the only heavy metal to exceed thresholds within the Essex survey area and this was only evident at one station. The only exceedance of cAL2 was for mercury and zinc at two stations and one station respectfully, within the Kent survey area. cAL1/PEL thresholds for numerous PAHs were exceeded at many of the sample stations within both the Kent and Essex survey areas. The presence of chemicals at the levels recorded is not unexpected for an industrial estuary such as the Thames Estuary.

4.3 A total of 38 and 41 taxa were recorded in the subtidal grab samples at Kent and Essex respectively, with five taxa recorded in wall scrape samples. Density of invertebrates at each station was highly variable ranging from 50 individuals $m^2$ to 14,270 individuals $m^2$ within the Kent survey area and 80 individuals $m^2$ to 27,510 individuals $m^2$ within the Essex survey area. Sessilia was the most abundant taxon recorded at the Kent survey area accounting for 27.9% of the total number of countable organisms, the oligochaete *Tubificoides benedii* was the most abundant taxon recorded at the Essex survey area accounting for 34.9% of the total number of countable organisms; and the non-native barnacle *Austominius modestus* was the most abundant taxon recorded within wall scrape samples. Biomass data indicated that annelids dominated subtidal grab stations within the Kent and Essex survey areas (influenced primarily by high numbers of *Streblospio*, *A. succinea*, *P. cornuta* and *T. benedii*) followed by crustaceans (influenced by large *M. gigas* individuals).

4.4 Species composition of subtidal grab samples from the Kent and Essex survey areas were distinct from one another and stations within each survey area had broadly overlapping species composition with the main differences between cluster groups resulting from differences in sediment composition or relative abundances of individual taxa. A total of eight SIMPROF cluster groups were identified and assigned to one of four habitats. Cluster groups containing stations from the Kent survey area were assigned to variants of the following three habitats: *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay (A5.321) (7 stations, 3 cluster groups); *Aphelochaeta* spp. and *Polydora* spp. in variable salinity infralittoral mixed sediment (A5.421) (6 stations, 1 cluster group); and *Crepidula fornicata* and *Mediomastus fragilis* in variable salinity infralittoral mixed sediment (A5.422) (1 station, 1 cluster group). Cluster groups containing stations from the Essex survey area were also assigned to variants of the following three habitats: *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud (A5.322) (6 stations, 2 cluster groups); *Polydora ciliata* and *Corophium volutator* in variable salinity infralittoral firm mud or clay (A5.321) (2 station, 2 cluster groups); and *Aphelochaeta* spp. and *Polydora* spp. in variable salinity infralittoral mixed sediment (A5.421) (1 station, 1 cluster group).

4.5 The tentacled lagoon worm *Alkmaria* romijni was recorded in relatively low densities at three stations within the Kent survey area (20 individuals $m^{-2}$ recorded at Stations 3 and 6 and 40 individuals $m^{-2}$ recorded at Station 22. *A. romijni* is a protected feature of the Swanscombe MCZ and is scarce throughout the UK (DEFRA 2019).

4.6 A total of seven non-native species were recorded during the subtidal survey (*A. modestus C. caspia, E. zostericola, M. gigas, M. nitida, P. macrodactylus* and *R. philippinarum*). *C. caspia* and *R. philippinarum* was recorded within the Kent survey area; *M. nitida* and *P. macrodactylus* were recorded in the Essex survey area; *E. zostericola* and *M. gigas* were recorded at the Kent and Essex survey areas and *A. modestus* was recorded within wall scrape samples only. *Streblospio* sp. and Gammaridae were recorded in subtidal grab samples whilst Sessilia was recorded in subtidal and wall scrape samples. Chironomidae was also recorded in one wall scrape sample. At least one species of each of these taxa are considered non-native in the UK. A total of nine species considered to be cryptogenic were recorded (*A. succinea, A. improvisus, A. lacustre, B. ligerica, E. lighti , M. insidiosum, P. cornuta, T. navalis and T. heterochaetus*).

4.7 *E. zostericola* is known from a number of estuaries in south-eastern Britain including the Thames and it has previously been recorded in the vicinity of Tilbury Power Station (RWE nPower 2011 (unpublished data)). *E. zostericola* was believed to have been introduced into the UK with Pacific Oysters *M. gigas* (Eno *et al*. 1997). The hydroid *C. caspia* was recorded in seven of the subtidal samples. This species has a preference for low salinity or freshwaters and is abundant in the Thames where it provides a valuable food resource for the sea slug *Tenellia adspersa* which is protected under the Wildlife and Countryside Act 1981 but this slug was not recorded during the project survey. The Asian shrimp species *P. macrodactylus* was first recorded in the river Thames in November 1992 and abundant within the estuary by 2006 (Worsfold & Ashelby 2008; Ashelby *et al*. 2013). *R. philiformes* was introduced via hatcheries within the outer Thames estuary and is considered to be commercially important (Humphreys *et al.* 2015). *M. nitida* has recently been introduced into the UK.

4.8 Overall, the habitats recorded at the Kent and Essex project sites are considered to be widespread within the Thames Estuary and with the exception of *A. romijni* which is restricted to the Swanscombe MCZ area, species recorded are considered to be widespread within the wider mid and lower Thames Estuary.

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# Appendices

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# Appendix 1.0 Figures

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**Figure 13.5.1: Subtidal survey area and grab locations for Kent Project Site.**

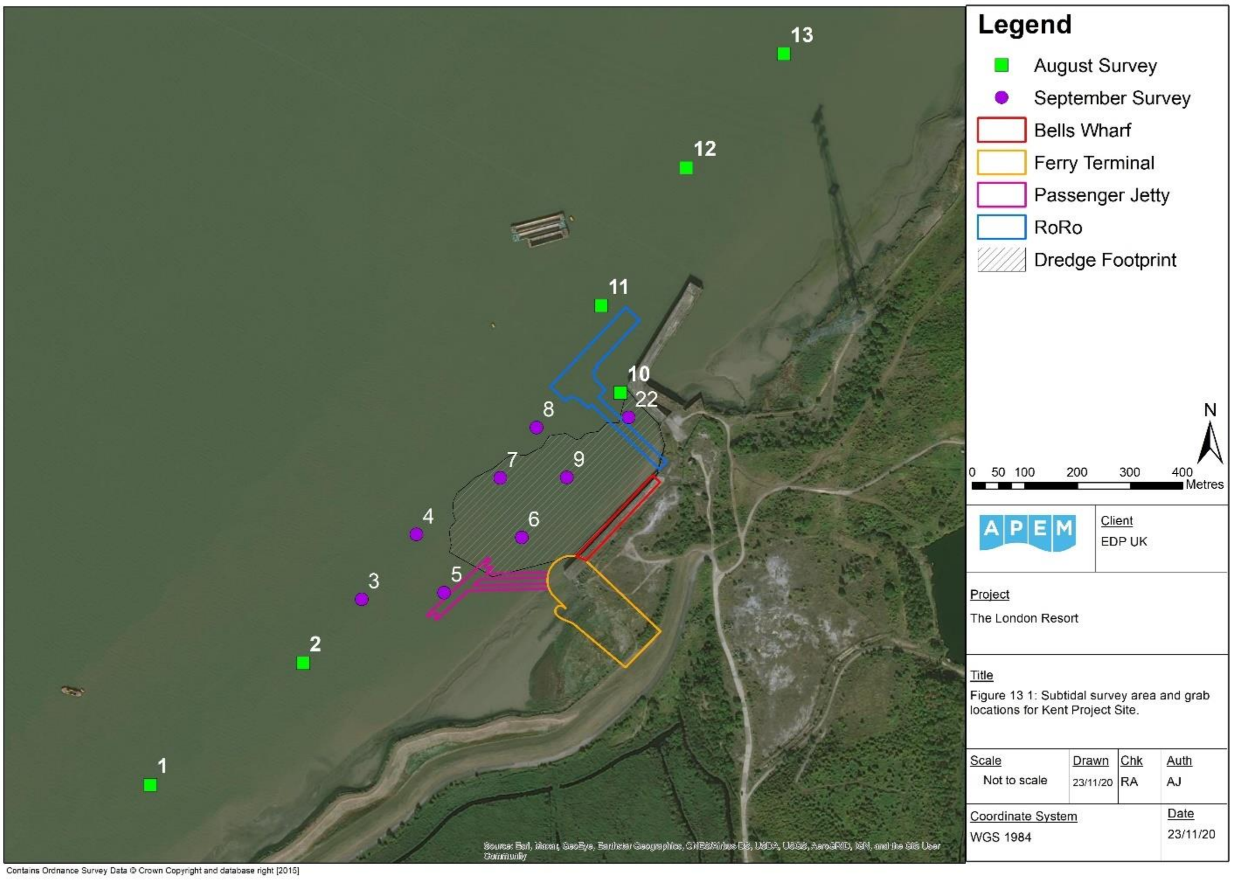


**Figure 13.5.2: Subtidal survey area and grab locations for Essex Project Site.**

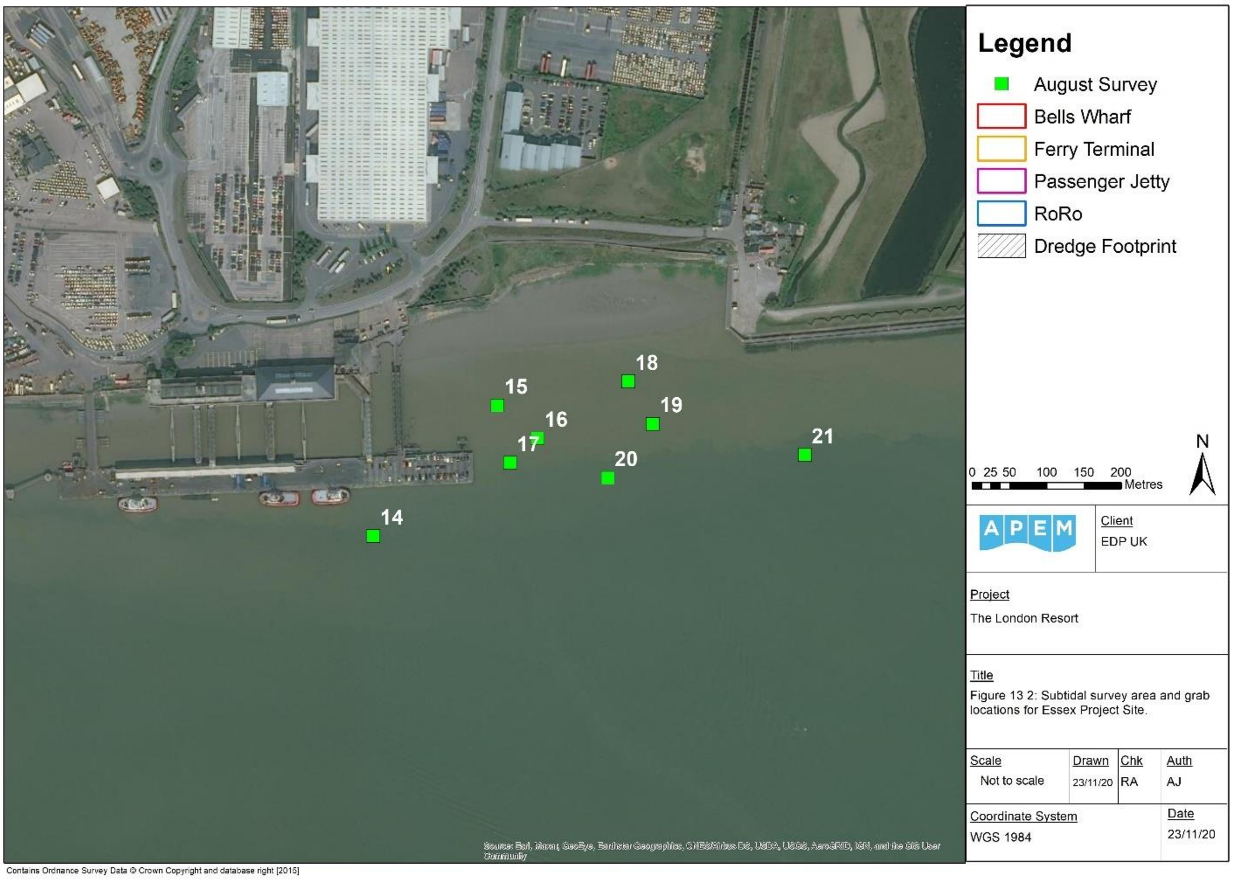


**Figure 13.5.3: Dalby Venture, used for the first subtidal survey.**

**Figure 13.5.4: Emilia D, used for the second subtidal survey.**

**Figure 13.5.5: Folk sediment classification pyramid (Folk 1954).**

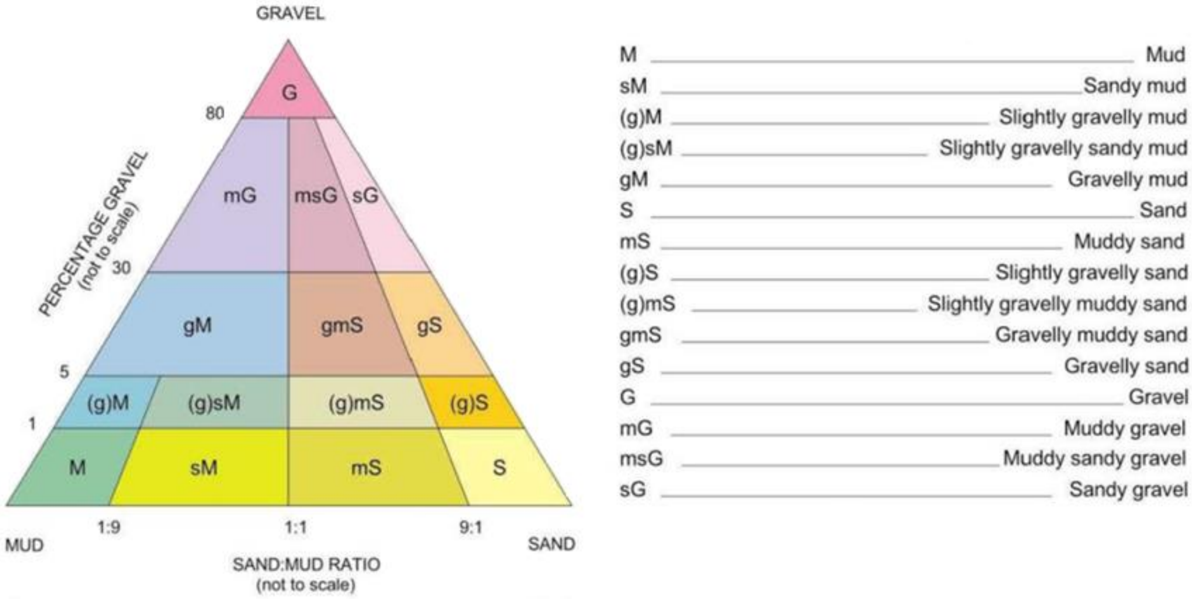


**Figure 13.5.6: Abundance of *A. rominji* recorded from grab samples within the Kent survey area.**

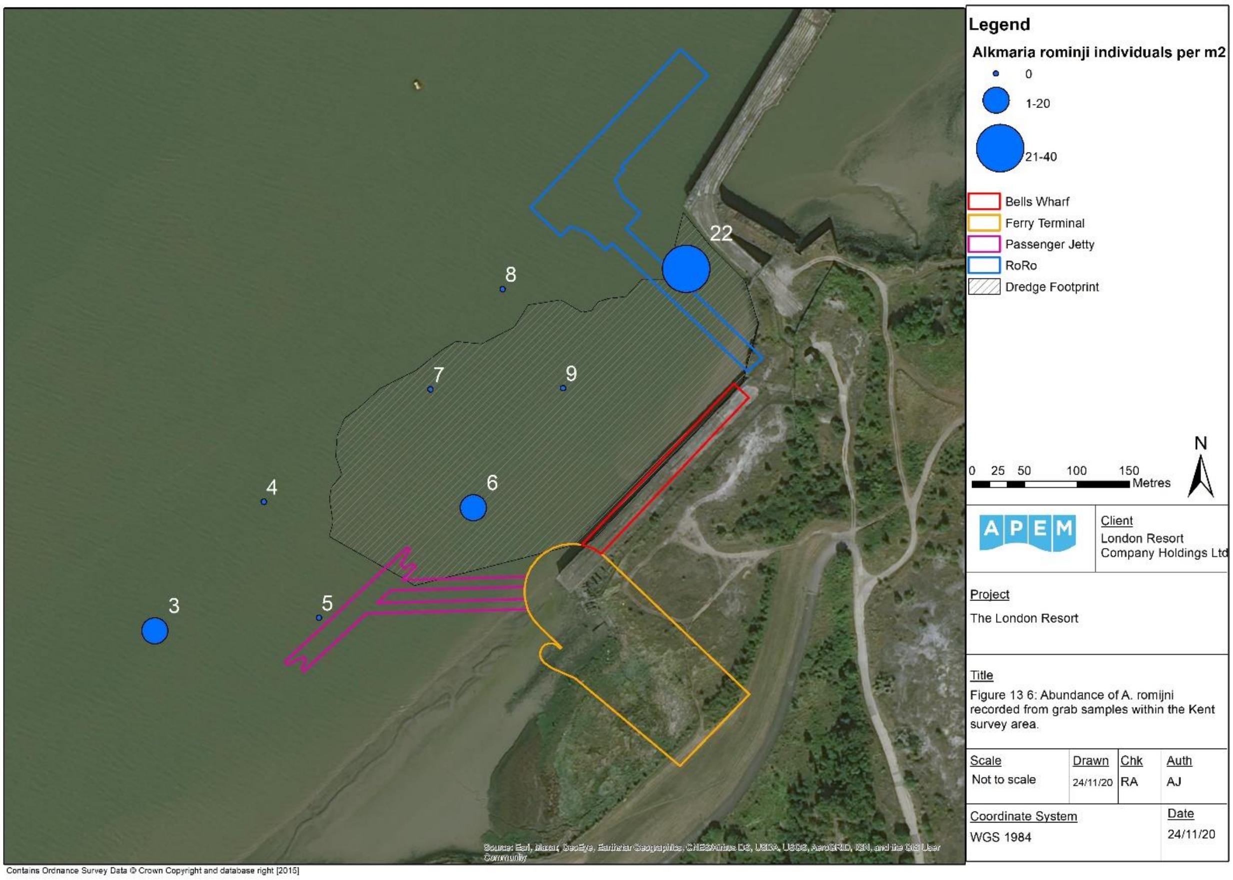


**Figure 13.5.7: Total wet weight biomass in grams at each subtidal grab station within the Kent survey area.**

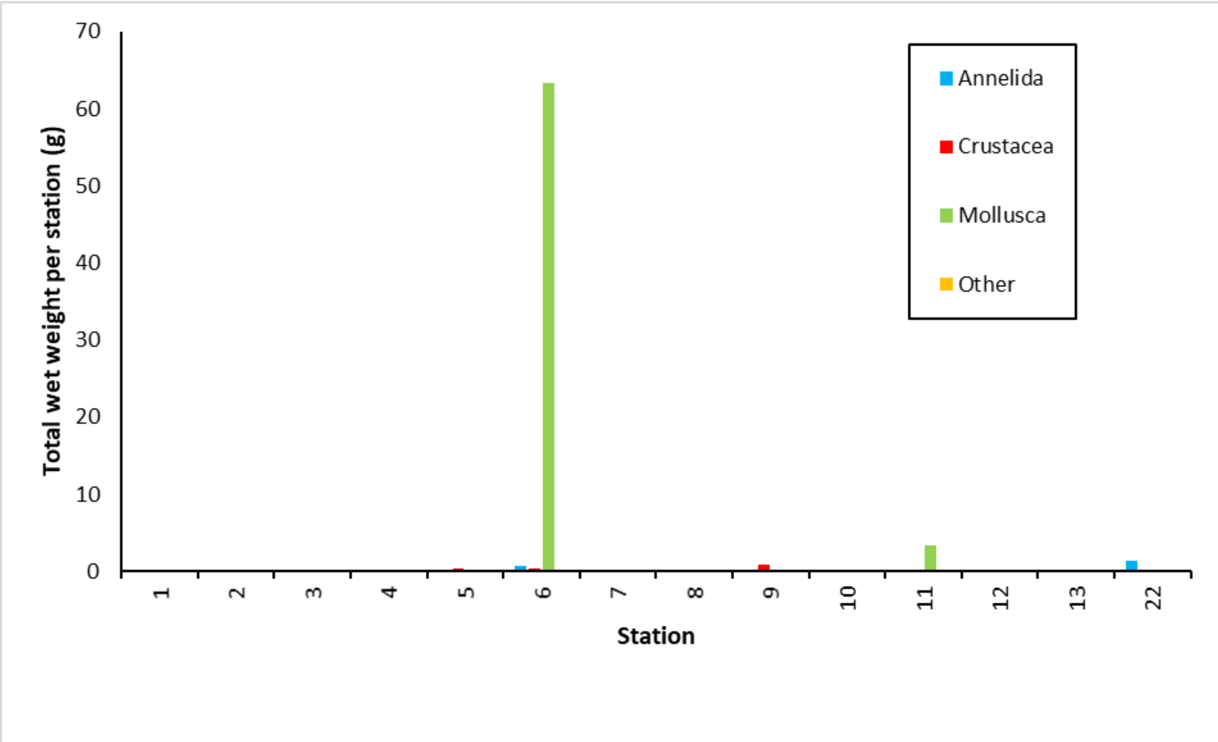


**Figure 13.5.8: Total wet weight biomass in grams at each subtidal grab station within the Kent survey area with values for molluscs at Station 6 and 11 removed.**

