Benthic Survey of the Outer Thames Estuary Sandbank System

Volume I: Parts I and II

Final Report

September 2006
Report No. 06/J/1/03/0837/0572

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This work will contribute to the MESH project (www.searchmesh.net) and received European Regional Development Funding through the INTERREG III B Community Initiative (www.nweurope.org).

EXECUTIVE SUMMARY

Emu Limited was commissioned by English Nature to conduct a broadscale study on the sub-tidal sandbanks at the approaches to the Outer Thames Estuary. The purpose of the study was to record and characterise the sub-tidal sandbank habitat and map the macrofaunal biotopes with the intention of submitting this area as candidate for Special Area of Conservation (SAC) status as described in the European Habitats Directive.

The survey was conducted in two parts:

- A characterisation of the physical extent of the sandbank and surrounding habitats (Part I).
- A description of the biological communities of the sandbanks and surrounding habitats (Part II).

A series of traverse survey lines were run across the Sandbanks using single beam echosounder and sidescan sonar. Analysis of the data identified depths ranging between -2m and 30m below Chart Datum. The sidescan sonar data revealed seven different sediment types ranging from fine sand to coarse sand and gravel. Seabed relief ranges from the flat and featureless to medium dimension ripples of height >0.7m and wavelength >6m with all ripple sizes in between these two extremes.

The survey sites were chosen based on the initial acoustic survey. Sample sites were targeted along the survey lines to include the major seabed types indicated by the acoustic backscatter.

One hundred grab samples were investigated for the sediment particle size, organic matter content and faunal composition, with 33 x Anchor Dredge samples and 30 x 2M Beam Trawl tows collected for faunal composition only. No replicates were taken at any location sampled. The sample sites were found to be predominantly sand which related to the sandbank features themselves, with some sands with varying amounts of silt in shallow less disturbed areas, and sand with gravel or shell in areas of high flow in the deeper channels between the sandbanks.

Around 250 macrofaunal species were recorded in the survey area overall: 187 species were recorded in the grabs, 86 in the dredge and 146 in the trawls. No unusual fauna were recorded for the region. *Sabellaria spinulosa* was recorded at a few sites within the region, but the extent of any populations or the possibility of any reef coverage could not be assessed using such a broadscale approach.

Using the species data inputted into PRIMER and the species lists from the grabs, dredges and trawls, four main infaunal biotopes were described and mapped for the Outer Thames Estuary sandbank system:

- **SS.SSa.IFiSa.NcirBat** (*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand)
- **SS.SSa.IMuSa.FfabMag** (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand).
- **SS.SSa.IFiSa.IMoSa** (Infralittoral mobile clean sand with sparse fauna)

With one biotope found in the tide-swept channels between the sandbank features:

- **SS.SMx** (sublittoral mixed sediment)

The two biotopes that best classified the epibenthic habitat were:

- **SS.SMX.CMx.FluHyd** (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment)
- **SS.SSA.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles).

A third biotope was found from analysing the trawl, grab and dredge at one site:

- **SS.SSa.IMuSa.EcorEns** (*Echinocardium cordatum* and *Ensis* spp. in lower sublittoral slightly muddy sand).

Both **SS.SSa.IFiSa.NcirBat** and **SS.SSa.IMuSa.FfabMag** are important habitats and listed under the UK Biodiversity Action Plan and the EC Habitats Directive, Annex I under the heading 'Sandbanks which are slightly covered by sea water all the time'. The Outer Thames Estuary sandbank system appears to fulfil the criteria for SAC designation.

A review of the sampling methodology used during this survey was also commissioned by English Nature as part of the Mapping of European Seabed Habitats (MESH) programme. The comments given by Emu Limited will aid in the development of international survey standards and protocols. The data from this current survey was also submitted in a format to be included in the MESH interactive web-based mapping system.

General Introduction

Background to Current Study

English Nature commissioned a broad scale survey to study the sub-tidal sandbanks at the approaches to the Outer Thames Estuary. The purpose of the study was to record and characterise the sub-tidal sandbank habitat with the intention of submitting this area as candidate for Special Area of Conservation (SAC) status as a sandbank described in the European Habitats Directive.

This particular geographical area was chosen by English Nature after collating existing biological and geological survey data on sandbank habitats around the whole of the English coastline. English Nature considered the Outer Thames Estuary shallow subtidal mobile sandbank system with its surrounding matrix of differing ecological habitats as a good example of the habitat type described and afforded protection under the European Habitats Directive, Annex I 'Sandbanks which are slightly covered by sea water all the time'.

Field Study - Mapping European Seabed Habitats (MESH)

The Outer Thames Estuary SAC survey has direct relevance to a project that English Nature is involved in called Mapping European Seabed Habitats (MESH). The overall aim of MESH is to establish a framework for mapping the marine habitats of north-west Europe through the development of internationally agreed protocols and guidelines for seabed habitat mapping, and the generation of the first compiled marine habitat maps for the area covered by the project (further details can be found at www.searchmesh.net). In doing so, MESH will also demonstrate how habitat mapping could be applied at local, national and international scales for sea-use planning and management. The Outer Thames Estuary SAC survey is directly relevant to a number of the specific 'tasks' that comprise the MESH project. Therefore, some extra work was undertaken in the analysis and write up to fully draw out the value, learning and data from the Thames survey to the MESH project. This is presented in a section at the end of the report.

Part I:
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VOLUME I - PART I

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1.0 INTRODUCTION AND OBJECTIVES

1.1 Scope of Work

Emu Limited was contracted by English Nature to undertake a bathymetric and sidescan sonar survey on the sub-tidal banks at the approaches to the Outer Thames Estuary. This report covers the Hydrographic survey work.

The survey was undertaken between 15th and 25th August 2005 onboard the *Emu Surveyor*. A suite of survey systems were operated in order to achieve the objectives as summarised below.

Table 1.1 Techniques and Objectives

Techniques Employed	Objective
• **Single Beam Bathymetric Survey** will determine variations in seabed level directly below the track of the vessel. By combining adjacent lines of data together a contoured bathymetric chart of the survey area is created.	i) To determine seabed levels across the survey area.
• **Sidescan Sonar Survey** will detect differences in sonar reflectivity of seabed areas and hence variations in sediment type and seabed relief. The seabed is insonified over a wide swath of seabed perpendicular to the direction of travel. By analysing the data for strong reflections and/or areas of shadow, seabed features such as anthropogenic debris can be identified.	ii) To determine the nature of the sediment and differences in the seabed material across the survey area.

1.2 Summary of events

Table 1.2. Summary of Survey Events

Date	Event
15/08/05	Mobilisation to Ramsgate Marina
16/08/05	Commenced survey of site
25/08/05	Completed survey
25/10/05 – 26/08/05	Demobilisation

2.0. METHODOLOGY

This section includes a brief factual description of the methods used to achieve the project objectives. More detailed descriptions of specific survey techniques and procedures are contained within Emu Limited Method Statement, numbers 8 and 9 (a component part of the Company's QA Manual - details of which can be inspected on request).

2.1 Horizontal Positioning

Table 2.1. Summary of Horizontal Positioning Methodology

POSITIONING	
Requirement	**Application**
• To provide navigation information to on board sensors with an accuracy of 3-5m.	Two independent DGPS Navigation systems were used. These receivers obtain differential corrections via the MF radio band from a network of beacons located around the British coast, and use the data to correct positions in real time. This enables the location of seabed information collected by on board sensors to be recorded with a high degree of accuracy and repeatability, typically better that 3m.
Data Collection	
Survey Dates:	16/08/05 – 25/08/05
Equipment Used:	Trimble AgGPS Navigation DGPS (primary) Ashtead 3011 DGPS (secondary) Trimble HYDRO*Pro* navigation software.
Vessel:	Emu Surveyor
Methodology:	

The survey was undertaken in accordance with the relevant standard Emu Limited Method Statements. The DGPS receiver was configured to receive corrections from North Foreland. The vessel position was continuously updated and logged at regular intervals using Trimble HYDRO*Pro* navigation software.

Navigation Settings			
Geodetic Parameters System Source (GPS)		Projection Parameters	
Spheroid	WGS 1984	**Projection**	UTM Zone 31 N
Semi-major axis	6378137	False Easting	500000
Semi-minor axis	6356752.3142451793	False Northing	0
Inverse Flattening	298.257223563	Central Meridian	3
		Scale factor	0.9996

Outputs

- Chart Figure No J.1.02.0837.01 Trackplot (data coverage) Chart

2.2. Single Beam Bathymetry Survey

Table 2.2. Summary of Single Beam Bathymetric Survey Methodology

SINGLE BEAM BATHYMETRY SURVEY	
Requirement	**Application**
• To provide information on seabed bathymetry within the survey areas.	• The echo soundings provide information on the level of the seabed relative to the water level. By combining this with tidal data, the level of the seabed relative to Chart Datum can be determined.
Data Collection	
Survey Dates:	16/8/05 – 25/8/05
Equipment Used:	Navisound 215 Dual Frequency Echosounder, TSS CMS25 motion reference unit
Vessel:	Emu Surveyor
Methodology: The single beam echosounder survey was conducted in accordance with the relevant Emu Limited Method Statements. Data was recorded both digitally and on paper record to ensure 100% data back up. The data collection rate was controlled by the pulse repetition rate of the echosounder and the logging rate set at 1 sec (approximately every 0.5m at survey speed). Bathymetric points were logged along with heave compensator and DGPS navigation data as the vessel progressed along each survey line. A heave compensator was interfaced directly to the HydroPro data acquisition system and data displayed on-line. This data was later applied to soundings as part of the processing and reduction process.	
Comments: Tidal correction data used for this survey were obtained from the UK National Tide Gauge Network from the Sheerness tide gauge and were co-tidally corrected for the survey area. All data have been reduced to Chart Datum for the purpose of this study.	
Outputs	
• Chart Figure No J.1.02.0837.02	Bathymetric Soundings Chart

2.3. Sidescan Sonar Survey

Table 2.3. Summary of Sidescan Sonar Survey Methodology

SIDESCAN SONAR SURVEY	
Requirement	**Application**
• To provide information on seabed material types and distribution. • To identify the nature and location of any seabed features.	A high-frequency sidescan sonar provides high-resolution acoustic images of the seabed. The configuration of the system, with wide vertical and narrow horizontal beam angles, enables a swath of the seabed to be imaged by each pulse. Qualitative interpretation of the strength of the acoustic response enables the identification of both topographic and material changes within the surveyed area.
Data Collection	
Survey Dates: 16/8/05 – 25/8/05	
Equipment Used: EG&G 272TD towfish EG&G 260 thermal paper recorder CODA DA200 four channel digital acquisition and processing system SonarWiz processing software	
Vessel: Emu Surveyor	
Methodology: The sidescan sonar survey was conducted in accordance with the relevant Emu Limited Method Statements. Throughout the majority of the survey the sidescan sonar was generally towed between 2m - 5m from the stern of the vessel. Any alterations to tow lengths were logged as changes were made. Seabed features were corrected for towfish layback during interpretation and plotting. The sonar system was operated at a frequency of 100kHz, a 230ms trigger was used and a 3ms pulse width resulting in a 200m across track swath. Digital sidescan sonar data were examined for distribution of different sediment types as well as seabed features (ripples, scour marks, etc). The boundaries of the different sediment types were plotted on the seabed features chart.	
Outputs	
• Chart Figure No J.1.02.0837.03 Seabed Features Chart	

3.0 RESULTS

Data from the survey are presented in this section, with figures, drawings and data presented in the Appendices.

3.1. Data Quality

3.1.1 Horizontal Positioning

The horizontal accuracy (DGPS status) was monitored throughout the survey period and it was of good quality. Navigation checks were carried out at a known location within Ramsgate Harbour on each survey day and these co-ordinates were noted in the Daily Logs (Volume II, Appendix I).

3.1.2 Bathymetry

Depth data has been heave corrected and reduced to Chart Datum using tidal data obtained from the UK National Tide Gauge Network, run by the Tide Gauge Inspectorate for the survey dates specified. The tidal data used were from Sheerness and they were co-tidally corrected for the survey site. A quality check of the co-tidally corrected data was carried out by using data from Felixstone. Following these reductions, primary and crossline depth values were compared. These correlated well, indicating a good quality of results obtained.

3.1.3 Sidescan Sonar

All sidescan sonar data collected during the survey were of high quality. Data were both recorded digitally as well as with paper records for quality control. The main restriction with the data and its interpretation was the fact that the data collected is a very small representation of the entire area of interest.

The positional accuracy of all boundaries presented is taken to be ±5m (95% confidence).

3.2. Bathymetry

Results are presented in Drawing No. J.1.02.0837.02

Throughout the sandbank area there is significant variation in seabed level. Depths range between 1.4m above Chart Datum and 29.6m below Chart Datum.

Depth data compares well with the Admiralty Chart, however the boundaries of the sandbanks seem to have shifted slightly. Due to the wide spacing of the survey lines it is not possible to accurately depict the limits of the sandbanks and further field work will need to be done in order to determine with accuracy the boundaries as well as possible movement of the sandbanks.

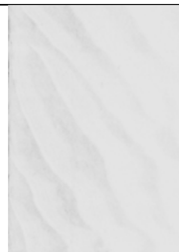
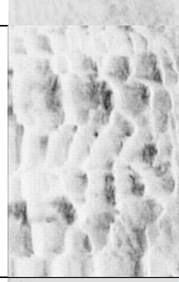
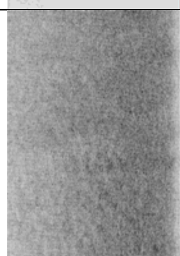
3.3. Sidescan Sonar

Results are presented in Drawing No. J.1.02.0837.03

3.3.1 Seabed Features

The sidescan sonar data acquired from the area revealed numerous different sediment types. Nevertheless grouping of different sub-types facilitated the interpretation of the sediment on the seabed as well as the features that are present. The analysis of the data revealed seven principle seabed types throughout the survey area and these are listed in Table 3.1 below.