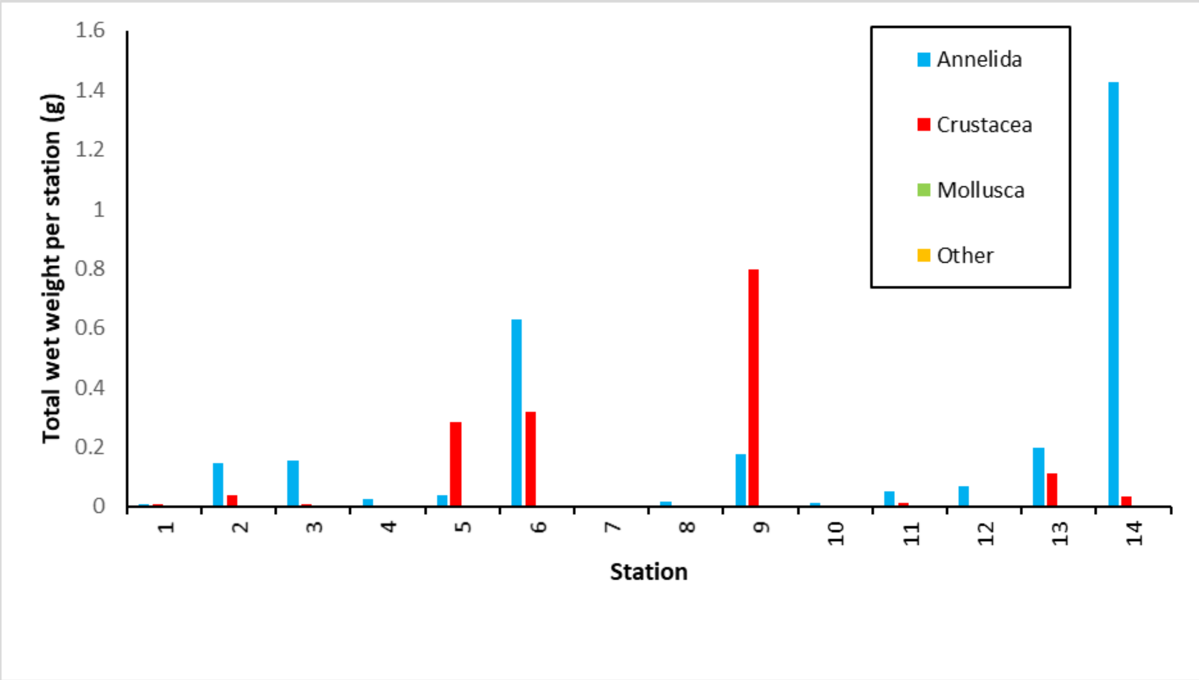


**Figure 13.5.9: Total wet weight biomass in grams at each subtidal grab station within the Essex survey area.**

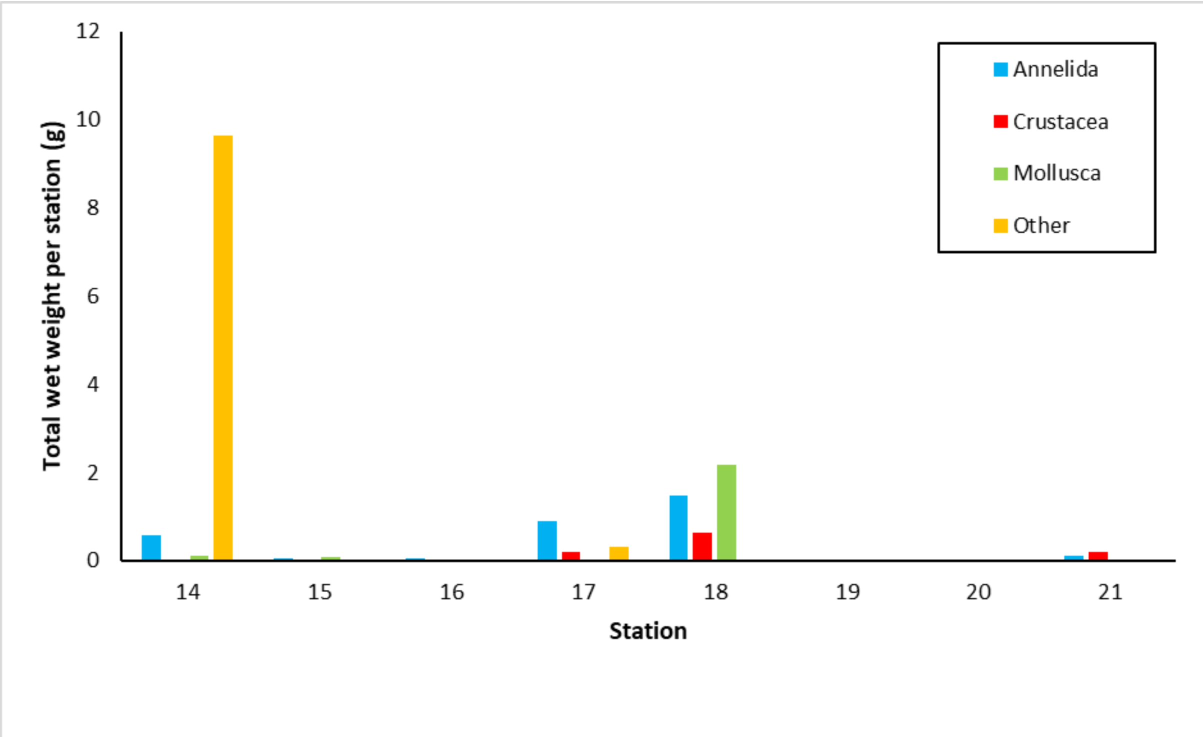


**Figure 13.5.10: Cluster analysis dendrogram with SIMPROF for subtidal grab invertebrate abundance. Black lines show groupings at ≥5%.**

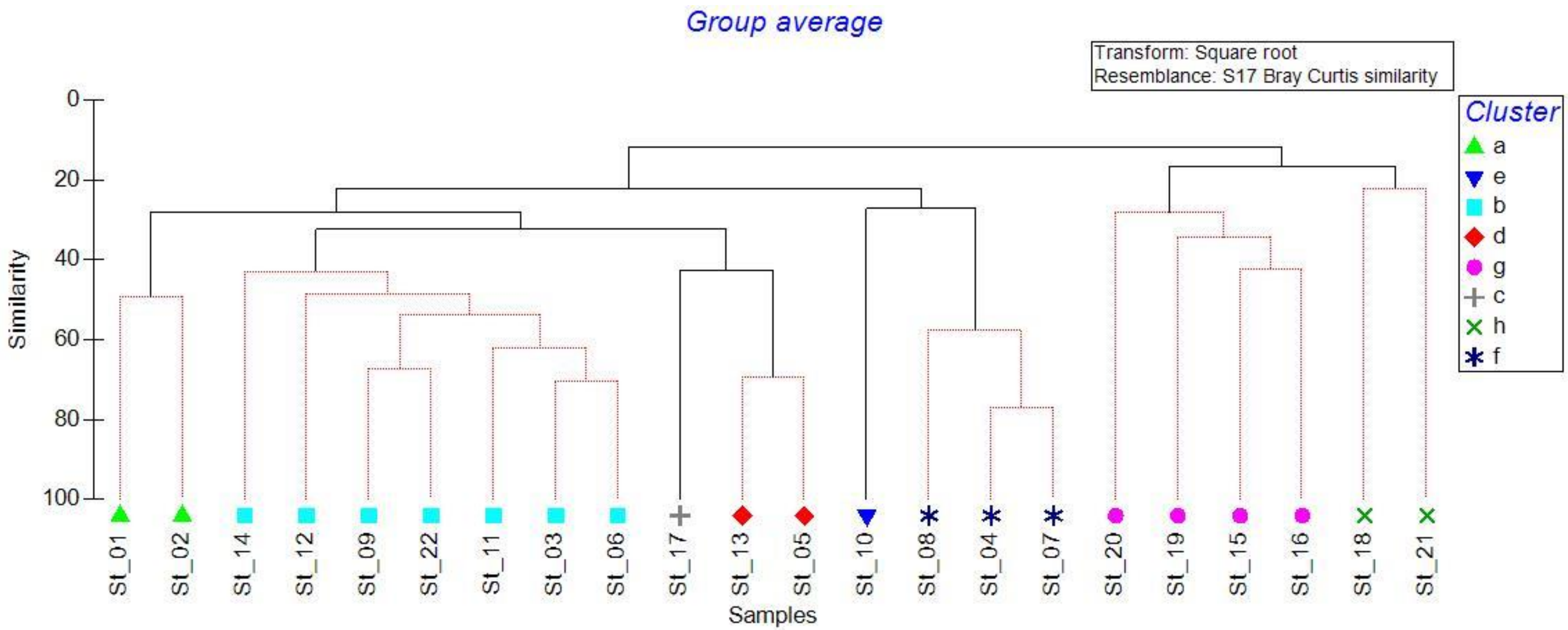


**Figure 13.5.11: Cluster analysis dendrogram with SIMPROF for subtidal grab invertebrate abundance. Stations are categorised based on survey area. Black lines show groupings at ≥5%**

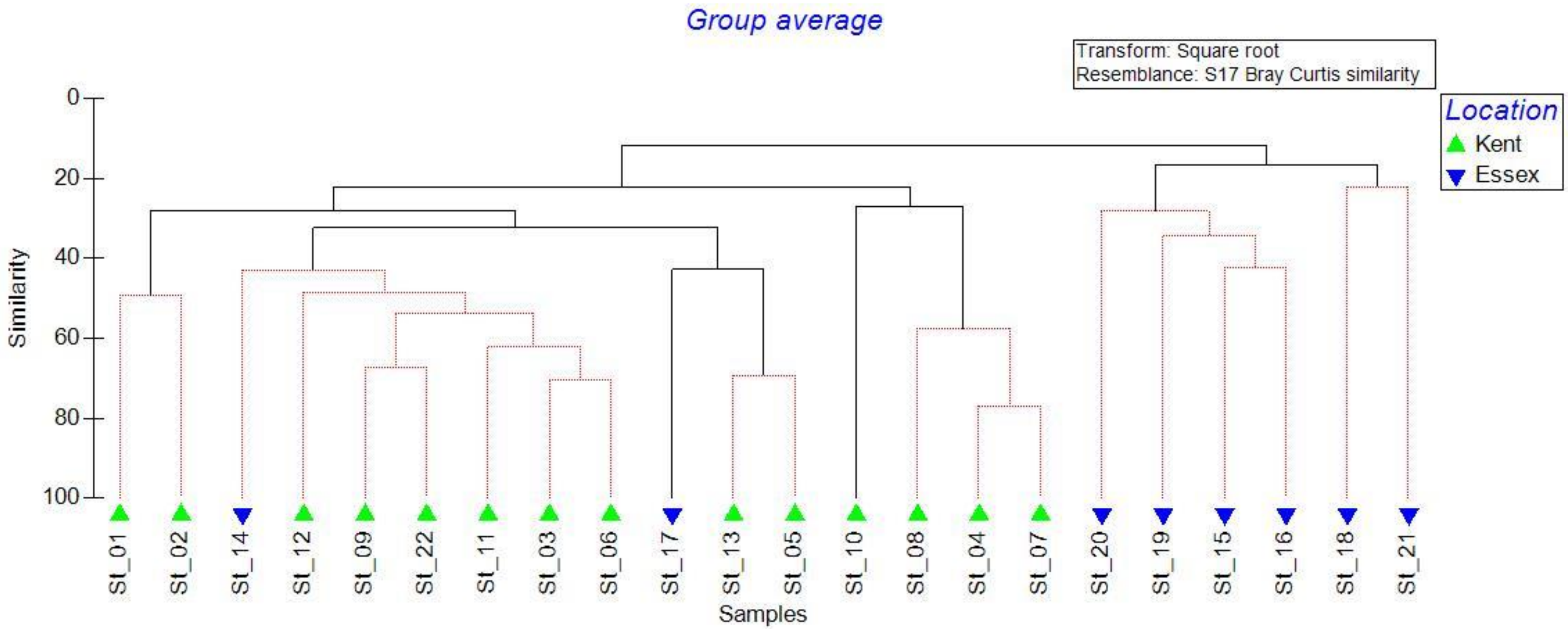


**Figure 13.5.12: Multidimensional Scaling ordination plot for subtidal grab invertebrate abundance.**

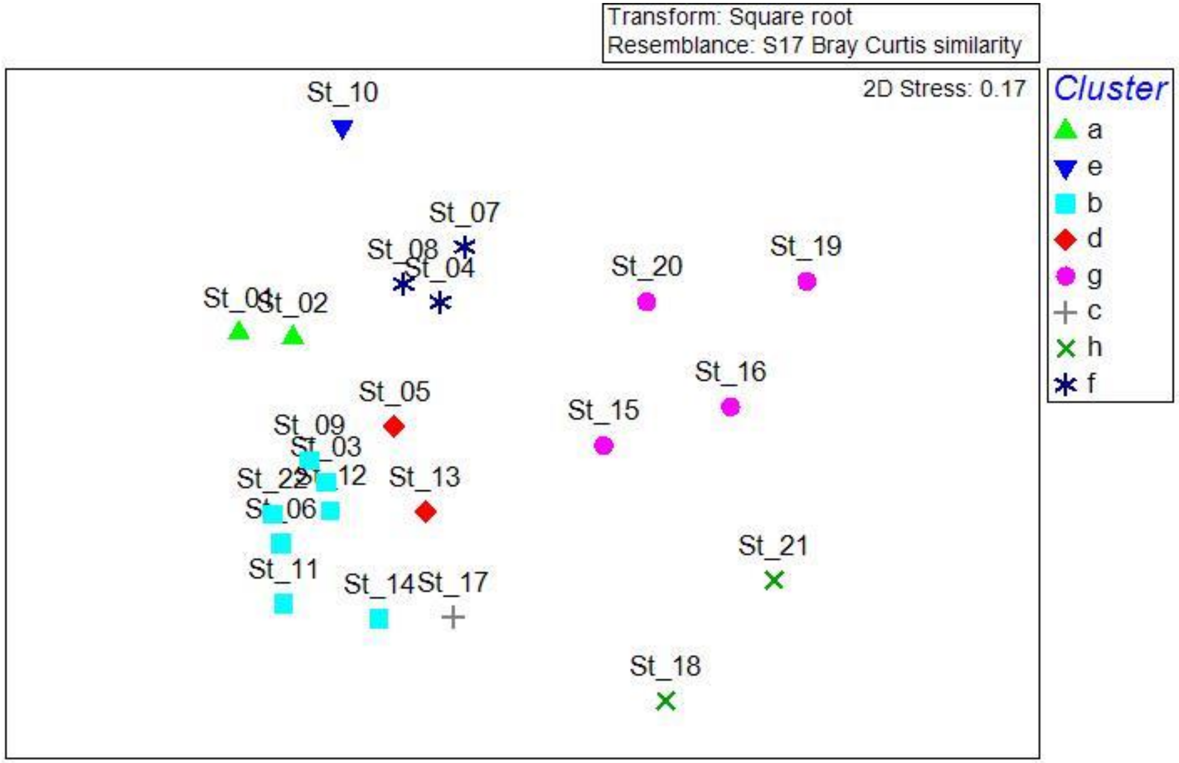


**Figure 13.5.13: Multidimensional Scaling ordination plot for subtidal grab invertebrate abundance. Stations are categorised based on survey area.**