Table 3.1 Seabed Types

	**Seabed type 1**: Low height and wavelength underdeveloped ripples in a sandy seabed
	**Seabed type 2**: Flat featureless seabed with fine sand mixed occasionally with cobbles and gravel
	**Seabed type 3**: Low height and wavelength ripples in a seabed consisted of sand and fine gravel and occasional patches of shell fragments
	**Seabed type 4**: Flat featureless seabed with fine sand
	**Seabed type 5**: Coarse sand and gravel with occasional relief
	**Seabed type 6**: Well developed ripples with dimensions wl<4m, H<0.5m in a sandy seabed
	**Seabed type 7**: Seabed consisting of fine sand with ripples with dimensions wl >6m, h>0.7m

The acoustic character of the seabed, as shown by the sidescan sonar data is very mixed. The majority of the surveyed area consisted of sediments of sand and fine gravel with occasional small dimension ripples (Seabed type 3). The ripple height in this sediment type is in general less <0.7m and the wavelength <6m. This sediment type is also more typical of the SW part of the area.

The second most often observed sediment type is a flat featureless seabed of sand with occasional presence of gravel or shells (types 2 and 4). This sediment type is mostly observed in the areas around the sandbanks and the shallower parts of the region surveyed.

Another type that is observed in the northern area sandbanks is of fine sand with medium dimension ripples (height >0.7m and wavelength >6m), type 7. In the deeper parts of the region the seabed consisted of sand with small dimension well-developed ripples (height<0.5m and wavelength<4m). The rest of the types defined were not observed in any specific area, but in several different depths and locations. These were of low height and wavelength with under-developed ripples in sandy seabed, flat sandy seabed or seabed consisting of coarse sand with occasional relief.

4.0 CONCLUSIONS

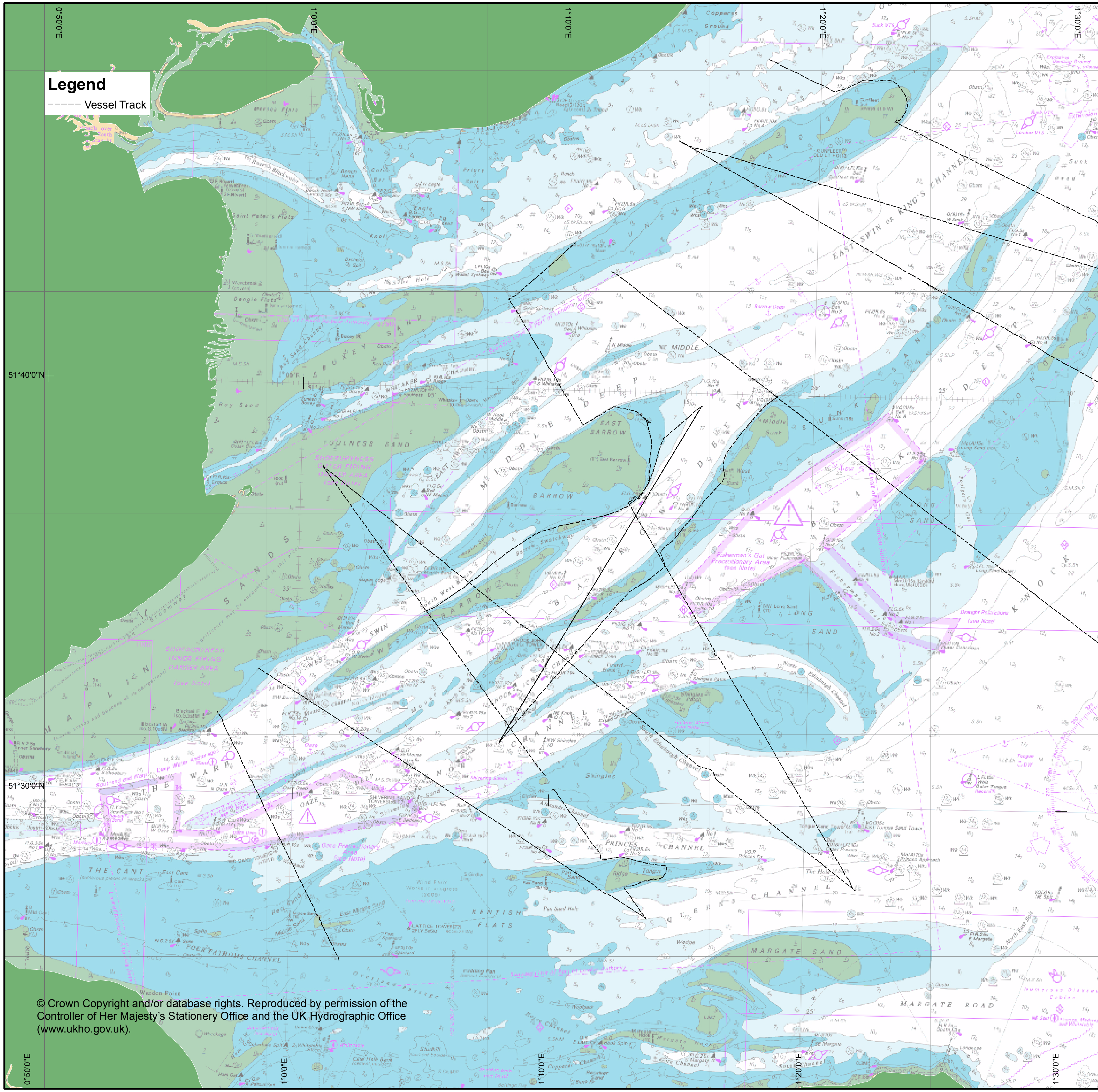
The survey was performed to the highest standards using the best available equipment and experienced personnel. The data collected during this survey were of a good quality, the required coverage was obtained, and the data have passed Emu's quality assurance checks.

As part of Emu's Quality Assurance procedures and in the interests of our ongoing development, every contract undergoes a comprehensive review on completion. This process is designed to identify any areas where improvements can be made. No deficiencies or recommendations were raised and all the requirements of the survey were met.

The results revealed seven distinct seabed types as summarised below:

Type 1	Low height and wavelength underdeveloped ripples in a sandy seabed.
Type 2	Flat featureless seabed with fine sand mixed occasionally with cobbles and gravel
Type 3	Low height and wavelength ripples in a seabed consisted of sand and fine gravel and occasional patches of shell fragments
Type 4	Flat featureless seabed with fine sand
Type 5	Coarse sand and gravel with occasional relief
Type 6	Well developed ripples with dimensions wl<4m, H<0.5m in a sandy seabed
Type 7	Seabed consisting of fine sand with ripples with dimensions wl >6m, h>0.7m

These seabed types were used to help define the biotopes identified and reported in Volume I, Part II: Biological Survey of the Outer Thames Estuary Sandbank System.