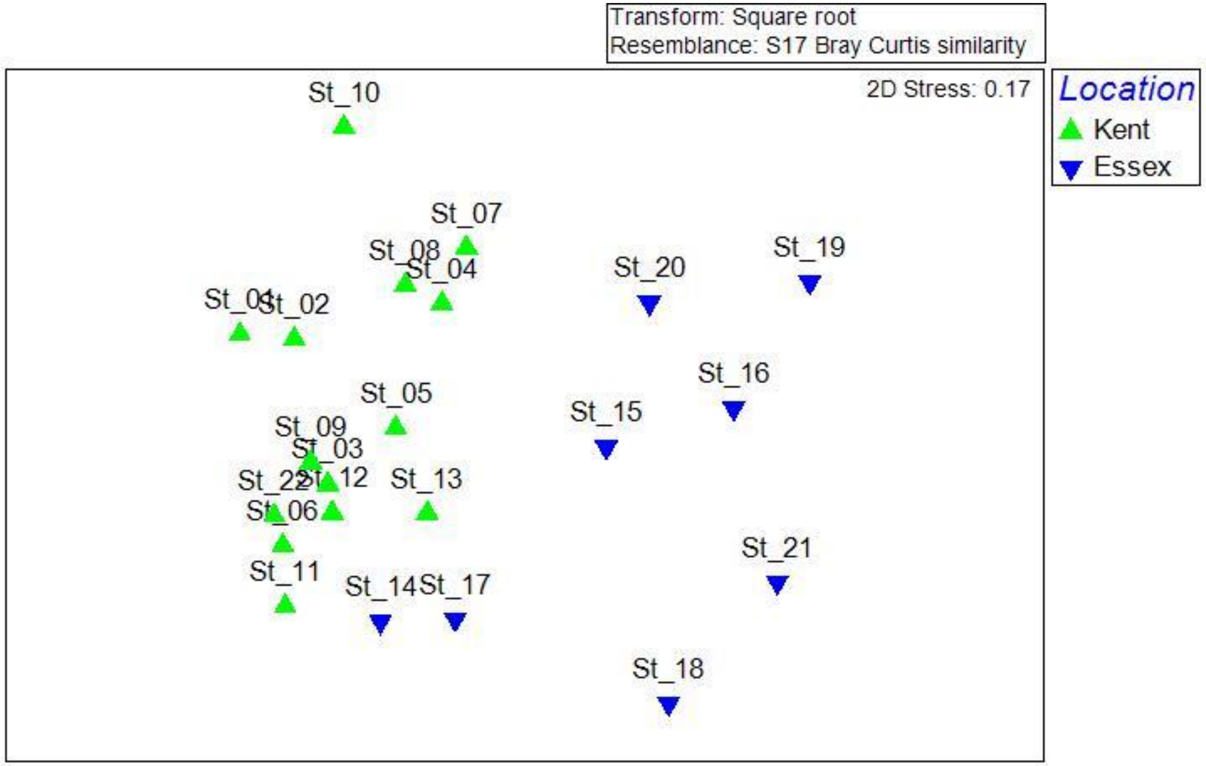


**Figure 13.5.14: Subtidal sample habitat locations within the Kent survey area.**

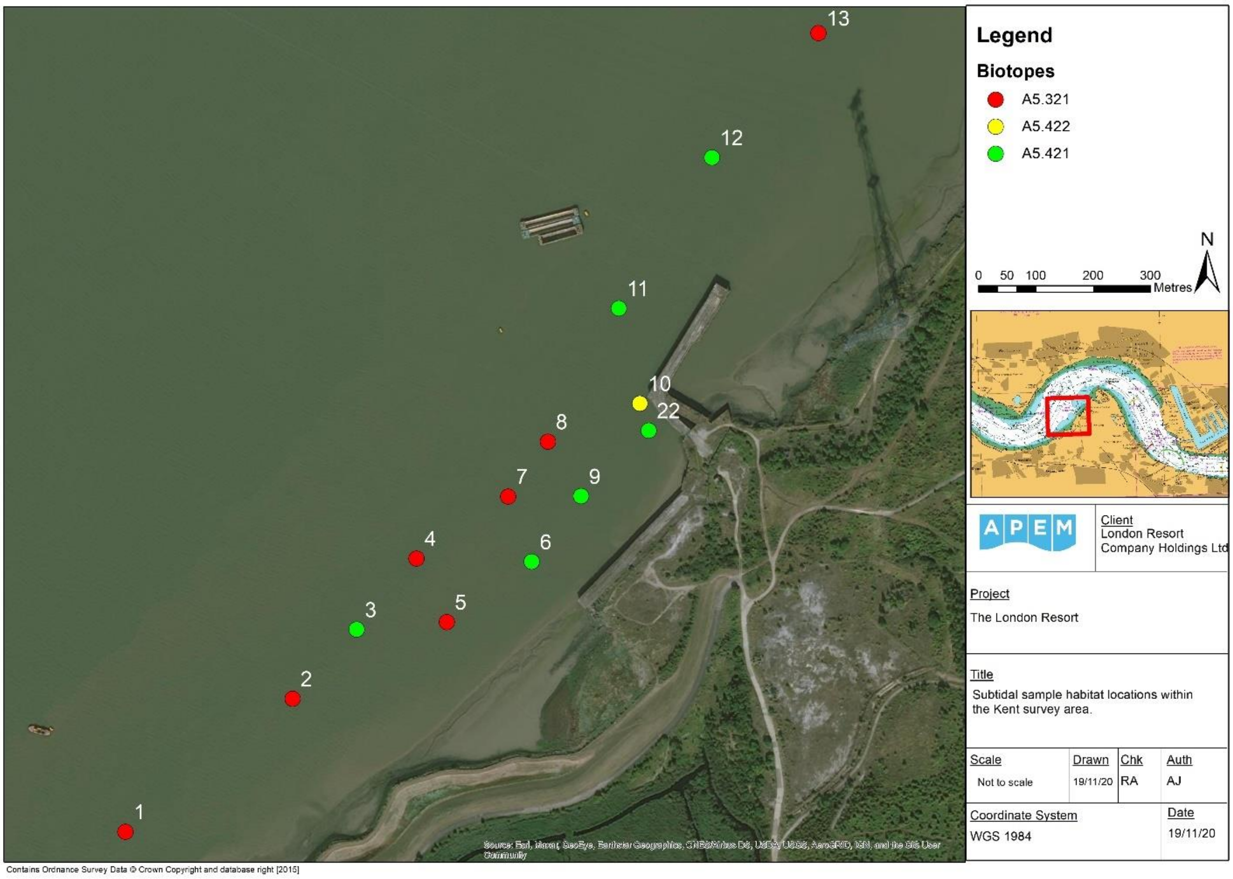
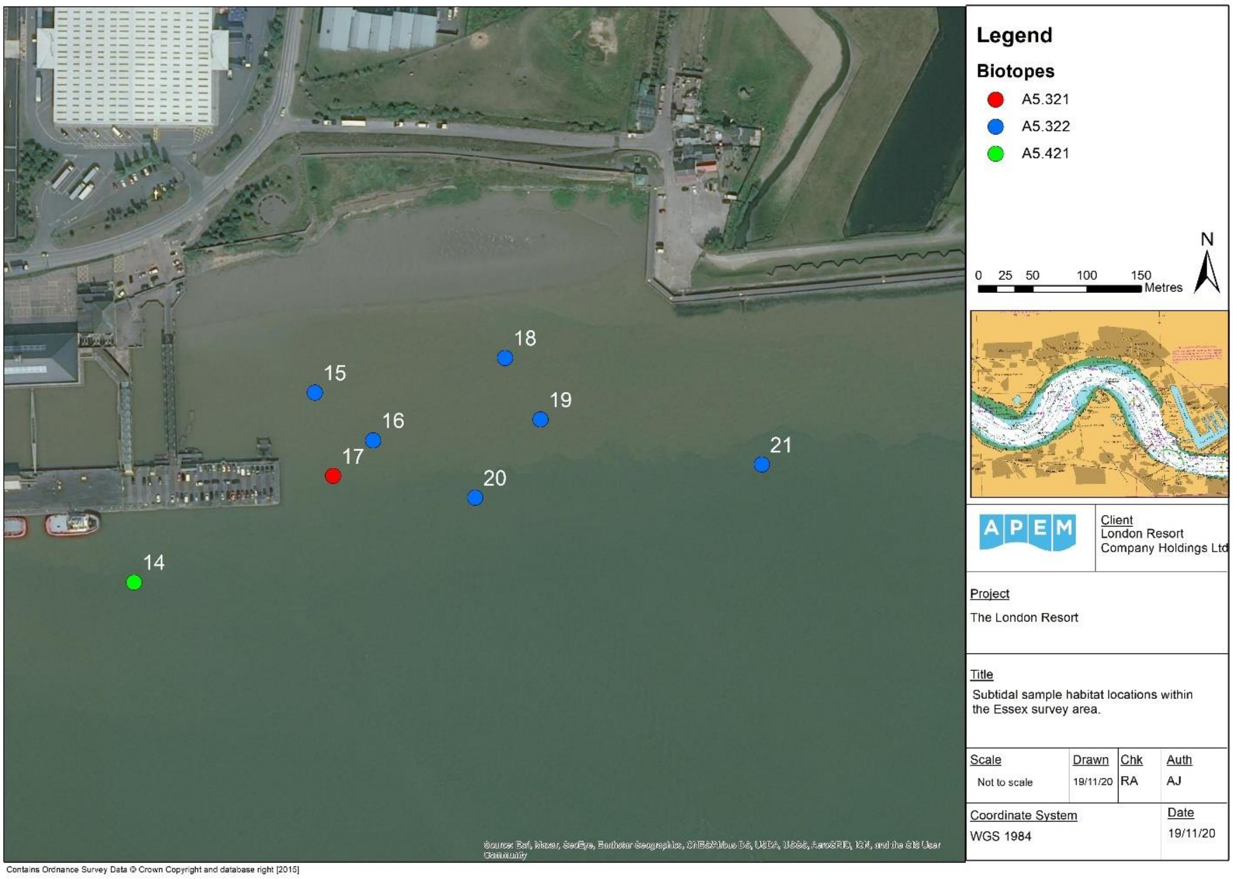


**Figure 13.5.15: Subtidal sample habitat locations within the Essex survey area.**



# Appendix 2.0 Sample locations

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| | | WGS84 | | British National Grid | |
|---|---|---|---|---|---|
| **Station** | **Sample Date** | **Latitude** | **Longitude** | **Easting** | **Northing** |
| G01 | 26/08/2020 | 51.457695 | 0.292567 | 559372 | 175683 |
| G02 | 26/08/2020 | 51.45828 | 0.295929 | 559603 | 175755 |
| G03 | 29/09/2020 | 51.45915 | 0.296886 | 559667 | 175854 |
| G04 | 29/09/2020 | 51.459843 | 0.297821 | 559729 | 175933 |
| G05 | 29/09/2020 | 51.459221 | 0.298293 | 559764 | 175865 |
| G06 | 29/09/2020 | 51.459811 | 0.299619 | 559854 | 175933 |
| G07 | 29/09/2020 | 51.460446 | 0.29925 | 559827 | 176003 |
| G08 | 29/09/2020 | 51.460983 | 0.29987 | 559868 | 176064 |
| G09 | 29/09/2020 | 51.460452 | 0.300388 | 559906 | 176006 |
| G10 | 25/08/2020 | 51.46133 | 0.301272 | 559964 | 176106 |
| G11 | 25/08/2020 | 51.462286 | 0.300979 | 559940 | 176211 |
| G12 | 25/08/2020 | 51.463602 | 0.302137 | 560016 | 176360 |
| G13 | 25/08/2020 | 51.465135 | 0.30404 | 560143 | 176535 |
| G14 | 25/08/2020 | 51.449913 | 0.36572 | 564482 | 174979 |
| G15 | 25/08/2020 | 51.451293 | 0.367335 | 564589 | 175136 |
| G16 | 25/08/2020 | 51.450936 | 0.367972 | 564634 | 175098 |
| G17 | 25/08/2020 | 51.450686 | 0.367369 | 564593 | 175069 |
| G18 | 25/08/2020 | 51.451435 | 0.368568 | 564674 | 175155 |
| G19 | 25/08/2020 | 51.450983 | 0.36922 | 564721 | 175106 |
| G20 | 25/08/2020 | 51.450631 | 0.368509 | 564673 | 175065 |
| G21 | 25/08/2020 | 51.450857 | 0.371103 | 564852 | 175096 |
| G22 | 29/09/2020 | 51.461092 | 0.301445 | 559977 | 176080 |

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# Appendix 3.0 List of Chemicals Analysed

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| **Metals** | | |
|---|---|---|
| Arsenic | Copper | Lead |
| Cadmium | Mercury | Zinc |
| Chromium | Nickel | |

| **PAHs (DTI 2-6 ring aromatics + EPA 16)** | | | |
|---|---|---|---|
| Acenaphthene | Benzo(e)pyrene | C3-naphthalenes | Naphthalene |
| Acenaphthylene | Benzo(ghi)perylene | Chrysene | Perylene |
| Anthracene | Benzo(K)fluoranthene | Dibenzo(ah)anthracene | Phenanthrene |
| Benzo(a)anthracene | C1-naphthalenes | Fluoranthene | Pyrene |
| Benzo(a)pyrene | C1-phenanthrene | Fluorene | |
| Benzo(b)fluoranthene | C2-naphthalenes | Indeno(1,2,3-cd)pyrene | |

| **PCBs (~Indicates included in suite ICES7** | | | | | |
|---|---|---|---|---|---|
| PCB28~ | PCB138~ | PCB110 | PCB151 | PCB180~ | PCB31 |
| PCB52~ | PCB153~ | PCB128 | PCB156 | PCB183 | PCB44 |
| PCB101~ | PCB18 | PCB141 | PCB158 | PCB187 | PCB47 |
| PCB118~ | PCB105 | PCB149 | PCB170 | PCB194 | PCB49 |
| | | | | | PCB66 |

| **Organochlorine Pesticides** | |
|---|---|
| alpha-Hexachlorcyclohexane | Hexachlorobenzene |
| beta-Hexachlorcyclohexane | p,p'-Dichorodiphenyldicloroethylene |
| gamma-Hexachlorcyclohexane | p,p'-Dichorodiphenyltrichloroethane |
| Dieldrin | p,p'-Dichorodiphenyldicloroethane |

| **Brominated Flame Retardants** | | |
|---|---|---|
| BDE100 | BDE183 | BDE99 |
| BDE17 | BDE85 | BDE154 |
| BDE66 | BDE153 | BDE47 |
| BDE138 | BDE28 | BDE209 |

| **Other analyses** |
|---|
| Diuron |
| Dichlorvos |
| Cyanide (free and total) |
| Phenol |
| Gasoline Range Organics (GRO) plus Benzene, Toluene, Ethylbenzene and Xylene (BTEX) and Methyl Tert-Butyl Ether (MTBE) |
| Total Petroleum Hydrocarbons (TPH) by GCFID |
| Asbestos |

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# Appendix 4.0 Subtidal sample photographs

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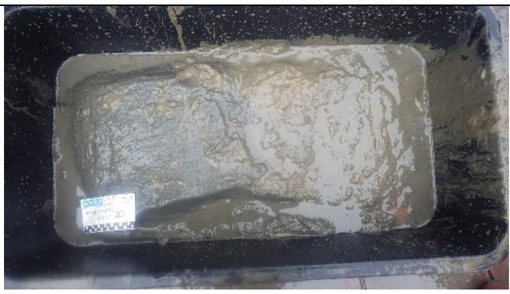
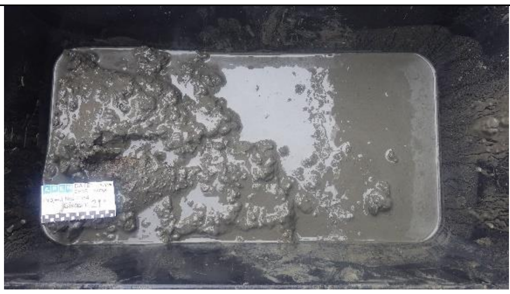
| Station | Raw sediment | Sieved sediment |
|---|---|---|
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |

| Station | Raw sediment | Sieved sediment |
|---|---|---|
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |

| Station | Raw sediment | Sieved sediment |
|---|---|---|
| 9 |  |  |
| 10 |  |  |
| 11 |  |  |
| 12 |  |  |

| Station | Raw sediment | Sieved sediment |
|---|---|---|
| 13 |  |  |
| 22 |  |  |
| 14 |  |  |
| 15 |  |  |

| Station | Raw sediment | Sieved sediment |
|---|---|---|
| 16 |  |  |
| 17 |  |  |
| 18 |  |  |
| 19 |  | Image not taken |

| Station | Raw sediment | Sieved sediment |
|---|---|---|
| **20** |  |  |
| **21** |  |  |

# Appendix 5.0 Wall scrape sample photographs

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| Station | Surface |
|---|---|
| WS6 |   |
| WS7 |   |

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# Appendix 6.0 Two-stage analysis of resemblance matrices for different transformation options

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**Two stage analysis of transformations**

Correlation (-1 to 1)

| | Resem No | Resem PA | Resem SqRoot | Resem4thRot |
|---|---|---|---|---|
| Untrans_B-C | | | | |
| SqRt_B-C | 0.931552 | | | |
| 4thRT_B-C | 0.809334 | 0.959646 | | |
| Log(X+1)_B-C | 0.869754 | 0.980325 | 0.974677 | |
| PA-B-C | 0.642477 | 0.845284 | 0.955192 | 0.881762 |

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# Appendix 7.0 Particle size data for subtidal stations