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Project
Acoustic Survey of the Outer Thames Estuary Sandbank System

Title
Trackplot (data coverage) Chart

Job No:	Sheet Size:	Scale	Drawn by:
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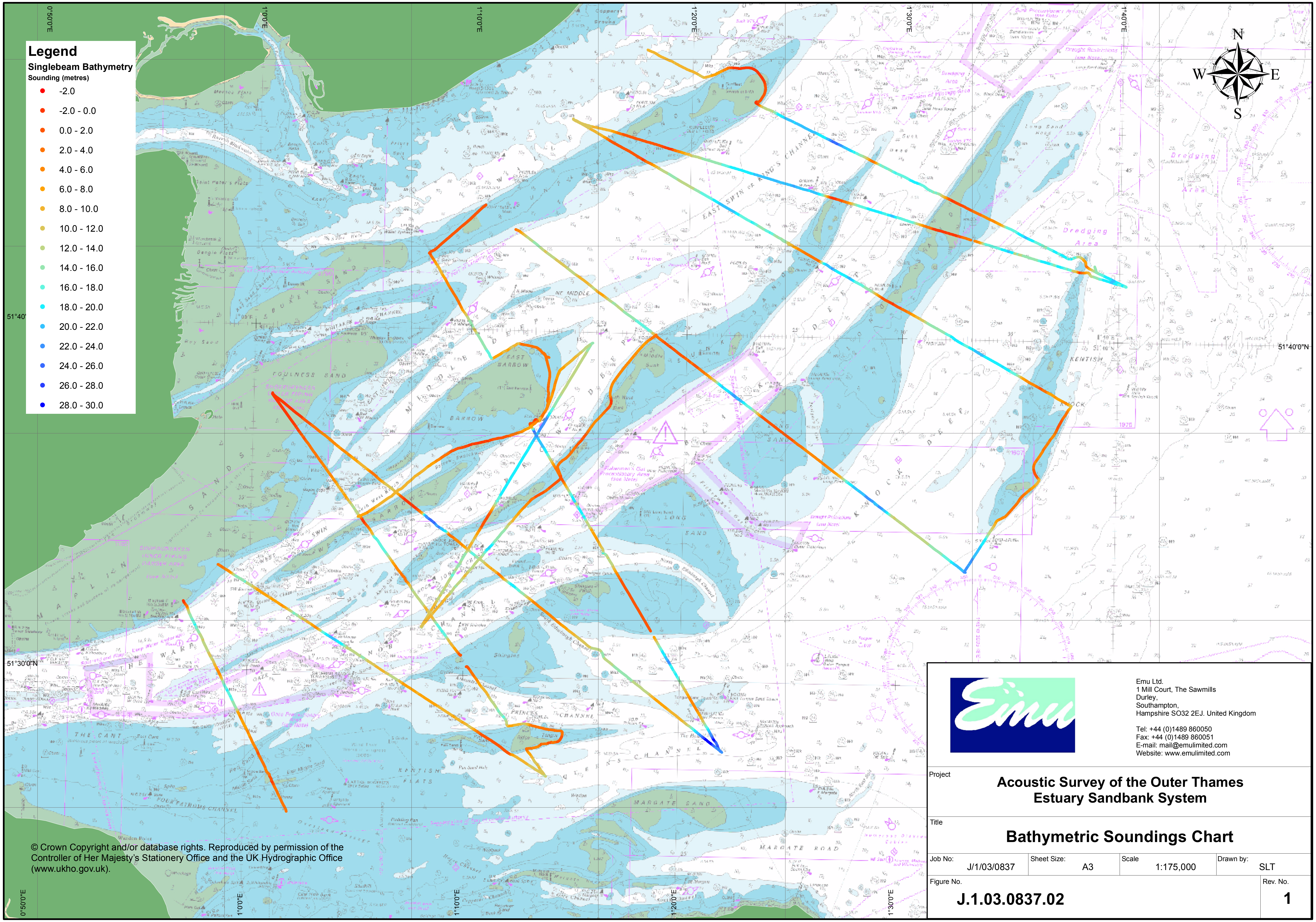

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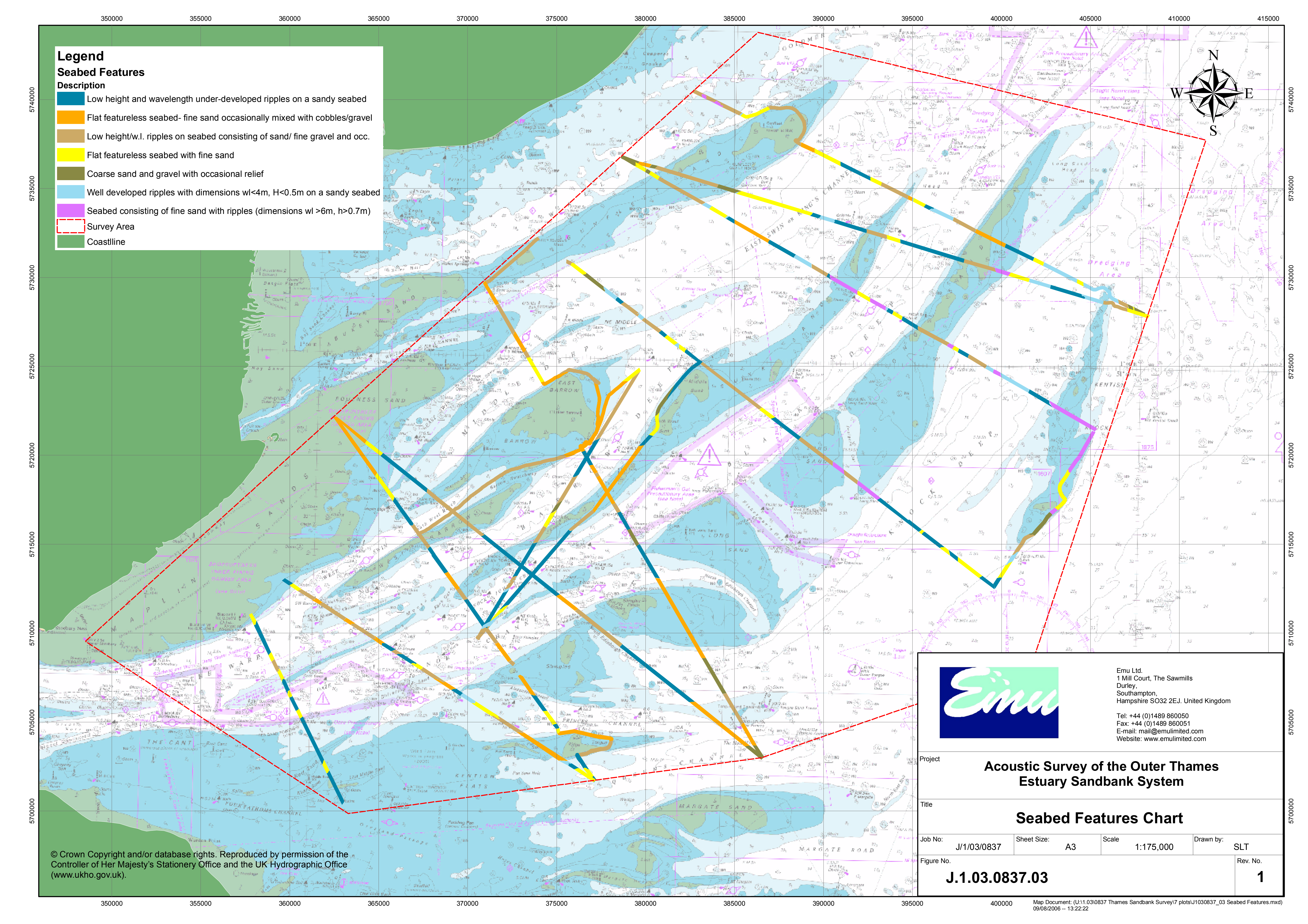
Legend
Seabed Features
Description
Low height and wavelength under-developed ripples on a sandy seabed
Flat featureless seabed- fine sand occasionally mixed with cobbles/gravel
Low height/w.l. ripples on seabed consisting of sand/ fine gravel and occ.
Flat featureless seabed with fine sand
Coarse sand and gravel with occasional relief
Well developed ripples with dimensions wl<4m, H<0.5m on a sandy seabed
Seabed consisting of fine sand with ripples (dimensions wl >6m, h>0.7m)
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Project
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Title
Seabed Features Chart
Job No: J/1/03/0837
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Part II:

Biological Survey of the Outer Thames Estuary Sandbank System

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VOLUME I - PART II

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1.0 Introduction and Objectives

The principal objectives of the biological study were to broadly characterise the biotopes found within the whole Outer Thames Estuary sandbank system and assess the species richness and diversity supported by the Outer Thames Estuary sandbank feature.

The remit of this current biological study was to sample and analyse the benthic macrofaunal communities only. The benthic meiofauna and marine flora were not targeted during this study and therefore have to be excluded from any discussions as were any marine mammals and birds.

2.0 Methods

2.1 General

Day Grab and Mini-Hamon Grab sampling ($0.1m^2$), Anchor Dredging, 2m Beam Trawling, drop down video and the subsequent laboratory and data analyses were carried out by Emu Limited. All field and laboratory methods employed by Emu conformed to in-house operating procedures and/or ISO9001 control procedures where appropriate and are detailed in the text below.

Analysis (taxonomy) of all the macrofaunal samples was undertaken by Emu who are participants in the National Marine Biological Analytical Quality Control Scheme (NMBAQC) scheme. This scheme is an independent, national QC scheme designed to assess the quality of marine benthic taxonomy between laboratories in the United Kingdom. The Emu laboratories have participated since 1996 and have consistently achieved >95% compliance with the scheme. Emu undertook Quality Control checks on a representative number of whole samples as well as the entire reference collection in compliance with internal analytical quality control criteria.

The sediment particle size distribution analysis (PSA) was undertaken at Emu's UKAS accredited sediment laboratory.

2.2 Survey Design

The sampling survey was designed to sample the major seabed types (i.e. sands, gravels and muddy sediments) and therefore the representative biological communities found within the Outer Thames Estuary sandbank feature.

This was achieved by conducting an initial broadscale acoustic survey along pre-chosen transects using sidescan sonar and single beam bathymetry techniques (see Volume I, Part I). Sample sites were then targeted along these transects to include the major seabed types indicated by the acoustic backscatter. The positions of these sites were then taken and entered digitally onto the vessels navigation system and marked on a copy of the Admiralty chart.

The primary survey tool for both the sands and the unconsolidated mud was a Day Grab ($0.1m^2$). For the coarser sediments a Mini-Hamon Grab ($0.1m^2$) was deployed. A single grab sample was collected at each site with sub-samples taken for PSA and organic content. All the grab samples were retained and sieved over a 1mm mesh prior to laboratory analysis.

Deeper burrowing fauna were sampled using an Anchor Dredge at a selected number of sites where the grab samples had also been collected.

In addition to the grab sampling, two metre scientific beam trawling was also conducted to sample the epibenthic and fish species within the study area using approved CEFAS methods (tow of approximately 100 metres (5-10 minutes tow)). Trawl lines were positioned so as to sample the range of substrate types present within the study area and each was located within close proximity to a current grab site. Fish and conspicuous fauna were recorded and enumerated at each site. A representative sub-sample was retained and returned to the lab for analysis.

The sample site array for the Day and Mini-Hamon Grab, Anchor Dredge and trawls are given in Chart Figures 2.1, 2.2 and 2.3. (Figure Appendix). The total number of samples collected are summarised below:

Grab samples	-	100
Anchor Dredge samples	-	33
Beam trawl samples	-	30

Video surveying and underwater stills photography on the seabed at each site was planned, however, when conducting the survey, the visibility was consistently zero and this part of the survey was abandoned.

2.3 Benthic Sampling and Beam Trawl Surveys

All the Day Grab sampling, the majority of the Mini-Hamon Grab sampling and all the Anchor Dredging were conducted from the 27th August to the 1st September 2005 onboard the vessel MV *Ina K* sailing from Leigh-on-Sea. Horizontal positioning was provided using Leica MX 412 DGPS navigation equipment accurate to +/- 5m. Sample site positions were recorded in Geodetic WGS84 every time the grab touched the seabed as indicated by the winch wire slackening. All grab and dredge samples were taken within 0-10 metres of the positions agreed prior to the survey.

The remaining Mini-Hamon Grab sampling and the full two metre scientific beam trawl survey were conducted from the 1st to the 4th September 2005 onboard the vessel MV *Aire Dirk* sailing from Westcliff. The start and end of the line position for each trawl deployment was taken once the trawl had reached the seabed as evidenced by tension on the winch cable with the end position noted once the hauling of the trawl had commenced.

All field sampling methods employed were consistent with Emu Methods: (MET/05) Infaunal and Epifaunal Sampling Methods and Procedures (Emu 2004b). Survey logs for both surveys are presented in Volume II, Appendix I.

2.4 Onboard Sample Treatment

2.4.1. Day Grab and Mini-Hamon Grab

The samples were taken using a stainless steel Day Grab for soft substrata and a stainless steel Mini-Hamon Grab for harder or gravelly substrata. Both sample an area of 0.1m^2.

Upon recovery of the grab, the sample was checked through the viewing hatch. If the grab had failed, the grab washed thoroughly and another grab sample taken at the same site. An acceptable sample was dropped into a hopper placed under the grab and any sediment retained in the grab was washed into the hopper. An *in-situ* photograph of the sample was taken (presented in Volume II, Appendix II) as well as a description of sediment characteristics, including the depth of the redox layer. A single faunal sample was taken for analysis at each site with a small sub-sample taken out for particle size analysis (PSA).

The PSA samples were held in labelled plastic bags onboard the vessel and stored in a refrigerator on return to the Emu laboratory prior to any analysis. The faunal samples were stored in labelled plastic buckets and fixed in 4% buffered formal saline solution onboard the vessel. All the samples were subsequently returned to Emu Laboratories for registration, processing and faunal analysis.

2.4.2. Anchor Dredge

A stainless steel Anchor Dredge was deployed in conjunction with the grab sampling at selected sites in order to sample the deeper burrowing megafauna.

The Anchor Dredge consists of an empty oblong box, open at the front end, (0.7m wide x 0.2m high x 0.5m long). A fixed rigid bridle is welded to each side of the box to hold the wires and the dredge's position on the seabed during deployment.