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| Station ID | Location | Visual description pre-analysis | Blott & Pye (2012) classification | Folk (1954) classification | Statistics calculated using Folk and Ward (1957) formulae | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Mean | | Sorting | | Skewness | | Kurtosis | |
| | | | | | (µm) | (description) | (phi) | (description) | (phi) | (description) | (phi) | (description) |
| 3 | Kent | Mud | Very slightly sandy mud | Mud | 10.4 | Medium Silt | 1.851 | Poorly Sorted | 0.229 | Fine Skewed | 1.375 | Leptokurtic |
| 4 | Kent | Gravelly mud | Gravelly sandy mud | Gravelly Mud | 111.6 | Very Fine Sand | 5.270 | Extremely Poorly Sorted | -0.318 | Very Coarse Skewed | 1.120 | Leptokurtic |
| 5 | Kent | Gravelly mud | Slightly sandy muddy gravel | Muddy Gravel | 2274.1 | Very Fine Gravel | 5.051 | Extremely Poorly Sorted | 0.694 | Very Fine Skewed | 0.653 | Very Platykurtic |
| 6 | Kent | Gravelly mud | Slightly sandy slightly muddy gravel | Muddy Gravel | 3508.9 | Very Fine Gravel | 4.638 | Extremely Poorly Sorted | 0.822 | Very Fine Skewed | 0.853 | Platykurtic |
| 7 | Kent | Gravelly mud | Slightly sandy muddy gravel | Muddy Gravel | 256.8 | Medium Sand | 5.437 | Extremely Poorly Sorted | -0.154 | Coarse Skewed | 0.586 | Very Platykurtic |
| 8 | Kent | Gravelly mud | Slightly sandy muddy gravel | Muddy Gravel | 1998.0 | Very Coarse Sand | 4.558 | Extremely Poorly Sorted | 0.676 | Very Fine Skewed | 0.671 | Platykurtic |
| 9 | Kent | Gravelly mud | Slightly sandy muddy gravel | Muddy Gravel | 1230.4 | Very Coarse Sand | 5.263 | Extremely Poorly Sorted | 0.402 | Very Fine Skewed | 0.524 | Very Platykurtic |
| 22 | Kent | Gravelly mud | Slightly sandy gravelly mud | Muddy Gravel | 222.1 | Fine Sand | 4.969 | Extremely Poorly Sorted | -0.306 | Very Coarse Skewed | 0.599 | Very Platykurtic |
| 1 | Kent | Gravelly mud | Slightly sandy slightly muddy gravel | Muddy Gravel | 4785.0 | Fine Gravel | 4.116 | Extremely Poorly Sorted | 0.875 | Very Fine Skewed | 1.775 | Very Leptokurtic |
| 2 | Kent | Sandy mud | Sandy mud | Sandy Mud | 14.8 | Medium Silt | 3.222 | Very Poorly Sorted | 0.075 | Symmetrical | 1.051 | Mesokurtic |
| 10 | Kent | Slightly gravelly mud | Slightly gravelly slightly sandy mud | Gravelly Mud | 62.6 | Very Fine Sand | 4.234 | Extremely Poorly Sorted | -0.422 | Very Coarse Skewed | 1.308 | Leptokurtic |
| 11 | Kent | Gravelly mud | Slightly muddy sandy gravel | Muddy Sandy Gravel | 3871.5 | Very Fine Gravel | 3.893 | Very Poorly Sorted | 0.648 | Very Fine Skewed | 0.822 | Platykurtic |
| 12 | Kent | Gravelly mud | Slightly muddy sandy gravel | Muddy Sandy Gravel | 3853.6 | Very Fine Gravel | 3.231 | Very Poorly Sorted | 0.573 | Very Fine Skewed | 0.977 | Mesokurtic |
| 13 | Kent | Sandy mud | Sandy mud | Sandy Mud | 27.8 | Coarse Silt | 2.879 | Very Poorly Sorted | 0.008 | Symmetrical | 0.991 | Mesokurtic |
| 14 | Essex | Gravel | Very slightly muddy slightly sandy gravel | Gravel | 15225.6 | Medium Gravel | 1.700 | Poorly Sorted | 0.463 | Very Fine Skewed | 2.002 | Very Leptokurtic |
| 15 | Essex | Mud | Muddy sand | Muddy Sand | 38.2 | Very Coarse Silt | 2.089 | Very Poorly Sorted | 0.600 | Very Fine Skewed | 0.975 | Mesokurtic |
| 16 | Essex | Mud | Sandy mud | Sandy Mud | 30.8 | Coarse Silt | 2.338 | Very Poorly Sorted | 0.411 | Very Fine Skewed | 0.833 | Platykurtic |
| 17 | Essex | Mud | Sandy mud | Sandy Mud | 21.3 | Coarse Silt | 2.588 | Very Poorly Sorted | 0.159 | Fine Skewed | 0.893 | Platykurtic |
| 18 | Essex | Mud | Muddy sand | Muddy Sand | 37.8 | Very Coarse Silt | 2.083 | Very Poorly Sorted | 0.567 | Very Fine Skewed | 0.968 | Mesokurtic |
| 19 | Essex | Mud | Muddy sand | Muddy Sand | 49.7 | Very Coarse Silt | 2.070 | Very Poorly Sorted | 0.619 | Very Fine Skewed | 0.999 | Mesokurtic |
| 20 | Essex | Slightly gravelly mud | Slightly gravelly muddy sand | Gravelly Muddy Sand | 73.9 | Very Fine Sand | 3.307 | Very Poorly Sorted | 0.150 | Fine Skewed | 1.341 | Leptokurtic |
| 21 | Essex | Mud | Muddy sand | Muddy Sand | 53.2 | Very Coarse Silt | 2.385 | Very Poorly Sorted | 0.616 | Very Fine Skewed | 0.920 | Mesokurtic |

| Station ID | Location | Primary Mode (µm) | d10 (µm) | d50 (µm) | d90 (µm) | Gravel (>2 mm) (%) | Sand (63-2000 µm) (%) | Mud (<63 µm) (%) | V Coarse Gravel (32-64 mm) (%) | Coarse Gravel (16-32 mm) (%) | Medium Gravel (8-16 mm) (%) | Fine Gravel (4-8 mm) (%) | V Fine Gravel (2-4 mm) (%) | V Coarse Sand (1-2 mm) (%) | Coarse Sand (500-1000 µm) (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Kent | 13.3 | 1.6 | 11.4 | 40.1 | 0.0 | 3.5 | 96.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | Kent | 13.3 | 1.7 | 37.3 | 19146.1 | 20.7 | 22.7 | 56.6 | 5.1 | 10.2 | 2.1 | 1.8 | 1.5 | 0.9 | 2.6 |
| 5 | Kent | 54000.0 | 7.4 | 14015.4 | 55056.7 | 63.6 | 13.7 | 22.7 | 30.4 | 17.4 | 11.2 | 3.1 | 1.6 | 1.2 | 4.0 |
| 6 | Kent | 38250.0 | 12.2 | 24995.8 | 52677.2 | 71.9 | 9.8 | 18.3 | 41.8 | 20.4 | 7.4 | 1.3 | 0.9 | 0.7 | 2.0 |
| 7 | Kent | 38250.0 | 2.8 | 127.7 | 32918.2 | 46.1 | 11.7 | 42.2 | 10.9 | 19.1 | 8.4 | 4.9 | 2.8 | 2.2 | 0.0 |
| 8 | Kent | 19200.0 | 10.8 | 9791.1 | 36531.1 | 62.7 | 16.3 | 21.1 | 16.4 | 28.5 | 8.1 | 6.5 | 3.2 | 2.2 | 2.7 |
| 9 | Kent | 54000.0 | 5.9 | 3567.7 | 56412.0 | 52.5 | 13.3 | 34.2 | 30.5 | 9.7 | 5.0 | 4.3 | 3.1 | 2.1 | 1.9 |
| 22 | Kent | 19200.0 | 4.3 | 78.9 | 22199.4 | 40.5 | 12.0 | 47.5 | 5.2 | 14.3 | 12.1 | 5.2 | 3.8 | 2.2 | 0.0 |
| 1 | Kent | 38250.0 | 23.4 | 26145.2 | 41456.0 | 77.1 | 9.8 | 13.1 | 41.6 | 21.0 | 9.2 | 3.9 | 1.5 | 0.9 | 0.7 |
| 2 | Kent | 26.7 | 0.6 | 16.0 | 250.1 | 0.0 | 24.7 | 75.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 |
| 10 | Kent | 13.3 | 2.8 | 20.4 | 4960.2 | 17.7 | 15.0 | 67.3 | 0.0 | 0.0 | 3.1 | 9.5 | 5.1 | 2.5 | 0.0 |
| 11 | Kent | 38250.0 | 34.7 | 11739.5 | 39465.9 | 64.9 | 23.2 | 11.9 | 26.0 | 17.6 | 13.2 | 4.7 | 3.5 | 3.0 | 5.8 |
| 12 | Kent | 26950.0 | 89.2 | 8669.0 | 29369.1 | 71.1 | 20.7 | 8.2 | 5.1 | 28.1 | 19.0 | 12.0 | 7.1 | 5.1 | 3.7 |
| 13 | Kent | 13.3 | 2.2 | 25.0 | 339.5 | 0.0 | 34.3 | 65.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.2 |
| 14 | Essex | 26950.0 | 3046.3 | 17489.9 | 36421.7 | 91.1 | 7.2 | 1.7 | 16.1 | 38.5 | 25.8 | 8.4 | 2.3 | 0.7 | 0.9 |
| 15 | Essex | 106.7 | 3.7 | 68.4 | 148.1 | 0.0 | 54.8 | 45.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| 16 | Essex | 106.7 | 2.8 | 46.0 | 156.7 | 0.0 | 45.5 | 54.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| 17 | Essex | 106.7 | 1.7 | 23.0 | 156.3 | 0.0 | 33.3 | 66.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 |
| 18 | Essex | 106.7 | 3.8 | 65.7 | 148.6 | 0.0 | 52.5 | 47.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 |
| 19 | Essex | 106.7 | 4.8 | 92.0 | 173.4 | 0.0 | 63.6 | 36.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.4 |
| 20 | Essex | 150.9 | 4.4 | 115.5 | 5901.2 | 12.6 | 51.7 | 35.7 | 0.0 | 0.0 | 7.3 | 4.3 | 1.0 | 0.2 | 2.6 |
| 21 | Essex | 150.9 | 3.7 | 107.4 | 234.9 | 0.0 | 63.2 | 36.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 |

| Station | Location | Medium Sand | Fine Sand | V Fine Sand | V Coarse Silt | Coarse Silt | Medium Silt | Fine Silt | V Fine Silt | Clay | distribution in each 'half-phi' size interval, expressed in µm (sieving for >1mm fraction, laser diffraction | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | | (250-500 µm) | (125-250 µm) | (63-125 µm) | (31-63 µm) | (16-31 µm) | (8-16 µm) | (4-8 µm) | (2-4 µm) | (<2 µm) | >63000 | 45000 | 31500 | 22400 | 16000 | 11200 | 8000 | 5600 | 4000 | 2800 |
| | | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | (%) | | to 63000 | to 45000 | to 31500 | to 22400 | to 16000 | to 11200 | to 8000 | to 5600 | to 4000 |
| 3 | Kent | 0.0 | 0.0 | 3.5 | 11.8 | 22.0 | 26.7 | 17.5 | 7.5 | 11.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | Kent | 4.3 | 6.1 | 8.9 | 9.2 | 11.0 | 11.0 | 8.9 | 5.9 | 10.6 | 0.0 | 0.0 | 5.4 | 0.0 | 9.9 | 0.0 | 2.1 | 1.2 | 0.6 | 0.9 |
| 5 | Kent | 1.7 | 2.3 | 4.6 | 2.9 | 4.2 | 5.3 | 4.4 | 2.4 | 3.6 | 0.0 | 25.0 | 5.6 | 14.4 | 2.8 | 6.1 | 5.1 | 1.9 | 1.2 | 0.8 |
| 6 | Kent | 2.3 | 1.3 | 3.5 | 3.0 | 3.7 | 4.2 | 3.2 | 1.7 | 2.5 | 0.0 | 18.8 | 24.1 | 10.5 | 8.8 | 4.5 | 2.9 | 0.6 | 0.7 | 0.5 |
| 7 | Kent | 0.0 | 1.8 | 7.7 | 5.7 | 6.6 | 8.5 | 8.4 | 5.2 | 7.8 | 0.0 | 0.0 | 11.4 | 8.7 | 9.8 | 4.3 | 4.1 | 3.1 | 1.8 | 1.5 |
| 8 | Kent | 2.4 | 3.3 | 5.8 | 3.8 | 4.5 | 5.1 | 3.6 | 1.7 | 2.5 | 0.0 | 0.0 | 17.1 | 13.5 | 14.3 | 3.2 | 4.9 | 3.1 | 3.4 | 1.9 |
| 9 | Kent | 1.5 | 2.3 | 5.5 | 5.0 | 7.3 | 8.8 | 6.5 | 3.0 | 3.5 | 0.0 | 30.5 | 0.0 | 6.9 | 2.7 | 2.7 | 2.3 | 2.3 | 2.0 | 1.7 |
| 22 | Kent | 0.3 | 2.2 | 7.3 | 9.7 | 11.1 | 10.4 | 6.9 | 3.6 | 5.6 | 0.0 | 0.0 | 5.4 | 4.3 | 9.7 | 8.3 | 3.9 | 2.8 | 2.4 | 2.3 |
| 1 | Kent | 1.1 | 3.1 | 4.1 | 2.2 | 2.2 | 2.3 | 2.1 | 1.5 | 2.8 | 0.0 | 0.0 | 43.5 | 11.9 | 7.1 | 5.5 | 3.7 | 2.3 | 1.6 | 0.9 |
| 2 | Kent | 6.7 | 7.1 | 7.6 | 11.7 | 14.1 | 13.1 | 10.5 | 7.4 | 18.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | Kent | 1.3 | 3.0 | 8.3 | 9.3 | 14.0 | 17.7 | 12.9 | 6.0 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 5.5 | 4.0 | 3.1 |
| 11 | Kent | 7.4 | 3.3 | 3.7 | 2.2 | 2.2 | 2.5 | 2.0 | 1.1 | 1.8 | 0.0 | 0.0 | 27.2 | 7.2 | 9.2 | 7.4 | 5.8 | 2.4 | 2.3 | 1.9 |
| 12 | Kent | 3.9 | 4.0 | 3.9 | 2.9 | 2.1 | 1.5 | 0.9 | 0.4 | 0.4 | 0.0 | 0.0 | 5.3 | 22.9 | 4.9 | 10.1 | 8.9 | 5.9 | 6.1 | 3.8 |
| 13 | Kent | 8.5 | 9.6 | 10.9 | 11.6 | 13.4 | 14.2 | 11.1 | 6.4 | 9.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | Essex | 2.3 | 2.4 | 0.9 | 0.3 | 0.3 | 0.4 | 0.3 | 0.2 | 0.2 | 0.0 | 0.0 | 16.9 | 20.2 | 17.6 | 16.2 | 9.6 | 5.2 | 3.2 | 1.5 |
| 15 | Essex | 2.2 | 12.3 | 39.9 | 12.7 | 6.7 | 7.9 | 7.5 | 4.5 | 5.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | Essex | 1.7 | 16.3 | 27.1 | 9.7 | 9.3 | 11.9 | 10.5 | 5.7 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | Essex | 2.3 | 12.8 | 17.5 | 11.4 | 12.2 | 13.8 | 11.5 | 6.9 | 10.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 18 | Essex | 2.1 | 11.7 | 37.9 | 13.6 | 7.6 | 8.6 | 7.6 | 4.4 | 5.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | Essex | 2.6 | 24.9 | 34.7 | 7.3 | 6.3 | 7.9 | 6.8 | 3.6 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 20 | Essex | 5.5 | 26.5 | 17.0 | 5.2 | 6.0 | 8.4 | 7.2 | 3.8 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.3 | 3.2 | 1.1 | 0.7 |
| 21 | Essex | 5.5 | 36.2 | 19.6 | 5.6 | 6.3 | 7.7 | 7.0 | 4.3 | 6.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| Station ID | Location | 2000 to 2800 | 1400 to 2000 | 1000 to 1400 | 710 to 1000 | 500 to 710 | 355 to 500 | 250 to 355 | 180 to 250 | 125 to 180 | 90 to 125 | 63 to 90 | 44.19 to 63 | 31.25 to 44.19 | 22.097 to 31.25 | 15.625 to 22.097 | 11.049 to 15.625 | 7.813 to 11.049 | 5.524 to 7.813 | 3.906 to 5.524 | 2.762 to 3.906 | 1.953 to 2.762 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Kent | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 3.1 | 4.4 | 7.3 | 9.7 | 12.3 | 14.0 | 12.7 | 10.2 | 7.3 | 4.7 | 2.8 |
| 4 | Kent | 0.5 | 0.5 | 0.4 | 0.3 | 2.3 | 2.4 | 1.9 | 2.5 | 3.6 | 4.6 | 4.3 | 4.1 | 5.1 | 5.4 | 5.6 | 5.8 | 5.2 | 4.7 | 4.2 | 3.3 | 2.5 |
| 5 | Kent | 0.7 | 0.7 | 0.5 | 1.8 | 2.2 | 1.3 | 0.4 | 0.6 | 1.7 | 2.7 | 1.9 | 1.3 | 1.6 | 1.9 | 2.3 | 2.7 | 2.6 | 2.4 | 2.0 | 1.4 | 1.0 |
| 6 | Kent | 0.4 | 0.4 | 0.3 | 1.0 | 1.0 | 1.4 | 0.9 | 0.4 | 0.9 | 1.8 | 1.7 | 1.4 | 1.6 | 1.8 | 2.0 | 2.1 | 2.0 | 1.8 | 1.4 | 1.0 | 0.7 |
| 7 | Kent | 1.3 | 1.2 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.7 | 4.0 | 3.7 | 2.7 | 3.0 | 3.1 | 3.5 | 4.1 | 4.4 | 4.4 | 4.0 | 3.1 | 2.1 |
| 8 | Kent | 1.3 | 1.2 | 1.0 | 1.3 | 1.3 | 1.6 | 0.8 | 0.9 | 2.3 | 3.3 | 2.5 | 1.8 | 2.0 | 2.1 | 2.4 | 2.6 | 2.4 | 2.0 | 1.5 | 1.0 | 0.6 |
| 9 | Kent | 1.4 | 1.2 | 0.9 | 0.4 | 1.6 | 0.9 | 0.6 | 0.7 | 1.5 | 2.9 | 2.6 | 2.2 | 2.8 | 3.3 | 4.0 | 4.5 | 4.3 | 3.7 | 2.8 | 1.9 | 1.1 |
| 22 | Kent | 1.5 | 1.4 | 0.8 | 0.0 | 0.0 | 0.0 | 0.3 | 0.8 | 1.4 | 3.5 | 3.8 | 3.8 | 6.0 | 5.5 | 5.6 | 5.6 | 4.8 | 3.9 | 3.0 | 2.1 | 1.4 |
| 1 | Kent | 0.6 | 0.5 | 0.3 | 0.2 | 0.5 | 0.6 | 0.5 | 1.0 | 2.1 | 2.4 | 1.6 | 1.1 | 1.1 | 1.1 | 1.1 | 1.2 | 1.1 | 1.1 | 1.0 | 0.8 | 0.6 |
| 2 | Kent | 0.0 | 0.0 | 0.0 | 0.5 | 2.8 | 3.4 | 3.3 | 3.4 | 3.7 | 3.9 | 3.8 | 4.9 | 6.8 | 7.0 | 7.0 | 6.9 | 6.2 | 5.6 | 4.9 | 4.1 | 3.4 |
| 10 | Kent | 2.0 | 1.5 | 1.0 | 0.0 | 0.0 | 0.2 | 1.1 | 1.1 | 1.9 | 4.1 | 4.2 | 4.1 | 5.2 | 6.2 | 7.7 | 9.0 | 8.6 | 7.3 | 5.5 | 3.7 | 2.3 |
| 11 | Kent | 1.6 | 1.6 | 1.4 | 2.3 | 3.6 | 4.3 | 3.1 | 1.7 | 1.6 | 2.2 | 1.6 | 1.1 | 1.1 | 1.1 | 1.1 | 1.3 | 1.2 | 1.1 | 0.9 | 0.7 | 0.5 |
| 12 | Kent | 3.2 | 3.0 | 2.1 | 1.7 | 2.1 | 2.1 | 1.7 | 1.9 | 2.2 | 2.1 | 1.7 | 1.5 | 1.3 | 1.2 | 1.0 | 0.9 | 0.7 | 0.5 | 0.4 | 0.2 | 0.1 |
| 13 | Kent | 0.0 | 0.0 | 0.0 | 1.8 | 3.4 | 4.3 | 4.2 | 4.5 | 5.1 | 5.6 | 5.3 | 5.3 | 6.3 | 6.5 | 6.9 | 7.3 | 6.9 | 6.1 | 5.1 | 3.8 | 2.6 |
| 14 | Essex | 0.8 | 0.4 | 0.3 | 0.3 | 0.5 | 0.9 | 1.4 | 1.4 | 1.1 | 0.7 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| 15 | Essex | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.3 | 0.9 | 2.3 | 10.1 | 21.6 | 18.3 | 8.2 | 4.5 | 3.4 | 3.3 | 3.8 | 4.1 | 4.0 | 3.5 | 2.7 | 1.8 |
| 16 | Essex | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1.0 | 0.7 | 3.4 | 12.9 | 17.1 | 10.0 | 5.1 | 4.6 | 4.4 | 4.9 | 5.8 | 6.0 | 5.7 | 4.8 | 3.4 | 2.3 |
| 17 | Essex | 0.0 | 0.0 | 0.0 | 0.1 | 0.7 | 1.3 | 1.0 | 3.8 | 9.0 | 10.5 | 7.0 | 5.4 | 6.0 | 5.9 | 6.3 | 7.0 | 6.8 | 6.2 | 5.3 | 4.0 | 2.9 |
| 18 | Essex | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 1.3 | 0.8 | 2.4 | 9.3 | 20.3 | 17.6 | 8.5 | 5.0 | 3.8 | 3.8 | 4.3 | 4.3 | 4.1 | 3.5 | 2.6 | 1.8 |
| 19 | Essex | 0.0 | 0.0 | 0.0 | 0.4 | 1.0 | 1.7 | 0.9 | 4.8 | 20.0 | 23.8 | 10.9 | 4.1 | 3.3 | 3.0 | 3.3 | 3.9 | 4.0 | 3.7 | 3.1 | 2.2 | 1.4 |
| 20 | Essex | 0.3 | 0.1 | 0.1 | 1.0 | 1.5 | 2.2 | 3.3 | 10.6 | 15.8 | 11.7 | 5.3 | 2.6 | 2.6 | 2.8 | 3.3 | 4.1 | 4.3 | 4.0 | 3.3 | 2.3 | 1.5 |
| 21 | Essex | 0.0 | 0.0 | 0.0 | 0.1 | 1.8 | 1.2 | 4.3 | 14.5 | 21.7 | 14.6 | 5.0 | 2.7 | 2.8 | 3.0 | 3.3 | 3.8 | 3.9 | 3.7 | 3.3 | 2.5 | 1.8 |

| Station ID | Location | 1.381 to 1.953 | 0.977 to 1.381 | 0.691 to 0.977 | 0.488 to 0.691 | 0.345 to 0.488 | 0.244 to 0.345 | 0.173 to 0.244 | 0.122 to 0.173 | 0.086 to 0.122 | 0.061 to 0.086 | 0.043 to 0.061 | 0.01 to 0.043 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Kent | 1.8 | 1.3 | 1.3 | 1.4 | 1.5 | 1.4 | 1.0 | 0.7 | 0.4 | 0.1 | 0.0 | 0.0 |
| 4 | Kent | 1.8 | 1.2 | 1.2 | 1.5 | 1.8 | 1.6 | 1.0 | 0.5 | 0.1 | 0.0 | 0.0 | 0.0 |
| 5 | Kent | 0.6 | 0.5 | 0.4 | 0.5 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 6 | Kent | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 7 | Kent | 1.4 | 1.0 | 0.9 | 1.0 | 1.0 | 0.9 | 0.7 | 0.5 | 0.3 | 0.1 | 0.0 | 0.0 |
| 8 | Kent | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 9 | Kent | 0.7 | 0.5 | 0.4 | 0.5 | 0.4 | 0.4 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 22 | Kent | 1.0 | 0.8 | 0.7 | 0.7 | 0.7 | 0.6 | 0.5 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 |
| 1 | Kent | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| 2 | Kent | 3.0 | 2.6 | 2.4 | 2.3 | 2.3 | 2.1 | 1.6 | 1.1 | 0.7 | 0.3 | 0.0 | 0.0 |
| 10 | Kent | 1.4 | 1.0 | 0.9 | 0.9 | 0.8 | 0.8 | 0.6 | 0.5 | 0.3 | 0.1 | 0.0 | 0.0 |
| 11 | Kent | 0.4 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| 12 | Kent | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | Kent | 1.7 | 1.2 | 1.0 | 1.0 | 1.1 | 1.1 | 0.8 | 0.6 | 0.3 | 0.1 | 0.0 | 0.0 |
| 14 | Essex | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | Essex | 1.3 | 0.9 | 0.7 | 0.6 | 0.6 | 0.5 | 0.5 | 0.4 | 0.2 | 0.1 | 0.0 | 0.0 |
| 16 | Essex | 1.5 | 1.1 | 0.9 | 0.8 | 0.8 | 0.7 | 0.6 | 0.5 | 0.3 | 0.1 | 0.0 | 0.0 |
| 17 | Essex | 2.1 | 1.6 | 1.3 | 1.2 | 1.2 | 1.1 | 0.9 | 0.7 | 0.4 | 0.2 | 0.0 | 0.0 |
| 18 | Essex | 1.3 | 0.9 | 0.7 | 0.6 | 0.6 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 |
| 19 | Essex | 1.0 | 0.7 | 0.6 | 0.5 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 |
| 20 | Essex | 1.0 | 0.8 | 0.6 | 0.6 | 0.5 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 | 0.0 | 0.0 |
| 21 | Essex | 1.3 | 1.0 | 0.8 | 0.7 | 0.6 | 0.6 | 0.5 | 0.4 | 0.2 | 0.1 | 0.0 | 0.0 |

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# Appendix 8.0 Macrobenthic data for subtidal grab samples

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| Code | Station | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D0285 | Cordylophora caspia | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| D0433 | Sertularia | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | P | 0 | 0 | N/A |
| D0662 | Actiniaria | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 0 | 28 |
| HD0001 | Nematoda | | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 8 | 1 | 2 | 0 | 0 | 16 | 0 | 0 | 0 | 1 | 33 |
| P0118 | Eteone longa | aggregate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 50 |
| P0123 | Eteone lighti | | 0 | 0 | 1 | 0 | 1 | 2 | 0 | Frag. | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| P0262 | Glycera oxycephala | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| P0462 | Hediste diversicolor | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 17 | 0 | 0 | 0 | 13 | 13 | 0 | 0 | 0 | 0 | 61 |
| P0471 | Alitta succinea | | 10 | 10 | 18 | 1 | 5 | 28 | 1 | 1 | 13 | 1 | 46 | 6 | 8 | 21 | 0 | 0 | 24 | 0 | 0 | Frag. | 0 | 56 | 249 |
| P0494 | Nephtys | juvenile | 0 | 0 | 1 | 1 | 0 | 1 | 2 | 3 | 0 | 0 | 2 | 0 | 0 | 2 | 7 | 4 | 0 | Frag. | 6 | 0 | 0 | 0 | 29 |
| P0499 | Nephtys hombergii | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 7 | 0 | 12 |
| P0730 | Boccardiella ligerica | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| P0752 | Polydora ciliata | aggregate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| P0753 | Polydora cornuta | | 4 | 0 | 22 | 4 | 13 | 51 | 0 | 2 | 35 | 0 | 80 | 24 | 40 | 39 | 0 | 0 | 208 | 0 | 0 | 4 | 0 | 62 | 588 |
| P0776 | Pygospio elegans | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| P0798 | Streblospio | | 0 | 0 | 18 | 10 | 1 | 11 | 4 | 3 | 140 | 1 | 48 | 32 | 8 | 56 | 45 | 0 | 64 | 0 | 0 | 5 | 0 | 482 | 928 |
| P0847 | Tharyx species A | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 7 | 1 | 48 | 69 | 1 | 4 | 103 | 0 | 244 |
| P0906 | Capitella | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| P0917 | Heteromastus filiformis | | 0 | 0 | 0 | Frag. | 0 | 1 | 0 | 0 | 0 | 1 | Frag. | 0 | 0 | 1 | 1 | 0 | 0 | 5 | Frag. | 0 | 1 | 1 | 11 |
| P1117 | Sabellaria spinulosa | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| P1127 | Alkmaria romijni | | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 8 |
| P1235 | Polycirrus | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| P1479 | Baltidrilus costatus | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| P1490 | Tubificoides benedii | | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | Frag. | 0 | 1 | 0 | 5 | 8 | 81 | 16 | 1633 | 1 | 4 | 4 | 0 | 1754 |
| P1494 | Tubificoides diazi | aggregate | Frag. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 16 |
| P1495 | Tubificoides heterochaet | | 0 | 0 | 8 | 19 | 0 | 1 | 15 | 2 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 121 |
| P1501 | Enchytraeidae | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Q0054 | Acari | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| R0015 | Sessilia | juvenile | 1 | 0 | 39 | 0 | 0 | 320 | 0 | 2 | 25 | 0 | 589 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 180 | 1216 |
| R0068 | Austrominius modestus | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| R0078 | Amphibalanus improvisus | | 8 | 3 | 162 | 0 | 0 | 129 | 0 | 2 | 2 | 2 | 615 | 21 | 0 | 923 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 15 | 1898 |
| R2432 | Eusarsiella zostericola | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 7 |
| R2458 | Podocopida | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 16 |
| S0074 | Mesopodopsis slabberi | | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| S0464 | Gammaridae | juvenile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| S0483 | Gammarus zaddachi | | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| S0522 | Melita nitida | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| S0525 | Melita palmata | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| S0612 | Monocorophium insidiosu | | 0 | 0 | 5 | Frag. | 0 | 14 | 0 | 1 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 51 |
| S0613 | Apocorophium lacustre | | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| S0616 | Corophium volutator | | 0 | 44 | 10 | 2 | 190 | 10 | 1 | 1 | 30 | 0 | 4 | 0 | 189 | 3 | 11 | 10 | 257 | 981 | Frag. | 0 | 0 | 24 | 1767 |
| S0805 | Cyathura carinata | | 1 | 1 | 7 | 0 | 4 | 4 | 0 | 0 | 3 | 0 | 6 | 1 | 0 | 19 | 0 | 0 | 65 | 1 | 0 | 0 | 0 | 6 | 118 |
| S0936 | Idotea chelipes | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 17 |
| S0937 | Idotea emarginata | | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| S1315 | Palaemon macrodactylus | | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| S1385 | Crangon crangon | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 |
| T0003 | Chironomidae | larva | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| W0385 | Peringia ulvae | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 |
| W1696 | Mytilus edulis | juvenile | 0 | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| W1761 | Magallana gigas | | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| W1761 | Magallana gigas | juvenile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| W2029 | Limecola balthica | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 17 |
| W2068 | Scrobicularia plana | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 5 |
| W2068 | Scrobicularia plana | juvenile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 12 |
| W2116 | Ruditapes philippinarum | juvenile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| W2201 | Teredo navalis | | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Y0086 | Arachnidium | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| Y0096 | Anguinella palmata | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | N/A |
| Y0172 | Conopeum reticulum | | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | P | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| Y0176 | Einhornia crustulenta | | P | P | P | P | P | P | P | P | P | 0 | P | P | P | P | 0 | 0 | 0 | 0 | 0 | 0 | P | P | N/A |
| Y0177 | Electra monostachys | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| ZD0151 | Molgula manhattensis | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ZM0655 | Polysiphonia | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | N/A |
| ZR0376 | Fucus | juvenile | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| ZS0144 | Blidingia marginata | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| ZS0145 | Blidingia minima | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| ZX | Bryophyta | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | N/A |
| ZX | Lemna | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | P | 0 | 0 | N/A |

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# Appendix 9.0 Macrobenthic data for wall scrape samples

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| Code | Station | | 6 | 7 | Total |
|---|---|---|---|---|---|
| D0285 | Cordylophora caspia | | 0 | 0 | N/A |
| D0433 | Sertularia | | 0 | 0 | N/A |
| D0662 | Actiniaria | | 0 | 0 | N/A |
| HD0001 | Nematoda | | 0 | 0 | N/A |
| P0118 | Eteone longa | aggregate | 0 | 0 | N/A |
| P0123 | Eteone lighti | | 0 | 0 | N/A |
| P0262 | Glycera oxycephala | | 0 | 0 | N/A |
| P0462 | Hediste diversicolor | | 0 | 0 | N/A |
| P0471 | Alitta succinea | | 0 | 0 | N/A |
| P0494 | Nephtys | juvenile | 0 | 0 | N/A |
| P0499 | Nephtys hombergii | | 0 | 0 | N/A |
| P0730 | Boccardiella ligerica | | 0 | 0 | N/A |
| P0752 | Polydora ciliata | aggregate | 0 | 0 | N/A |
| P0753 | Polydora cornuta | | 0 | 0 | N/A |
| P0776 | Pygospio elegans | | 0 | 0 | N/A |
| P0798 | Streblospio | | 0 | 0 | N/A |
| P0847 | Tharyx species A | | 0 | 0 | N/A |
| P0906 | Capitella | | 0 | 0 | N/A |
| P0917 | Heteromastus filiformis | | 0 | 0 | N/A |
| P1117 | Sabellaria spinulosa | | 0 | 0 | N/A |
| P1127 | Alkmaria romijni | | 0 | 0 | N/A |
| P1235 | Polycirrus | | 0 | 0 | N/A |
| P1479 | Baltidrilus costatus | | 0 | 0 | N/A |
| P1490 | Tubificoides benedii | | 0 | 0 | N/A |
| P1494 | Tubificoides diazi | aggregate | 0 | 0 | N/A |
| P1495 | Tubificoides heterochaetus | | 0 | 0 | N/A |
| P1501 | Enchytraeidae | | 0 | 0 | N/A |
| Q0054 | Acari | | 0 | 0 | N/A |
| R0015 | Sessilia | juvenile | 10 | 0 | 10 |
| R0068 | Austrominius modestus | | 33 | 0 | 33 |
| R0078 | Amphibalanus improvisus | | 0 | 0 | N/A |
| R2432 | Eusarsiella zostericola | | 0 | 0 | N/A |
| R2458 | Podocopida | | 0 | 0 | N/A |
| S0074 | Mesopodopsis slabberi | | 0 | 0 | N/A |
| S0464 | Gammaridae | juvenile | 0 | 0 | N/A |
| S0483 | Gammarus zaddachi | | 0 | 0 | N/A |
| S0522 | Melita nitida | | 0 | 0 | N/A |
| S0525 | Melita palmata | | 0 | 0 | N/A |

| | | | | | |
|---|---|---|---|---|---|
| S0612 | Monocorophium insidiosum | | 0 | 0 | N/A |
| S0613 | Apocorophium lacustre | | 0 | 0 | N/A |
| S0616 | Corophium volutator | | 0 | 0 | N/A |
| S0805 | Cyathura carinata | | 0 | 0 | N/A |
| S0936 | Idotea chelipes | | 0 | 0 | N/A |
| S0937 | Idotea emarginata | | 0 | 0 | N/A |
| S1315 | Palaemon macrodactylus | | 0 | 0 | N/A |
| S1385 | Crangon crangon | | 0 | 0 | N/A |
| T0003 | Chironomidae | larva | 1 | 0 | 1 |
| W0385 | Peringia ulvae | | 0 | 0 | N/A |
| W1696 | Mytilus edulis | juvenile | 0 | 0 | N/A |
| W1761 | Magallana gigas | | 0 | 0 | N/A |
| W1761 | Magallana gigas | juvenile | 0 | 0 | N/A |
| W2029 | Limecola balthica | | 0 | 0 | N/A |
| W2068 | Scrobicularia plana | | 0 | 0 | N/A |
| W2068 | Scrobicularia plana | juvenile | 0 | 0 | N/A |
| W2116 | Ruditapes philippinarum | juvenile | 0 | 0 | N/A |
| W2201 | Teredo navalis | | 0 | 0 | N/A |
| Y0086 | Arachnidium | | 0 | 0 | N/A |
| Y0096 | Anguinella palmata | | 0 | 0 | N/A |
| Y0172 | Conopeum reticulum | | 0 | 0 | N/A |
| Y0176 | Einhornia crustulenta | | 0 | 0 | N/A |
| Y0177 | Electra monostachys | | 0 | 0 | N/A |
| ZD0151 | Molgula manhattensis | | 0 | 0 | N/A |
| ZM0655 | Polysiphonia | | 0 | 0 | N/A |
| ZR0376 | Fucus | juvenile | P | 0 | N/A |
| ZS0144 | Blidingia marginata | | 0 | 0 | N/A |
| ZS0145 | Blidingia minima | | P | P | N/A |
| ZX | Bryophyta | | 0 | 0 | N/A |
| ZX | Lemna | | 0 | 0 | N/A |