The Anchor Dredge is deployed similarly to a ship's anchor by being lowered to the sea-bed as the vessel steams slowly forward thus allowing the dredge to bite into the sediment. The vessel then stops or manoeuvres astern so the dredge can be broken free of the sediment as the vessel moves nearly directly overhead.

The retrieved sample from the Anchor Dredge was scooped out of the box and sorted in a tray on the deck. An *in-situ* photograph of the sample was taken (presented in Volume II, Appendix II). Conspicuous infauna and epifauna were removed and the remaining sediment discarded. Some specimens were identified onboard by Emu-trained field taxonomists, enumerated and thrown back live into the sea. The remaining fauna were stored in labelled plastic buckets and fixed in 4% buffered formal saline solution onboard the vessel. The samples were subsequently returned to the Emu Laboratories for registration, processing and faunal analysis.

2.4.3. Beam Trawl sampling

A two metre scientific Beam Trawl with a 5mm cod end mesh was deployed and towed over a distance of 100m at 1.5 knots for 5 minutes. Upon recovery, the trawl net was emptied by releasing the cod end, and the sample collected in fish crates. An *in-situ* photograph of the trawl was taken before processing the fauna (presented in Volume II, Appendix II). Fish species were identified on site, enumerated and thrown back live into the sea. Rarer conspicuous fauna were also identified, enumerated and thrown back live into the sea. All *in situ* identification was conducted by Emu-trained field taxonomists with representative examples of all the species recorded on site preserved and taken to the laboratory for confirmation of identification. A sub-sample (actual volume recorded on site) of the remaining trawl was preserved in 4% buffered formal saline solution and subsequently taken back to the laboratory for full species analysis and enumeration.

2.5 Laboratory sample analyses

2.5.1. Laboratory Particle Size Analysis (PSA) and Organic Matter Content Analysis

Particle Size Analysis (PSA) was undertaken at Emu Limited's UKAS accredited laboratory, employing Emu Limited's In House Methods (MET/01) for the Determination of Particle Size Distribution (based on BS1377, 1990 part two and three) (Emu 2005), and Emu Limited's in-house methods for the Determination of Particle Size Distribution by Malvern Microsizer Laser Diffraction (MET/02) (Emu 2004a). Organic matter content was calculated using the Weight Loss on Ignition Technique (LOI) (MET/01) (Emu 2005). Samples with shell present were pre-treated with acid to eliminate the excess carbonate. The latter method does not fall under UKAS accreditation.

2.5.2. Macrobenthic Taxonomic analysis

2.5.2.1. Day and Mini-Hamon Grab samples

On return to the laboratory, the macrofaunal grab samples were gently washed in cold water and sieved over a 1mm mesh to remove fine sediment material and preservative. Biological material retained on the 1mm mesh was then sorted from the sediment by elutriation, with the remaining sediment sorted by hand under a binocular microscope to ensure no fauna remained. Following sorting, the residual sediment fractions were retained for future quality control auditing as detailed in Emu Limited's in-house methods (MET/07) for the Processing and Analysis of Macro-Invertebrate Samples (Emu 2006).

Macro-invertebrates from the grab samples were identified to species level, where possible, and enumerated. The colonial sessile epifauna from the grab samples were identified to species level, where possible, and recorded using the in-house abundance scale below (MET/05) (Emu 2006).

Abundance scale category	Description	Nominal abundance
1	Inconspicuous within sample. Close examination required to discern presence of 1-2 zooids/small colonies only.	3
2	Inconspicuous within sample. Close examination required. More than 2, less than 10 zooids / colonies	7
3	Conspicuous within sample but low in abundance	20
4	Immediately conspicuous within sample, occurs on most substrates.	54
5	Dominant, widespread on all hard surfaces within sample.	148

2.5.2.2. Anchor Dredge samples

On return to the laboratory, the macrofauna from the dredge samples were washed over a 1mm sieve and identified to species level, where possible, and enumerated. The colonial sessile epifauna from the dredge were recorded as presence/absence only. All biological material was stored in 70% Industrial Methylated Spirit (IMS). Any species found in the dredge material not represented in the grab faunal reference collection were duly added and checked by in-house QC procedures.

2.5.2.3. Beam Trawl samples

Specimens obtained from the trawl were washed over a 5mm sieve. Those brought back for species confirmation were checked and added to the faunal reference collection. The fauna from the trawl sub-sample were washed and identified to species level, where possible, and enumerated. All biological material was stored in 70% Industrial Methylated Spirit (IMS). The number of individuals of the trawl species recorded from the sub-samples were multiplied up and reported as number of individuals per haul. The fish counts remain as individuals per haul. Colonial sessile epifauna were recorded as presence/absence only. Any species found in the trawl material not represented in the grab faunal reference collection were duly added and checked by In-house QC procedures.

All biological material was stored in 70% Industrial Methylated Spirit (IMS). The faunal reference collection prepared with individuals of all species identified is retained for future reference by Emu. This will allow for future checks on taxonomic classification to be made when assessing comparative monitoring data. Emu undertook QC checks on the reference collection and on a representative number of whole samples in compliance with internal analytical quality control criteria.

2.6 Day and Mini-Hamon Grab Macrobenthic and PSA Data Analysis

Prior to any statistical analyses the macrofaunal abundance dataset for the Day and Mini-Hamon Grab samples was subject to some rationalisation to eliminate excess bias. Taxa whose identity was indeterminable were removed. Juvenile taxa were also removed. To enable them to be included in the statistical analysis, the epifaunal taxa scored using the In-house abundance scale were subject to an inverse $\log_e$ transformation using the function $a = e^x$ (where a is the nominal abundance and x is the estimated abundance scale category) to convert the scores to estimated number of individuals per m^2. The table below shows the conversions used:

Emu in-house abundance scale	No. individuals/0.1m^2
P1	3
P2	7
P3	20
P4	55
P5	148

As a further attempt to rationalise the data, rare species were removed from the dataset. This was done by calculating what percentage of the total abundance each taxon accounted for across all samples. All those species which contributed <0.1% and <1% of the total abundance were eliminated. Runs of the multivariate analyses on both the full (with rare taxa) and reduced (without rare taxa) showed that removal of all rare taxa had no significant effect on the faunal groupings. Therefore, all analyses results presented were performed on the full (with rare species) rationalised data set.

The macro-invertebrate community structure was investigated by employing a number of multivariate and univariate statistical measures drawn from the Plymouth Marine Laboratories PRIMER v6 suite of programs (Clarke & Gorey 2006; Clarke & Warwick 2001).

Faunal data were imported into PRIMER, and subject to transformation. Transformation is most commonly applied where the fauna is numerically dominated by a few species. This has the effect of masking the underlying community structures. Transformation reduces the influence of these more dominant species, with transformations ranging in severity from no transformation to the reduction of all the data to presence/absence only. In the case of the Outer Thames Estuary sandbank macrofaunal data, a 4^{th} Root (or Root-Root) transformation was found to be the most effective on the dataset and was applied. This transformation serves to down-weight the dominant species, taking a much greater account of the less frequently occurring species, and allowing the underlying community structure to be assessed.