# Appendix 10.0 Biomass data for subtidal grab samples

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| Code | Station | | St_01 | St_02 | St_03 | St_04 | St_05 | St_06 | St_07 | St_08 | St_09 | St_10 | St_11 | St_12 | St_13 | St_14 | St_15 | St_16 | St_17 | St_18 | St_19 | St_20 | St_21 | St_22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D0285 | Cordylophora caspia | | | | | | | | | | | | | | | | | | | | | | | |
| D0433 | Sertularia | | | | | | | | | | | | | | | | | | | | | | | |
| D0662 | Actiniaria | | | | | | | | | | | | | | | 9.6431 | | | 0.3022 | | | | | |
| HD0001 | Nematoda | | | | | | | 0.0001 | 0.0007 | | | | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | | | 0.0016 | | | | 0.0001 |
| P0118 | Eteone longa | aggregate | | | | | | | | | | | | 0.0001 | | | 0.0002 | | 0.0288 | | | | | |
| P0123 | Eteone lighti | | | | 0.0009 | | 0.0004 | 0.0018 | | 0.001 | 0.0026 | | | | | | | | | | | | | |
| P0262 | Glycera oxycephala | | | | | | | | | | | | | | | 0.0018 | | | | | | | | |
| P0462 | Hediste diversicolor | | | | | | | | | | | | 0.003 | | 0.1648 | | | | 0.4366 | 0.1373 | | | | |
| P0471 | Alitta succinea | | 0.0075 | 0.1484 | 0.139 | 0.0111 | 0.0345 | 0.6068 | 0.0006 | 0.0001 | 0.1153 | 0.0028 | 0.0313 | 0.0539 | 0.0282 | 0.5088 | | | 0.3938 | | | 0.0003 | | 1.3009 |
| P0494 | Nephtys | juvenile | | | 0.0039 | 0.0095 | | 0.004 | 0.0027 | 0.0145 | | | 0.004 | | | 0.0066 | 0.0321 | 0.0066 | | 0.0232 | 0.0142 | | | |
| P0499 | Nephtys hombergii | | | | | | | | | | | | | | | | | | | 0.0634 | | | 0.0323 | |
| P0730 | Boccardiella ligerica | | | | | | | | | | | | | | 0.0024 | | | | | | | | | |
| P0752 | Polydora ciliata | aggregate | | | | | | | | | | | | | 0.0004 | | | | | | | | | |
| P0753 | Polydora cornuta | | 0.0012 | | 0.0034 | 0.0007 | 0.002 | 0.0068 | | 0.0001 | 0.0064 | | 0.0085 | 0.0034 | 0.0008 | 0.0052 | | | 0.0088 | | | 0.0012 | | 0.0212 |
| P0776 | Pygospio elegans | | | | | | | | | | | | | | | 0.0027 | | | | | | | | |
| P0798 | Streblospio | | | | 0.0036 | 0.0024 | 0.0003 | 0.005 | 0.0005 | 0.0005 | 0.045 | 0.0001 | 0.0032 | 0.0069 | 0.0008 | 0.0137 | 0.0075 | | 0.0032 | | | 0.0009 | | 0.099 |
| P0847 | Tharyx species A | | | | | | | | | | | | | | | 0.0044 | 0.0037 | 0.0009 | 0.0176 | 0.0738 | 0.0003 | 0.0024 | 0.0567 | |
| P0906 | Capitella | | | | | | | | | | | | | | | 0.0002 | | | | | | | | |
| P0917 | Heteromastus filiformis | | | | | 0.0006 | | 0.0027 | | | | 0.0093 | 0.0036 | | | 0.0215 | 0.0001 | | | 0.1385 | 0.0102 | | 0.0123 | 0.001 |
| P1117 | Sabellaria spinulosa | | | | | | | | | | | | | | | 0.0001 | | | | | | | | |
| P1127 | Alkmaria romijni | | | | 0.0003 | | | 0.0009 | | | | | | | | | | | | | | | | 0.0016 |
| P1235 | Polycirrus | | | | | | | | | | | | | | | 0.0039 | | | | | | | | |
| P1479 | Baltidrilus costatus | | | | | | | | | | | | | 0.0008 | | | | | | | | | | |
| P1490 | Tubificoides benedii | | | | 0.0013 | | | | | | | 0.0002 | | 0.001 | | 0.0031 | 0.0044 | 0.0579 | 0.0016 | 1.0311 | 0.0002 | 0.0004 | 0.0044 | |
| P1494 | Tubificoides diazi | aggregate | 0.0004 | | | | | | | | | | | 0.0009 | | | | | | | | | 0.0004 | |
| P1495 | Tubificoides heterochaetu | | | | 0.002 | 0.0024 | | 0.0001 | 0.0018 | 0.0001 | 0.0064 | | | | | | | | | | | | | 0.0024 |
| P1501 | Enchytraeidae | | | | | | | | | | | | | | | | | | | | | | | |
| Q0054 | Acari | | | | | | | | | | | | | | | 0.0001 | | | | | | | | |
| R0015 | Sessilia | juvenile | | | | | | | | | | | | | | | | | | | | | | |
| R0068 | Austrominius modestus | | | | | | | | | | | | | | | | | | | | | | | |
| R0078 | Amphibalanus improvisus | | | | | | | | | | | | | | | | | | | | | | | |
| R2432 | Eusarsiella zostericola | | | | | | | | | 0.0001 | | | | 0.0001 | | | | | | | | | 0.0004 | 0.0001 |
| R2458 | Podocopida | | | | | | | | | | | | | | | | | | 0.0016 | | | | | |
| S0074 | Mesopodopsis slabberi | | 0.005 | | | | | 0.007 | | | | | | | | | | | | | | | | |
| S0464 | Gammaridae | juvenile | | | | | | | | | 0.0048 | | | | | 0.0001 | | | | | | | | |
| S0483 | Gammarus zaddachi | | | | | | | 0.0046 | | | | | | | | | | | | | | | | |
| S0522 | Melita nitida | | | | | | | | | | | | | | | | | | | | | | | 0.001 |
| S0525 | Melita palmata | | | | | | | | | | | | | | | | | | | | | | | |
| S0612 | Monocorophium insidiosu | | | | 0.0007 | 0.0014 | | 0.0035 | | 0.0001 | 0.013 | | | | | | | | | | | | | 0.0073 |
| S0613 | Apocorophium lacustre | | | | | | | 0.0058 | | | | | 0.0016 | | | | | | | | | | | |
| S0616 | Corophium volutator | | | 0.0151 | 0.0029 | 0.0022 | 0.2616 | 0.0083 | 0.0003 | 0.0001 | 0.0126 | | 0.0011 | | 0.1131 | 0.0006 | 0.0116 | 0.0041 | 0.0632 | 0.6353 | 0.0001 | | | 0.0118 |
| S0805 | Cyathura carinata | | 0.0043 | 0.0068 | 0.0049 | | 0.0232 | 0.0166 | | | 0.0135 | | 0.01 | 0.0005 | | 0.0035 | | | 0.1245 | 0.0051 | | | | 0.0148 |
| S0936 | Idotea chelipes | | | | | | | | | | | | | | | 0.0007 | | | 0.0016 | | | | | |
| S0937 | Idotea emarginata | | | 0.0161 | | | | | | | | | | | | | | | | | | | | |
| S1315 | Palaemon macrodactylus | | | | | | | 0.2715 | | | | | | | | | | | | | | | | |
| S1385 | Crangon crangon | | | | | | | | | | 0.7546 | | | | | | | | | | | | 0.2042 | |
| T0003 | Chironomidae | larva | | | | | | | | | | | | | | | | | | | | | | |
| W0385 | Peringia ulvae | | 0.0027 | | | | | | | | | | | | | | 0.0005 | | | | | 0.0009 | | |
| W1696 | Mytilus edulis | juvenile | | | 0.0055 | | | 0.0012 | | | | | 0.0412 | | | 0.0363 | | | | | | | | |
| W1761 | Magallana gigas | | | | | | | 63.328 | | | | | 3.2647 | | | | | | | | | | | |
| W1761 | Magallana gigas | juvenile | | | | | | | | | | | | | | | | | | | | | | |
| W2029 | Limecola balthica | | | | | | | | | | | | | | | | 0.0019 | | | 0.0016 | | | | |
| W2068 | Scrobicularia plana | | | | | | | | | | | | | | | | | | | 2.0178 | | | | |
| W2068 | Scrobicularia plana | juvenile | | | | | | | | | | | | | | | 0.0848 | | | 0.1414 | | | | |
| W2116 | Ruditapes philippinarum | juvenile | | | | | | | | | | | | | | 0.0605 | | | | | | | | |
| W2201 | Teredo navalis | | | | | | | 0.0024 | | | | | | | | | | | | | | | | |
| Y0086 | Arachnidium | | | | | | | | | | | | | | | | | | | | | | | |
| Y0096 | Anguinella palmata | | | | | | | | | | | | | | | | | | | | | | | |
| Y0172 | Conopeum reticulum | | | | | | | | | | | | | | | | | | | | | | | |
| Y0176 | Einhornia crustulenta | | | | | | | | | | | | | | | | | | | | | | | |
| Y0177 | Electra monostachys | | | | | | | | | | | | | | | | | | | | | | | |
| ZD0151 | Molgula manhattensis | | | | | | | | | | | | | | | | | | | | | | | |
| ZM0655 | Polysiphonia | | | | | | | | | | | | | | | | | | | | | | | |
| ZR0376 | Fucus | juvenile | | | | | | | | | | | | | | | | | | | | | | |
| ZS0144 | Blidingia marginata | | | | | | | | | | | | | | | | | | | | | | | |
| ZS0145 | Blidingia minima | | | | | | | | | | | | | | | | | | | | | | | |
| ZX | Bryophyta | | | | | | | | | | | | | | | | | | | | | | | |
| ZX | Lemna | | | | | | | | | | | | | | | | | | | | | | | |

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# Appendix 11.0 Biomass data for major groups

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Subtidal samples: Kent project site

| | 1 | 2 | 9 | 10 | 11 | 12 | 13 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Annelida | 0.0091 | 0.1484 | 0.6268 | 0.0124 | 0.0536 | 0.067 | 0.1974 | 0.1544 | 0.0267 | 0.0372 | 0.6281 | 0.0056 |
| Crustacea | 0.0093 | 0.038 | 0.2377 | - | 0.0127 | 0.0006 | 0.1131 | 0.0085 | 0.0036 | 0.2848 | 0.3173 | 0.0003 |
| Mollusca | 0.0027 | - | 0.0807 | - | 3.3059 | - | - | 0.0055 | - | - | 63.3316 | - |
| Others | - | - | - | - | - | 0.0001 | 0.0001 | - | - | - | 0.0001 | 0.0007 |
| Total | 0.0211 | 0.1864 | 0.9452 | 0.0124 | 3.3722 | 0.0677 | 0.3106 | 0.1684 | 0.0303 | 0.322 | 64.2771 | 0.0066 |

| | 8 | 9 | 22 |
|---|---|---|---|
| Annelida | 0.0163 | 0.1757 | 1.4261 |
| Crustacea | 0.0003 | 0.7985 | 0.035 |
| Mollusca | - | - | - |
| Others | - | - | 0.0001 |
| Total | 0.0166 | 0.9742 | 1.4612 |

Subtidal samples: Essex project site

| | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|
| Annelida | 0.572 | 0.048 | 0.0654 | 0.8904 | 1.4673 | 0.0249 | 0.0052 | 0.1061 |
| Crustacea | 0.0049 | 0.0116 | 0.0041 | 0.1909 | 0.6404 | 0.0001 | - | 0.2046 |
| Mollusca | 0.0968 | 0.0872 | - | - | 2.1608 | - | 0.0009 | - |
| Others | 9.6433 | 0.0001 | - | 0.3022 | 0.0016 | - | - | - |
| Total | 10.317 | 0.1469 | 0.0695 | 1.3835 | 4.2701 | 0.025 | 0.0061 | 0.3107 |

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# Appendix 12.0 SIMPER analysis results

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**Subtidal samples: Analysis results**

SIMPER
Similarity Percentages - species contributions

One-Way Analysis

Data worksheet
Name: Datal
Data type: Abundance
Sample selection: All
Variable selection: All

Parameters
Resemblance: S17 Bray Curtis similarity
Cut off for low contributions: 90.00%

**Simprof groups allocated to each station**

| Sample | SIMPROF |
|---|---|
| St_01 | a |
| St_02 | a |
| St_10 | e |
| St_11 | b |
| St_12 | b |
| St_14 | b |
| St_03 | b |
| St_06 | b |
| St_09 | b |
| St_22 | b |
| St_13 | d |
| St_05 | d |
| St_15 | g |
| St_16 | g |
| St_19 | g |
| St_20 | g |
| St_17 | c |
| St_18 | h |
| St_21 | h |
| St_04 | F |
| St_07 | f |
| St_08 | f |

Group a
Average similarity: 49.37

| Species | Av.Abund | Av.Sim | Sim/SD* | Contrib% | Cum.% |
|---|---|---|---|---|---|
| Alitta succinea | 3.16 | 22.64 | - | 45.86 | 45.86 |
| *Amphibalanus improvisus* | 2.28 | 12.40 | - | 25.12 | 70.99 |
| *Einhornia crustulenta* | 1.00 | 7.16 | - | 14.51 | 85.50 |
| *Cyathura carinata* | 1.00 | 7.16 | - | 14.50 | 100.00 |

Group e
Less than 2 samples in group

Group b
Average similarity: 51.63

| Species | Av.Abund | Av.Sim | Sim/SD* | Contrib% | Cum.% |
|---|---|---|---|---|---|
| *Amphibalanus improvisus* | 12.73 | 8.84 | 1.25 | 17.12 | 17.12 |
| *Sessilia juvenile* | 10.65 | 8.64 | 1.32 | 16.73 | 33.84 |
| *Polydora cornuta* | 6.53 | 8.45 | 7.30 | 16.36 | 50.21 |
| *Streblospio* | 8.77 | 8.12 | 2.44 | 15.72 | 65.93 |
| *Alitta succinea* | 4.92 | 5.71 | 5.16 | 11.06 | 76.98 |
| *Cyanthura carinata* | 2.38 | 2.65 | 3.90 | 5.13 | 82.12 |
| *Corophium volutator* | 2.92 | 2.62 | 1.17 | 5.07 | 87.19 |
| *Einhornia crustulenta* | 1.00 | 1.55 | 4.95 | 3.00 | 90.19 |

Group d
Average similarity: 69.30

| Species | Av.Abund | Av.Sim | Sim/SD* | Contrib% | Cum.% |
|---|---|---|---|---|---|
| *Corophium volutator* | 13.77 | 44.13 | - | 63.68 | 63.68 |
| *Polydora cornuta* | 4.97 | 11.57 | - | 16.70 | 80.38 |
| *Alitta succinea* | 2.53 | 7.18 | - | 10.36 | 90.73 |

Group g
Average similarity: 32.63

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| *Tubificoides benedii* | 3.71 | 10.86 | 3.90 | 33.27 | 33.27 |
| *Tharyx 'species A'* | 1.66 | 8.25 | 3.19 | 25.27 | 58.54 |
| *Nephtys juvenile* | 1.77 | 7.55 | 0.84 | 23.14 | 81.68 |
| *Corophium volutator* | 1.62 | 2.49 | 0.41 | 7.62 | 89.30 |
| *Streblospio* | 2.24 | 1.84 | 0.41 | 5.65 | 94.95 |

Group c
Less than 2 samples in group

Group h
Average similarity: 22.13

| Species | Av.Abund | Av.Sim | Sim/SD* | Contrib% | Cum.% |
|---|---|---|---|---|---|
| *Tharyx 'species A'* | 9.23 | 13.58 | - | 61.34 | 61.34 |
| *Nephtys juvenile* | 2.44 | 3.65 | - | 16.51 | 77.85 |
| *Tubificoides benedii* | 21.21 | 3.27 | - | 14.77 | 92.62 |

Group g
Average similarity: 64.11

| Species | Av.Abund | Av.Sim | Sim/SD | Contrib% | Cum.% |
|---|---|---|---|---|---|
| *Tubificoides heterochaetus* | 3.22 | 16.83 | 1.45 | 26.25 | 26.25 |
| *Streblospio* | 2.30 | 13.48 | 7.08 | 21.03 | 47.28 |
| *Nephtys juvenile* | 1.38 | 8.41 | 4.41 | 13.12 | 60.40 |
| *Einhornia crustulenta* | 1.00 | 7.38 | 15.91 | 11.52 | 71.92 |
| *Alitta succinea* | 1.00 | 7.38 | 15.91 | 11.51 | 83.43 |
| *Corophium volutator* | 1.14 | 7.38 | 15.91 | 11.51 | 94.94 |

Subtidal samples: Average dissimilarity (%) between SIMPROF groups

| Group | a | b | c | d | e | f | g | h |
|---|---|---|---|---|---|---|---|---|
| b | 73.55 | | | | | | | |
| c | 79.23 | 64.28 | | | | | | |
| d | 62.20 | 69.17 | 57.13 | | | | | |
| e | 73.71 | 88.61 | 92.73 | 88.36 | | | | |
| f | 72.88 | 74.34 | 88.31 | 72.71 | 72.81 | | | |
| g | 91.92 | 87.55 | 83.97 | 87.46 | 94.01 | 79.48 | | |
| h | 93.45 | 92.34 | 75.38 | 84.88 | 95.23 | 94.85 | 83.31 | |

# Appendix 13.0 Subtidal sediment – chemical concentrations against thresholds

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Exceedance of thresholds for chemicals in sediment. Cefas Contaminant Action Levels are chemical Action level 1 (cAL1) and Action level 2 (cAL2). If Cefas Guidelines are not available for a particular contaminant the OSPAR Guidelines have been used which are Effects Range Low (ERL) and Environmental Assessment Criteria (EAC). If neither guideline is available for a contaminant, the Canadian Guidelines have been used which are the interim sediment quality guidelines (ISQG) and probable effect level (PEL).

| Sediment Chemical Threshold exceedance | Colour Coding |
|---|---|
| Below cAL1 | (white) |
| Between cAL1 and TEL/ISQG | (grey) |
| Above cAL1 and TEL but below PEL | (yellow) |
| Above cAL1 and PEL but below cAL2/above cAL1 if no other threshold | (green) |
| Above cAL2 | (red) |

Subtidal samples: Kent project site (Stations 1 - 5). N/A = Non-applicable.

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **1** | **2** | **3** | **4** | **5** |
| ***Metals (mg/kg)*** | | | | | | | | | | | |
| Arsenic | 20 | 100 | 7.24 | 41.6 | | 1 | 6.1 | 14.7 | 14.1 | 16.1 | 68.4 |
| Cadmium | 0.4 | 5 | 0.676 | 4.21 | 12 | 0.1 | 0.09 | 0.29 | 0.51 | 0.23 | 0.9 |
| Chromium | 40 | 400 | 52.3 | 160 | 810 | 0.5 | 12.2 | 36.1 | 50.5 | 30.1 | 47.9 |
| Copper | 40 | 400 | 18.7 | 108 | 340 | 2 | 18.6 | 22.1 | 52.2 | 57 | 136 |
| Mercury | 0.3 | 3 | 0.13 | 0.7 | 1.5 | 0.01 | 0.14 | 0.04 | 0.78 | 0.16 | 4.59 |
| Nickel | 20 | 200 | 15.9 | 42.8 | | 0.5 | 11.2 | 27.5 | 27.5 | 26.9 | 30.6 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **1** | **2** | **3** | **4** | **5** |
| Lead | 50 | 500 | 30.2 | 112 | 470 | 2 | 16.5 | 50.3 | 108 | 98 | 353 |
| Zinc | 130 | 800 | 124 | 271 | 1500 | 3 | 26.5 | 72.7 | 184 | 75 | 867 |
| ***TBT (µg/kg)*** | | | | | | | | | | | |
| Tributyltin compounds | 100 | 1000 | | | | 5 | 0.008 | <0.005 | <0.005 | <0.005 | <0.005 |
| ***DBT (µg/kg)*** | | | | | | | | | | | |
| Dibutyltin | 100 | 1,000 | | | 190 | 5 | <0.005 | <0.005 | 0.02 | <0.005 | <0.005 |
| ***PAH (µg/kg)*** | | | | | | | | | | | |
| Acenaphthene | 100 | NA | 6.7 | 88.9 | | 1 | 3.53 | 1.76 | 33.7 | 5.84 | 351 |
| Acenaphthylene | 100 | NA | 5.9 | 128 | | 1 | 6.22 | 1.51 | 79.2 | 6.98 | 1430 |
| Anthracene | 100 | NA | 46.9 | 245 | 85 | 1 | 13.5 | 1.53 | 91.3 | 8.05 | 1620 |
| Benzo[a]anthracene | 100 | NA | 74.8 | 693 | 261 | 1 | 168 | 3.16 | 288 | 16.1 | 5150 |
| Benzo[a]pyrene | 100 | NA | 88.8 | 763 | 430 | 1 | 164 | 6.28 | 494 | 31 | 9690 |
| Benzo[b]fluoranthene | 100 | NA | | | | 1 | 168 | 7.35 | 492 | 28 | 7750 |
| Benzo[ghi]perylene | 100 | NA | | | 85 | 1 | 103 | 6.82 | 438 | 30.6 | 6470 |
| Benzo[e]pyrene | 100 | NA | | | | 1 | 140 | 6.22 | 416 | 28.5 | 6700 |
| Benzo[k]fluoranthene | 100 | NA | | | | 1 | 76.3 | 3.01 | 244 | 11.6 | 5530 |
| C1-naphthalenes | 100 | NA | | | 155 | 1 | 30.1 | 5.95 | 117 | 15.7 | 755 |
| C1-phenanthrene | | | | | | | 66.3 | 7.73 | 162 | 18.9 | 1680 |
| C2-naphthalenes | 100 | NA | | | 150 | 1 | 35.8 | 5.86 | 104 | 17.6 | 737 |
| C3-naphthalenes | | | | | | | 39.7 | 5.06 | 84.8 | 11.7 | 719 |
| Chrysene | 100 | NA | 108 | 846 | 384 | 1 | 154 | 7.26 | 247 | 15.6 | 5980 |
| Dibenzo[ah]anthracene | 10 | NA | 6.2 | 135 | | 1 | 33.1 | <1 | 70.7 | 6.53 | 1450 |
| Fluoranthene | 100 | NA | 113 | 1494 | 600 | 1 | 175 | 15.1 | 528 | 31.1 | 12100 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **1** | **2** | **3** | **4** | **5** |
| Fluorene | 100 | NA | 21.2 | 144 | | 1 | 7.09 | 2.24 | 47 | 5.48 | 591 |
| Indeno[1,2,3-cd]pyrene | 100 | NA | | | 240 | 1 | 117 | 5.98 | 507 | 31.4 | 7260 |
| Naphthalene | 100 | NA | 34.6 | 391 | 160 | 1 | 7.35 | 2.44 | 64.3 | 7.36 | 825 |
| Perylene | NA | NA | NA | NA | | 1 | 80.3 | 217 | 218 | 315 | 2670 |
| Phenanthrene | 100 | NA | 86.7 | 544 | 240 | 1 | 38.7 | 16.7 | 213 | 14.7 | 2300 |
| Pyrene | 100 | NA | 153 | 1398 | 665 | 1 | 155 | 12.9 | 500 | 30.4 | 9040 |
| THC | | | | | | | 37.3 | <1 | 48.5 | 4.1 | 822 |
| ***PCBs (µg/kg)*** | | | | | | | | | | | |
| sum of ICES 7 | 10 | None | | | | 0.08 | 0.00112 | 0.00116 | 0.01 | 0.00586 | 0.00282 |
| Sum of 25 congeners | 20 | 200 | | | | 0.08 | 0.00263 | 0.00283 | 0.02103 | 0.01362 | 0.00616 |
| ***Organochlorine pesticides (µg/kg)*** | | | | | | | | | | | |
| alpha-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| beta-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| gamma-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Dieldrin | 5 | | 0.715 | 4.3 | 2 | 5 | <0.0001 | <0.0001 | 0.001 | 0.0006 | 0.0003 |
| Hexachlorobenzene | | | | | 20 | 2 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 |
| p,p'-Dichorodiphenyldicloroethylene | | | | | | | <0.0001 | <0.0001 | 0.0011 | 0.0007 | 0.0005 |
| p,p'-Dichorodiphenyltrichloroethane | 1 | | 1.19 | 4.77 | | 5 | <0.0001 | <0.0001 | 0.0012 | 0.0005 | 0.0006 |
| p,p'-Dichorodiphenyldicloroethane | | | | | | | <0.0001 | 0.0002 | 0.0004 | 0.0034 | 0.004 |

Subtidal samples: Kent project site (Stations 6, 7, 8, 9 and 10).

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **6** | **7** | **8** | **9** | **10** |
| ***Metals (mg/kg)*** | | | | | | | | | | | |
| Arsenic | 20 | 100 | 7.24 | 41.6 | | 1 | 33.9 | 19.8 | 15.2 | 42.8 | 32.7 |
| Cadmium | 0.4 | 5 | 0.676 | 4.21 | 12 | 0.1 | 3.19 | 0.38 | 0.37 | 3.16 | 0.63 |
| Chromium | 40 | 400 | 52.3 | 160 | 810 | 0.5 | 68.4 | 31 | 30.3 | 68.5 | 41.4 |
| Copper | 40 | 400 | 18.7 | 108 | 340 | 2 | 132 | 62.6 | 77.2 | 140 | 89.9 |
| Mercury | 0.3 | 3 | 0.13 | 0.7 | 1.5 | 0.01 | 2.44 | 0.42 | 0.41 | 3.58 | 0.32 |
| Nickel | 20 | 200 | 15.9 | 42.8 | | 0.5 | 37.4 | 27.3 | 23.2 | 30.5 | 24.3 |
| Lead | 50 | 500 | 30.2 | 112 | 470 | 2 | 174 | 197 | 321 | 347 | 231 |
| Zinc | 130 | 800 | 124 | 271 | 1500 | 3 | 379 | 117 | 237 | 529 | 277 |
| ***TBT (µg/kg)*** | | | | | | | | | | | |
| Tributyltin compounds | 100 | 1000 | | | | 5 | <0.005 | <0.005 | <0.005 | <0.001 | 0.034 |
| ***DBT (µg/kg)*** | | | | | | | | | | | |
| Dibutyltin | 100 | 1,000 | | | 190 | 5 | 0.014 | 0.048 | 0.024 | <0.001 | 0.024 |
| ***PAH (µg/kg)*** | | | | | | | | | | | |
| Acenaphthene | 100 | NA | 6.7 | 88.9 | | 1 | 317 | 59.3 | 25.1 | 703 | 20 |
| Acenaphthylene | 100 | NA | 5.9 | 128 | | 1 | 875 | 70.7 | 68.2 | 1490 | 35.9 |
| Anthracene | 100 | NA | 46.9 | 245 | 85 | 1 | 1100 | 182 | 68.5 | 1960 | 57.2 |
| Benzo[a]anthracene | 100 | NA | 74.8 | 693 | 261 | 1 | 3100 | 370 | 169 | 6100 | 138 |
| Benzo[a]pyrene | 100 | NA | 88.8 | 763 | 430 | 1 | 5590 | 547 | 313 | 10700 | 246 |
| Benzo[b]fluoranthene | 100 | NA | | | | 1 | 3970 | 515 | 308 | 6530 | 246 |
| Benzo[ghi]perylene | 100 | NA | | | 85 | 1 | 3200 | 414 | 285 | 5800 | 197 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **6** | **7** | **8** | **9** | **10** |
| Benzo[e]pyrene | 100 | NA | | | | 1 | 3550 | 427 | 259 | 6530 | 212 |
| Benzo[k]fluoranthene | 100 | NA | | | | 1 | 2610 | 236 | 167 | 4350 | 101 |
| C1-naphthalenes | 100 | NA | | | 155 | 1 | 680 | 217 | 88.7 | 1160 | 93.5 |
| C1-phenanthrene | | | | | | | 1390 | 219 | 102 | 3110 | 92.5 |
| C2-naphthalenes | 100 | NA | | | 150 | 1 | 647 | 178 | 72.2 | 1320 | 73 |
| C3-naphthalenes | | | | | | | 574 | 145 | 66.9 | 1640 | 61.7 |
| Chrysene | 100 | NA | 108 | 846 | 384 | 1 | 3110 | 312 | 184 | 6310 | 120 |
| Dibenzo[ah]anthracene | 10 | NA | 6.2 | 135 | | 1 | 755 | 91.7 | 50.5 | 1410 | 40.3 |
| Fluoranthene | 100 | NA | 113 | 1494 | 600 | 1 | 7820 | 636 | 300 | 14100 | 260 |
| Fluorene | 100 | NA | 21.2 | 144 | | 1 | 502 | 80.1 | 30.4 | 822 | 28.5 |
| Indeno[1,2,3-cd]pyrene | 100 | NA | | | 240 | 1 | 3560 | 483 | 337 | 6400 | 217 |
| Naphthalene | 100 | NA | 34.6 | 391 | 160 | 1 | 570 | 101 | 53.5 | 847 | 62.8 |
| Perylene | NA | NA | NA | NA | | 1 | 1590 | 194 | 262 | 2710 | 101 |
| Phenanthrene | 100 | NA | 86.7 | 544 | 240 | 1 | 1580 | 288 | 134 | 2320 | 127 |
| Pyrene | 100 | NA | 153 | 1398 | 665 | 1 | 5640 | 568 | 289 | 10700 | 267 |
| THC | | | | | | | 961 | 186 | 56 | 997 | 179 |
| ***PCBs (µg/kg)*** | | | | | | | | | | | |
| sum of ICES 7 | 10 | None | | | | 0.08 | 0.01377 | 0.01798 | 0.01241 | 0.00951 | 0.11886 |
| Sum of 25 congeners | 20 | 200 | | | | 0.08 | 0.02811 | 0.03721 | 0.02649 | 0.02016 | 0.21273 |
| ***Organochlorine pesticides (µg/kg)*** | | | | | | | | | | | |
| alpha-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| beta-Hexachlorcyclohexane | | | | | | | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| gamma-Hexachlorcyclohexane | | | | | | | <0.0001 | 0.0001 | <0.0001 | <0.0001 | <0.0001 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **6** | **7** | **8** | **9** | **10** |
| Dieldrin | 5 | | 0.715 | 4.3 | 2 | 5 | 0.0002 | 0.0009 | 0.0013 | 0.0001 | 0.0005 |
| Hexachlorobenzene | | | | | 20 | 2 | 0.0006 | 0.0002 | 0.0002 | 0.0001 | <0.0001 |
| p,p'-Dichorodiphenyldicloroethylene | | | | | | | 0.0101 | 0.0009 | 0.0012 | 0.0045 | 0.0006 |
| p,p'-Dichorodiphenyltrichloroethane | 1 | | 1.19 | 4.77 | | 5 | 0.017 | 0.0011 | 0.0012 | 0.0067 | 0.001 |
| p,p'-Dichorodiphenyldicloroethane | | | | | | | 0.014 | 0.0009 | 0.0011 | 0.0062 | 0.0036 |

Subtidal samples: Kent project site (Stations 11 - 13 and 22). N/A = Non-applicable

| | Threshold | | | | | | Station | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **11** | **12** | **13** | **22** |
| ***Metals (mg/kg)*** | | | | | | | | | | |
| Arsenic | 20 | 100 | 7.24 | 41.6 | | 1 | 5.2 | 11.4 | 20.8 | 19.4 |
| Cadmium | 0.4 | 5 | 0.676 | 4.21 | 12 | 0.1 | 0.13 | 0.2 | 0.35 | 1.43 |
| Chromium | 40 | 400 | 52.3 | 160 | 810 | 0.5 | 9.1 | 15.5 | 38.3 | 38.9 |
| Copper | 40 | 400 | 18.7 | 108 | 340 | 2 | 18.4 | 24.8 | 19.9 | 61.7 |
| Mercury | 0.3 | 3 | 0.13 | 0.7 | 1.5 | 0.01 | 0.11 | 0.04 | 0.05 | 0.98 |
| Nickel | 20 | 200 | 15.9 | 42.8 | | 0.5 | 9.4 | 23.3 | 32.8 | 21.1 |
| Lead | 50 | 500 | 30.2 | 112 | 470 | 2 | 17.4 | 74.9 | 18.6 | 97.5 |
| Zinc | 130 | 800 | 124 | 271 | 1500 | 3 | 33.1 | 57.6 | 78.8 | 199 |
| ***TBT (µg/kg)*** | | | | | | | | | | |
| Tributyltin compounds | 100 | 1000 | | | | 5 | <0.005 | <0.005 | <0.005 | 0.008 |
| ***DBT (µg/kg)*** | | | | | | | | | | |
| Dibutyltin | 100 | 1,000 | | | 190 | 5 | 0.013 | 0.015 | <0.005 | <0.001 |
| ***PAH (µg/kg)*** | | | | | | | | | | |
| Acenaphthene | 100 | NA | 6.7 | 88.9 | | 1 | 4.67 | 13.7 | 1.88 | 135 |
| Acenaphthylene | 100 | NA | 5.9 | 128 | | 1 | 7.89 | 16.7 | <1 | 318 |
| Anthracene | 100 | NA | 46.9 | 245 | 85 | 1 | 14.7 | 35.8 | 1.41 | 586 |
| Benzo[a]anthracene | 100 | NA | 74.8 | 693 | 261 | 1 | 45.1 | 37.6 | 2.11 | 1200 |
| Benzo[a]pyrene | 100 | NA | 88.8 | 763 | 430 | 1 | 68.2 | 52.3 | 3.12 | 2090 |
| Benzo[b]fluoranthene | 100 | NA | | | | 1 | 66.1 | 51.8 | 4.3 | 1970 |
| Benzo[ghi]perylene | 100 | NA | | | 85 | 1 | 52 | 44.9 | 5.7 | 1490 |

| | Threshold | | | | | | Station | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **11** | **12** | **13** | **22** |
| Benzo[e]pyrene | 100 | NA | | | | 1 | 56.5 | 49.6 | 4.02 | 1640 |
| Benzo[k]fluoranthene | 100 | NA | | | | 1 | 32 | 23.3 | 1.4 | 872 |
| C1-naphthalenes | 100 | NA | | | 155 | 1 | 18.8 | 66.5 | 4.84 | 280 |
| C1-phenanthrene | | | | | | | 27.8 | 58.8 | 9.28 | 506 |
| C2-naphthalenes | 100 | NA | | | 150 | 1 | 18.3 | 72 | 11.2 | 250 |
| C3-naphthalenes | | | | | | | 19.3 | 56.9 | 5.48 | 236 |
| Chrysene | 100 | NA | 108 | 846 | 384 | 1 | 39.6 | 33.2 | 2.63 | 1140 |
| Dibenzo[ah]anthracene | 10 | NA | 6.2 | 135 | | 1 | 10.4 | 9.4 | <1 | 303 |
| Fluoranthene | 100 | NA | 113 | 1494 | 600 | 1 | 76 | 51.8 | 4.85 | 2180 |
| Fluorene | 100 | NA | 21.2 | 144 | | 1 | 6.55 | 16.5 | 1.63 | 171 |
| Indeno[1,2,3-cd]pyrene | 100 | NA | | | 240 | 1 | 55.3 | 39.1 | 3.94 | 1660 |
| Naphthalene | 100 | NA | 34.6 | 391 | 160 | 1 | 14.7 | 29.6 | 1.63 | 206 |
| Perylene | NA | NA | NA | NA | | 1 | 50.3 | 1090 | 270 | 636 |
| Phenanthrene | 100 | NA | 86.7 | 544 | 240 | 1 | 34 | 49.8 | 5.79 | 731 |
| Pyrene | 100 | NA | 153 | 1398 | 665 | 1 | 84.9 | 75.8 | 5.05 | 2120 |
| THC | | | | | | | 26.1 | 8.1 | 22.1 | 367 |
| ***PCBs (µg/kg)*** | | | | | | | | | | |
| sum of ICES 7 | 10 | None | | | | 0.08 | 0.00555 | 0.00321 | 0.0008 | 0.15974 |
| Sum of 25 congeners | 20 | 200 | | | | 0.08 | 0.01154 | 0.00754 | 0.00236 | 0.39157 |
| ***Organochlorine pesticides (µg/kg)*** | | | | | | | | | | |
| alpha-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| beta-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| gamma-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | 0.0001 |

| | Threshold | | | | | | Station | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **11** | **12** | **13** | **22** |
| Dieldrin | 5 | | 0.715 | 4.3 | 2 | 5 | 0.0002 | 0.0013 | <0.0001 | 0.0017 |
| Hexachlorobenzene | | | | | 20 | 2 | <0.0001 | 0.0001 | <0.0001 | 0.0001 |
| p,p'-Dichorodiphenyldicloroethylene | | | | | | | 0.0012 | 0.0005 | <0.0001 | 0.0045 |
| p,p'-Dichorodiphenyltrichloroethane | 1 | | 1.19 | 4.77 | | 5 | 0.0004 | 0.0003 | <0.0001 | 0.0078 |
| p,p'-Dichorodiphenyldicloroethane | | | | | | | 0.0009 | 0.0006 | <0.0001 | 0.0093 |

Subtidal samples: Essex project site (Stations 14 - 18). N/A = Non-applicable.