The transformed data was then subjected to hierarchical clustering. This cluster analysis divides sites into groupings based on a measure of similarity, in this case the Bray-Curtis index, which compares all samples with all other samples, producing a similarity matrix. The cluster analysis gradually combines sites into groups starting with the highest mutual similarities and then gradually lowering the similarity level at which groups are formed. The process ends with a single cluster containing all sites, and is best expressed as a dendrogram diagram, showing the sequential clustering of sites against relative similarity. The **sim**ilarity **prof**ile (SIMPROF) test was run in conjunction with cluster analysis. This test is a permutation test of the null hypothesis that a set of specified samples, which are not *a priori* divided into groups do not differ from each other in multivariate structure and looks for statistically significant evidence of 'true' clusters in samples.

The cluster analysis is best used together with **m**ulti-**d**imensional **s**caling (MDS) or ordination analysis and allows a check on the 'goodness of fit' of the clusters produced by both types of analyses. The MDS analysis uses the same similarity matrix as that used by the cluster analysis to produce an ordination of sites which is multi-dimensional. This attempts to satisfy all of the between-sites relationships indicated by the similarity matrix, in terms of the multi-dimensional spatial relationships between sites. This multi-dimensional ordination is then reduced to a 2 dimensional representation that is a more accessible and useable representation. The 'goodness of fit' of this 2 dimensional version, in comparison to the multi-dimensional array, is indicated by a stress level. The closer this stress level is to zero, the better the fit. Following the MDS analysis, the groupings of sites produced by the cluster analysis may be overlaid on the MDS plot to assess their validity.

SIMPER (**sim**ilarity **per**centages) analysis was also applied to the grab faunal dataset to gauge the faunal distinctiveness of each sample cluster, as identified by Bray-Curtis and MDS. The idea here is that each cluster contains its own characteristic suite of macrofauna which is different to that of the other sample clusters. The taxa within each cluster are ranked with respect to the "within" sample cluster similarity contributed. Also, SIMPER provides a ranked list of taxa that contributes most to the dissimilarity between samples clusters. The percentage dissimilarity between clusters, together with the ranked list of taxa per cluster can offer an assessment of faunal distinctiveness for each sample grouping.

The features of each of the samples as well as the site groupings identified during the multivariate analysis may then be assessed using a variety of measures of community structure using univariate analysis techniques. Several univariate analyses have been applied to the Outer Thames Estuary sandbank data using the DIVERSE program from the PRIMER suite. These summarise the rationalised raw species data by calculating a range of indices, including Margalef's index of Richness, Pielou's Evenness index, the Shannon-Wiener Diversity index. Reference to the calculation of these indices may be found in Clarke & Gorley (2001). Such univariate indices are useful in reducing large faunal data sets to a single figure that may be used in comparison to other sites in assessing community structure and changes.

The DIVERSE program was also used to calculate a taxonomic-related measure of diversity. This requires the species found in the study to be arranged in order and classified into a hierarchal taxonomic tree in order to see how the sites differed in their taxonomic relatedness. This is expressed as quantitative indices of taxonomic distinctness (Δ^*) which can be compared with other faunal datasets from the region.

Sediment data were also imported into PRIMER v6 and transformed. The transformed data was then subjected to hierarchical clustering using Euclidean distance as the similarity measure. These were subject to Cluster, SIMPROF, MDS and PCA ordinations. The PCA (Principal Component Analysis) ordination summarises the relationship between the samples pictorially in a two-dimensional plot. The distance between each point to each other reflects the relative dissimilarity between them i.e. the points nearest to each other are very similar in composition, whilst those furthest apart have very little in common with each other. The biggest differences in the samples will take place along the PC1 axis, with relatively small changes taking place in the PC2 direction.

BIOENV (also available within the PRIMER v6 suite) was applied to the data. BIOENV reveals those environmental variables which best match the observed grouping of faunal samples following the application of the Bray-Curtis similarity measure. Single and multiple combinations of variables can be input in order to assess those environmental factors which best fit the pattern of macrobenthic distribution. A ranked correlation using the Spearman method was applied.

Finally, both biological data and sediment characteristics have been further interrogated using MAPINFO (a geographic information system or GIS). This software allows a range of variables to be plotted relative to the spatial distribution of the sampling sites. This allows spatial relationships in the data to be represented visually, and trends can be discerned.

3.0 Results

3.1 Particle Size Analysis (PSA)

The surface sediments of the Outer Thames Estuary sandbank study area have been characterised through particle size analysis (PSA) and subsequently classified using the MNCR sediment nomenclature (Connor *et al* 2004) which is based on the Wentworth scale (Wentworth 1922) and the sediment sorting index (Holme & McIntyre 1984).

Broad Description of Grain Size	Aperture (mm)	Aperture (phi units)
Cobble	64	-6.0
Pebble	32 16	-5.0 -4.0
Gravel	8 4	-3.0 -2.0
Coarse Sand	2 1	-1.0 0.0
Medium Sand	0.5 0.25	1.0 2.0
Fine Sand	0.125 0.063	3.0 4.0
Silt/Clay	<0.063	5.0

Sorting Index Values	Verbal Classification
<0.35	Very well sorted
0.35-0.50	Well sorted
0.50-0.71	Moderately well sorted
0.71-1.00	Moderately sorted
1.00-2.00	Poorly sorted
2.00-4.00	Very poorly sorted
>4.00	Extremely poorly sorted

Full results of the PSA are presented in Volume II, Appendix III, and include tabulated weight data for each whole phi mesh aperture, % fractional data, % cumulative data and sediment description. Fractional histograms and cumulative charts have also been presented for each sediment sample. Chart Figure 3.1 (Figure Appendix) shows the distribution of principal sediment components across the survey area.

A summary of the sediment data is presented in Table 3.1 below. Overall, the surface sediments reported from the PSA were found to be predominantly sand, with some silty sand, gravelly sand, silty gravelly sand and sandy silt. However, from the onboard visual observations of the grab sample, the gravel component at sites 23, 27, 50H, 80 and 83 appeared to be largely made up of broken dead shell.

3.1.1. Multivariate Analysis of PSA Data

A Cluster analysis was performed to produce a group average similarity sorting dendrogram for the sediment samples based on the percentage of principal sediment components (% gravel, % sand, % silt). In this instance, Euclidean distance has been used as a measure of similarity for the analysis of environmental data. This multivariate technique is used to investigate similarities between sediment samples as well as spatial trends in sediment types over the study area (Clarke & Warwick 2001). Several transformations were performed on the sediment dataset before applying any analyses to the sediment data. The 4th root transformation was chosen as it gave the best stress level indicating that this was the best fit for the dataset.

The similarity analysis dendrogram puts sites together which have similar particulate composition, and in the case of the Outer Thames Estuary sediment data, the plot revealed different groupings according to their particle size distribution. SIMPROF was run in conjunction with the Cluster analysis to investigate the whether the groupings seen on the plots were significantly different from each other (P = <5%) i.e. whether the clusters are genuine. The test results are displayed below by colour convention on the dendrogram (Figure 3.1 below): samples connected by red lines cannot be significantly differentiated i.e. they do constitute a significant cluster. The dendrogram reveals seven significant cluster groupings from the Outer Thames Estuary PSA data. The key shows that the groupings fall out according to their sediment classification.