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **14** | **15** | **16** | **17** | **18** |
| ***Metals (mg/kg)*** | | | | | | | | | | | |
| Arsenic | 20 | 100 | 7.24 | 41.6 | | 1 | 5.8 | 7.5 | 8.9 | 5.4 | 7.2 |
| Cadmium | 0.4 | 5 | 0.676 | 4.21 | 12 | 0.1 | 0.07 | 0.16 | 0.2 | 0.21 | 0.18 |
| Chromium | 40 | 400 | 52.3 | 160 | 810 | 0.5 | 8.4 | 18.6 | 20.4 | 28.5 | 16.9 |
| Copper | 40 | 400 | 18.7 | 108 | 340 | 2 | 9.8 | 19.2 | 22.8 | 16.6 | 20.4 |
| Mercury | 0.3 | 3 | 0.13 | 0.7 | 1.5 | 0.01 | 0.04 | 0.22 | 0.26 | 0.05 | 0.23 |
| Nickel | 20 | 200 | 15.9 | 42.8 | | 0.5 | 7.9 | 10.3 | 12.1 | 23.2 | 10 |
| Lead | 50 | 500 | 30.2 | 112 | 470 | 2 | 8.7 | 25.6 | 31.2 | 15.6 | 24.9 |
| Zinc | 130 | 800 | 124 | 271 | 1500 | 3 | 25.6 | 61.6 | 76.4 | 62.9 | 61.2 |
| ***TBT (µg/kg)*** | | | | | | | | | | | |
| Tributyltin compounds | 100 | 1000 | | | | 5 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| ***DBT (µg/kg)*** | | | | | | | | | | | |
| Dibutyltin | 100 | 1,000 | | | 190 | 5 | 0.006 | 0.014 | 0.017 | <0.005 | 0.016 |
| ***PAH (µg/kg)*** | | | | | | | | | | | |
| Acenaphthene | 100 | NA | 6.7 | 88.9 | | 1 | 2.24 | 55.4 | 5.9 | 2.38 | 25 |
| Acenaphthylene | 100 | NA | 5.9 | 128 | | 1 | 5.84 | 37.2 | 12 | 2.06 | 34.7 |
| Anthracene | 100 | NA | 46.9 | 245 | 85 | 1 | 8.88 | 119 | 18.7 | 3 | 67.1 |
| Benzo[a]anthracene | 100 | NA | 74.8 | 693 | 261 | 1 | 23.1 | 420 | 152 | 9.71 | 236 |
| Benzo[a]pyrene | 100 | NA | 88.8 | 763 | 430 | 1 | 35.5 | 525 | 147 | 14 | 323 |
| Benzo[b]fluoranthene | 100 | NA | | | | 1 | 31.7 | 450 | 167 | 14.7 | 285 |
| Benzo[ghi]perylene | 100 | NA | | | 85 | 1 | 27 | 335 | 85.9 | 13.3 | 224 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **14** | **15** | **16** | **17** | **18** |
| Benzo[e]pyrene | 100 | NA | | | | 1 | 27 | 374 | 122 | 12.5 | 243 |
| Benzo[k]fluoranthene | 100 | NA | | | | 1 | 15.6 | 204 | 56.1 | 7.29 | 164 |
| C1-naphthalenes | 100 | NA | | | 155 | 1 | 17.3 | 73.8 | 12.1 | 6.74 | 57 |
| C1-phenanthrene | | | | | | | 15.9 | 202 | 55 | 8.96 | 125 |
| C2-naphthalenes | 100 | NA | | | 150 | 1 | 14 | 55.5 | 12.5 | 7.32 | 51.7 |
| C3-naphthalenes | | | | | | | 13.4 | 53.9 | 13.9 | 6 | 52.1 |
| Chrysene | 100 | NA | 108 | 846 | 384 | 1 | 21.4 | 362 | 137 | 9.2 | 199 |
| Dibenzo[ah]anthracene | 10 | NA | 6.2 | 135 | | 1 | 6.11 | 79.3 | 31.7 | 2.57 | 46.8 |
| Fluoranthene | 100 | NA | 113 | 1494 | 600 | 1 | 35.7 | 854 | 185 | 18.2 | 446 |
| Fluorene | 100 | NA | 21.2 | 144 | | 1 | 3.47 | 56.4 | 8.56 | 2.29 | 31.3 |
| Indeno[1,2,3-cd]pyrene | 100 | NA | | | 240 | 1 | 31.7 | 377 | 105 | 14 | 259 |
| Naphthalene | 100 | NA | 34.6 | 391 | 160 | 1 | 9.63 | 53.7 | 7.45 | 3.88 | 36.8 |
| Perylene | NA | NA | NA | NA | | 1 | 14.7 | 170 | 46 | 294 | 119 |
| Phenanthrene | 100 | NA | 86.7 | 544 | 240 | 1 | 19.6 | 483 | 46.1 | 10.6 | 195 |
| Pyrene | 100 | NA | 153 | 1398 | 665 | 1 | 34.2 | 759 | 159 | 17.5 | 396 |
| THC | | | | | | | 32.5 | 121 | 151 | 1.6 | 63.9 |
| ***PCBs (µg/kg)*** | | | | | | | | | | | |
| sum of ICES 7 | 10 | None | | | | 0.08 | 0.00107 | 0.00312 | 0.00432 | 0.00093 | 0.00502 |
| Sum of 25 congeners | 20 | 200 | | | | 0.08 | 0.00217 | 0.0065 | 0.00891 | 0.00256 | 0.01107 |
| ***Organochlorine pesticides (µg/kg)*** | | | | | | | | | | | |
| alpha-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| beta-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| gamma-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |

| | Threshold | | | | | | Station | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **14** | **15** | **16** | **17** | **18** |
| Dieldrin | 5 | | 0.715 | 4.3 | 2 | 5 | <0.0001 | 0.0002 | 0.0003 | <0.0001 | 0.0002 |
| Hexachlorobenzene | | | | | 20 | 2 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| p,p'-Dichorodiphenyldicloroethylene | | | | | | | 0.0001 | 0.0003 | 0.0004 | <0.0001 | 0.0003 |
| p,p'-Dichorodiphenyltrichloroethane | 1 | | 1.19 | 4.77 | | 5 | 0.0001 | 0.0004 | 0.0005 | <0.0001 | 0.0005 |
| p,p'-Dichorodiphenyldicloroethane | | | | | | | <0.0001 | 0.0006 | 0.0009 | <0.0001 | 0.0004 |

Subtidal samples: Essex project site (Stations 19 - 21). N/A = Non-applicable.

| | Threshold | | | | | | Station | | |
|---|---|---|---|---|---|---|---|---|---|
| **Chemical** | **cAL1** | **cAL2** | **TEL/ISQG** | **PEL** | **ERL** | **LOD** | **19** | **20** | **21** |
| ***Metals (mg/kg)*** | | | | | | | | | |
| Arsenic | 20 | 100 | 7.24 | 41.6 | | 1 | 7.8 | 8.8 | 8.2 |
| Cadmium | 0.4 | 5 | 0.676 | 4.21 | 12 | 0.1 | 0.17 | 0.15 | 0.17 |
| Chromium | 40 | 400 | 52.3 | 160 | 810 | 0.5 | 17.7 | 20 | 18.7 |
| Copper | 40 | 400 | 18.7 | 108 | 340 | 2 | 19 | 20.3 | 19.5 |
| Mercury | 0.3 | 3 | 0.13 | 0.7 | 1.5 | 0.01 | 0.24 | 0.27 | 0.25 |
| Nickel | 20 | 200 | 15.9 | 42.8 | | 0.5 | 10.3 | 11.3 | 10.9 |
| Lead | 50 | 500 | 30.2 | 112 | 470 | 2 | 28.8 | 32 | 28.3 |
| Zinc | 130 | 800 | 124 | 271 | 1500 | 3 | 63.2 | 65.9 | 64.7 |
| ***TBT (µg/kg)*** | | | | | | | | | |
| Tributyltin compounds | 100 | 1000 | | | | 5 | <0.005 | <0.005 | <0.005 |
| ***DBT (µg/kg)*** | | | | | | | | | |
| Dibutyltin | 100 | 1,000 | | | 190 | 5 | 0.011 | 0.012 | 0.01 |
| ***PAH (µg/kg)*** | | | | | | | | | |
| Acenaphthene | 100 | NA | 6.7 | 88.9 | | 1 | 49.8 | 17.3 | 32.6 |
| Acenaphthylene | 100 | NA | 5.9 | 128 | | 1 | 44.5 | 32.4 | 40.6 |
| Anthracene | 100 | NA | 46.9 | 245 | 85 | 1 | 94.8 | 42.9 | 72.5 |
| Benzo[a]anthracene | 100 | NA | 74.8 | 693 | 261 | 1 | 269 | 151 | 236 |
| Benzo[a]pyrene | 100 | NA | 88.8 | 763 | 430 | 1 | 395 | 224 | 312 |
| Benzo[b]fluoranthene | 100 | NA | | | | 1 | 307 | 225 | 286 |
| Benzo[ghi]perylene | 100 | NA | | | 85 | 1 | 258 | 163 | 213 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Benzo[e]pyrene | 100 | NA | | | | 1 | 262 | 180 | 235 |
| Benzo[k]fluoranthene | 100 | NA | | | | 1 | 203 | 93.3 | 150 |
| C1-naphthalenes | 100 | NA | | | 155 | 1 | 83.6 | 60.3 | 62.4 |
| C1-phenanthrene | | | | | | | 171 | 100 | 132 |
| C2-naphthalenes | 100 | NA | | | 150 | 1 | 69.3 | 50.8 | 55.1 |
| C3-naphthalenes | | | | | | | 60.9 | 50.3 | 51.3 |
| Chrysene | 100 | NA | 108 | 846 | 384 | 1 | 256 | 148 | 208 |
| Dibenzo[ah]anthracene | 10 | NA | 6.2 | 135 | | 1 | 56.1 | 36.6 | 47.8 |
| Fluoranthene | 100 | NA | 113 | 1494 | 600 | 1 | 577 | 285 | 456 |
| Fluorene | 100 | NA | 21.2 | 144 | | 1 | 53.8 | 24.5 | 39.2 |
| Indeno[1,2,3-cd]pyrene | 100 | NA | | | 240 | 1 | 282 | 188 | 249 |
| Naphthalene | 100 | NA | 34.6 | 391 | 160 | 1 | 56.5 | 37.1 | 42.3 |
| Perylene | NA | NA | NA | NA | | 1 | 150 | 83.6 | 115 |
| Phenanthrene | 100 | NA | 86.7 | 544 | 240 | 1 | 328 | 127 | 243 |
| Pyrene | 100 | NA | 153 | 1398 | 665 | 1 | 500 | 253 | 387 |
| THC | | | | | | | 85.2 | 145 | 109 |
| ***PCBs (µg/kg)*** | | | | | | | | | |
| sum of ICES 7 | 10 | None | | | | 0.08 | 0.00354 | 0.00328 | 0.00385 |
| Sum of 25 congeners | 20 | 200 | | | | 0.08 | 0.0074 | 0.00711 | 0.0079 |
| ***Organochlorine pesticides (µg/kg)*** | | | | | | | | | |
| alpha-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 |
| beta-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 |
| gamma-Hexachlorcyclohexane | | | | | | | <0.0001 | <0.0001 | <0.0001 |
| Dieldrin | 5 | | 0.715 | 4.3 | 2 | 5 | 0.0002 | 0.0003 | 0.0002 |
| Hexachlorobenzene | | | | | 20 | 2 | <0.0001 | <0.0001 | <0.0001 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| p,p'-Dichorodiphenyldicloroethylene | | | | | | | 0.0003 | 0.0004 | 0.0003 |
| p,p'-Dichorodiphenyltrichloroethane | 1 | | 1.19 | 4.77 | | 5 | 0.0004 | 0.0004 | 0.0004 |
| p,p'-Dichorodiphenyldicloroethane | | | | | | | 0.0008 | 0.001 | <0.0001 |

**Polybrominated diphenyl ethers (PBDEs) (brominated flame retardants) data are provided below for the 14 stations indicated.**

## Polybrominated diphenyl ethers (PBDEs) (brominated flame retardants)

| | | | | | | |
|---|---|---|---|---|---|---|
| | | **Units** | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) |
| | | **Method No** | *SUB_01 | *SUB_01 | *SUB_01 | *SUB_01 |
| | | **Limit of Detection** | 0.00002 | 0.00002 | 0.00002 | 0.00002 |
| | | **Accreditation** | MMO | MMO | MMO | MMO |
| | **Station Number** | **Matrix** | **BDE17** | **BDE28** | **BDE47** | **BDE66** |
| | G01 | Sediment | <0.00002 | <0.00002 | 0.00010 | <0.00002 |
| | G02 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G10 | Sediment | 0.00006 | 0.00003 | 0.00021 | 0.000022 |
| | G11 | Sediment | <0.00002 | <0.00002 | 0.00005 | <0.00002 |
| | G12 | Sediment | <0.00002 | <0.00002 | 0.00008 | 0.00005 |
| | G13 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G14 | Sediment | <0.00002 | <0.00002 | 0.00011 | 0.00003 |
| | G15 | Sediment | 0.00002 | <0.00002 | 0.00008 | <0.00002 |
| | G16 | Sediment | <0.00002 | <0.00002 | 0.00012 | <0.00002 |
| | G17 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G18 | Sediment | 0.000020 | <0.00002 | 0.00007 | <0.00002 |
| | G19 | Sediment | 0.00002 | <0.00002 | 0.00007 | <0.00002 |
| | G20 | Sediment | <0.00002 | <0.00002 | 0.00007 | <0.00002 |
| | G21 | Sediment | <0.00002 | <0.00002 | 0.00009 | <0.00002 |

| | | **Units** | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) |
|---|---|---|---|---|---|---|
| | | **Method No** | *SUB_01 | *SUB_01 | *SUB_01 | *SUB_01 |
| | | **Limit of Detection** | 0.00002 | 0.00002 | 0.00002 | 0.00002 |
| | | **Accreditation** | MMO | MMO | MMO | MMO |
| | **Station Number** | **Matrix** | **BDE85** | **BDE99** | **BDE100** | **BDE138** |
| | G01 | Sediment | <0.00002 | 0.00008 | 0.00002 | <0.00002 |
| | G02 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G10 | Sediment | <0.00002 | 0.00017 | 0.00004 | <0.00002 |
| | G11 | Sediment | <0.00002 | 0.00004 | <0.00002 | <0.00002 |
| | G12 | Sediment | <0.00002 | 0.00004 | <0.00002 | <0.00002 |
| | G13 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G14 | Sediment | <0.00002 | 0.00012 | 0.00004 | <0.00002 |
| | G15 | Sediment | <0.00002 | 0.00003 | <0.00002 | 0.00003 |
| | G16 | Sediment | <0.00002 | 0.00012 | 0.00003 | <0.00002 |
| | G17 | Sediment | <0.00002 | <0.00002 | <0.00002 | <0.00002 |
| | G18 | Sediment | <0.00002 | 0.00009 | 0.00002 | <0.00002 |
| | G19 | Sediment | <0.00002 | 0.00006 | <0.00002 | 0.00002 |
| | G20 | Sediment | <0.00002 | 0.00007 | 0.00002 | <0.00002 |
| | G21 | Sediment | <0.00002 | 0.00009 | 0.00002 | <0.00002 |

| | | Units | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) | mg/Kg (Dry Weight) |
|---|---|---|---|---|---|---|
| | | **Method No** | *SUB_01 | *SUB_01 | *SUB_01 | *SUB_01 |
| | | **Limit of Detection** | 0.00002 | 0.00002 | 0.0001 | 0.0001 |
| | | **Accreditation** | MMO | MMO | MMO | MMO |
| | **Station Number** | **Matrix** | **BDE153** | **BDE154** | **BDE183** | **BDE209** |
| | G01 | Sediment | <0.00002 | <0.00002 | <0.00002 | 0.018 |
| | G02 | Sediment | <0.00002 | <0.00002 | <0.00002 | 0.001 |
| | G10 | Sediment | 0.00004 | 0.000043 | 0.000066 | 0.110 |
| | G11 | Sediment | <0.00002 | <0.00002 | 0.000021 | 0.008 |
| | G12 | Sediment | <0.00002 | <0.00002 | 0.000022 | 0.006 |
| | G13 | Sediment | <0.00002 | <0.00002 | 0.00003 | 0.002 |
| | G14 | Sediment | 0.00003 | 0.00003 | 0.00002 | 0.009 |
| | G15 | Sediment | 0.00003 | 0.00002 | 0.00005 | 0.098 |
| | G16 | Sediment | 0.00004 | 0.000029 | 0.000054 | 0.083 |
| | G17 | Sediment | <0.00002 | <0.00002 | <0.00002 | 0.003 |
| | G18 | Sediment | 0.00004 | 0.000032 | 0.000030 | 0.119 |
| | G19 | Sediment | 0.00003 | 0.00002 | 0.000039 | 0.056 |
| | G20 | Sediment | 0.00003 | 0.00002 | 0.00004 | 0.044 |
| | G21 | Sediment | 0.00003 | 0.00002 | 0.000035 | 0.042 |

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# Appendix 14.0 Additional sediment chemistry data

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# 1. Additional sediment contaminant analysis results

Subtidal samples Kent project site (Stations 1 – 7, 8, 9, 10 – 13 and 22). N/A = Non-applicable, NAISS = No Asbestos In Sediment Samples.

| Station | LoD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Other*** | | | | | | | | | | | | |
| Diuron (µg/kg) | 0.5 | 2.15 | <0.5 | 3.44 | 3.62 | 0.53 | 0.93 | 2.3 | 2.17 | <0.5 | 3.8 | 1.34 |
| Dichlorvos (µg/kg) | 0.2 | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* |
| Cyanide (free) | 0.5 | – | <0.5 | N/A | N/A | N/A | <0.5 | <0.5 | <0.5 | <0.5 | – | – |
| Cyanide (total) | 0.5 | <0.5 | <0.5 | N/A | N/A | N/A | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | <0.5 |
| Phenol (mg/Kg) | 0.1 | <0.10 | <0.10 | N/A | N/A | N/A | 0.17 | 0.25 | <0.1 | <0.1 | <0.1 | <0.1 |
| GRO plus BTEX (mg/Kg) | 0.2 | <0.200 | <0.200 | N/A | N/A | N/A | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 |
| MTBE (µg/kg) | 20 | N/A | N/A | N/A | N/A | N/A | <20 | <20 | N/A | <20 | N/A | N/A |
| TPH (mg/Kg) | 20 | 41.6 | 37.8 | N/A | N/A | N/A | 285 | 63.5 | 46.7 | 164 | 72 | 46.8 |
| Asbestos | N/A | NAISS | NAISS | N/A | N/A | N/A | NAISS | NAISS | NAISS | NAISS | NAISS | NAISS |

| Station | LoD | 12 | 13 | 22 |
|---|---|---|---|---|
| ***Other*** | | | | |
| Diuron (µg/kg) | 0.5 | 16.4 | 1.27 | 2.09 |
| Dichlorvos (µg/kg) | 0.2 | <2.00* | <2.00* | <2.00* |
| Cyanide (free) (mg/Kg) | 0.5 | <0.5 | – | <0.5 |
| Cyanide (total) (mg/Kg) | 0.5 | <0.5 | <0.5 | <0.5 |
| Phenol (mg/Kg) | 0.1 | <0.1 | <0.1 | 0.3 |
| GRO plus BTEX (mg/Kg) | 0.2 | <0.200 | <0.200 | <0.200 |
| MTBE (µg/kg) | 20 | N/A | N/A | <20 |
| TPH (mg/Kg) | 20 | 68.3 | 44.5 | 226 |

| Station | LoD | 12 | 13 | 22 |
|---|---|---|---|---|
| ***Other*** | | | | |
| Asbestos | N/A | NAISS | NAISS | AM |

Subtidal samples Essex project site (Stations 14 - 21). N/A = Non-applicable, NAISS – No Asbestos In Sediment Samples, AM = Amosite.

| Station | LoD | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|
| ***Other*** | | | | | | | | | |
| Diuron (µg/kg) | <0.5 | <0.5 | 0.85 | 1.24 | <0.5 | 0.86 | 0.76 | 0.73 | 0.76 |
| Dichlorvos (µg/kg) | <0.2 | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* | <2.00* |
| Cyanide (free) | 0.5 | - | - | <0.5 | - | - | - | <0.5 | - |
| Cyanide (total) | 0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Phenol (mg/Kg) | 0.1 | <0.10 | <0.10 | <0.10 | <0.10 | 0.12 | 0.1 | <0.10 | <0.10 |
| GRO plus BTEX (mg/Kg) | 0.2 | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 | <0.200 |
| MTBE (µg/kg) | 20 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TPH (mg/Kg) | 20 | 44.3 | 52.2 | 55 | 40.5 | 64 | 57.8 | 54.7 | 72.9 |
| Asbestos | N/A | NAISS | NAISS | NAISS | NAISS | NAISS | NAISS | NAISS | NAISS |