A MDS ordination was applied to the data to compare each sample with each other sample so that their relative distances from each other within the resulting plot reflect their particle size distribution similarities (Figure 3.2). The extremely low stress value of 0.003 associated with the ordination plot indicates that this is an excellent two-dimensional representation of the particle size analysis data. The SIMPROF groups overlain on the MDS plot allows one to view the two techniques in combination. The MDS plot shows that the seven groupings revealed by SIMPROF are a good representation of the sample sediment size distribution.

Figure 3.1. Particle Size Distribution Data. Euclidean Distance Dendrogram. Sediment Data, 4th Root Transformed. Sediment Classification Based on the Wentworth Scale.

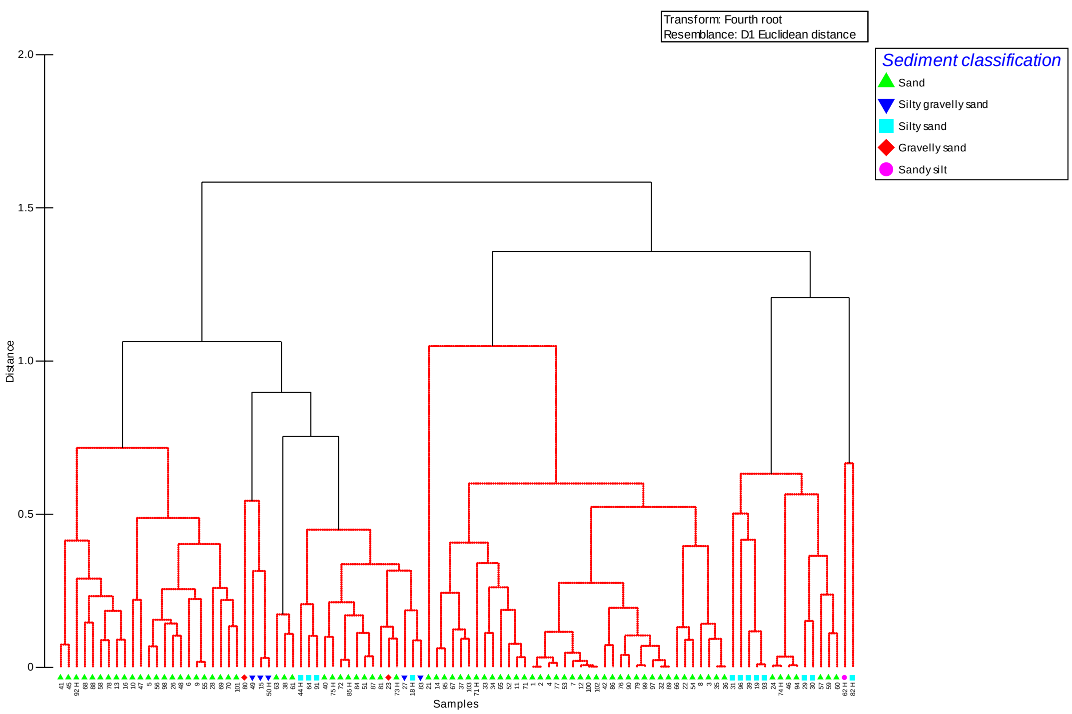
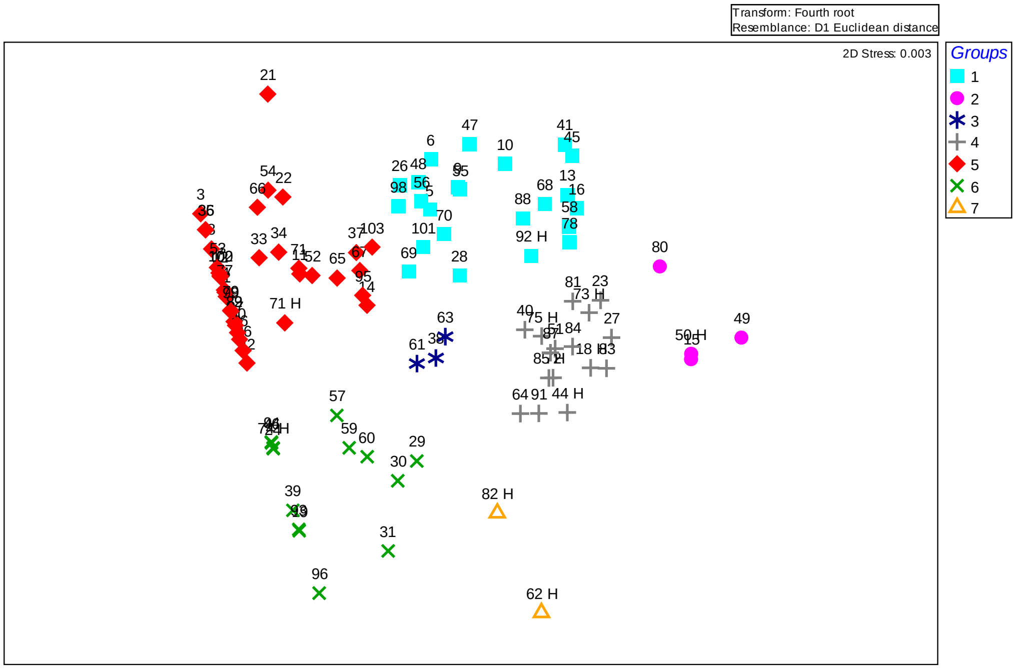


Figure 3.2. Particle Size Analysis Data. MDS Ordination Analysis. 4th Root Transformation. The cluster groupings (1-7) identified by SIMPROF are represented by coloured symbols.



The sediment samples taken from the Outer Thames Estuary sandbank survey area fell into the seven distinct groupings listed below:

- Group 1 (23 sites) - samples comprised of very poorly sorted, poorly sorted, moderately well sorted, moderately sorted and very well sorted sands with little or no silt or gravel.

- Group 2 (four sites) - all sites comprised of very poorly sorted silty gravelly sands and gravelly sands with between ~25 and 40% gravel (the gravel content in sites 80 and 50 H comprising of more shell).

- Group 3 (three sites) - sites comprised of well sorted sands with a slight silt influence.

- Group 4 (16 sites) - comprised of very poorly sorted sands with one site of poorly sorted sand. These ranged from sand, silty sand, silty gravelly sand and gravelly sand with ~5-20% silt and ~3-15% gravel.

- Group 5 (38 sites) - comprises sites of very well sorted, well sorted, moderately well sorted and moderately sorted sands with little or no silt.

- Group 6 (14 sites) - comprises of very poorly sorted and poorly sorted sands and silty sands with ~5-50% silt.

- Group 7 (two sites) - Both sites were very poorly sorted sandy silt and silty sands. Visual descriptions of these samples showed them to be muddy sandy clay, with site 82 H having some shell.

Although the Primer analysis split the sediment into seven groups, the area can be described as comprising predominantly of sands with some siltier areas with gravel/large shell found. The distribution of the PSA data suggests most sands are found on the sandbanks particularly further offshore with a greater diversity of sediments types inshore and in the channels.

The groups have been interpreted on the basis of broad sediment classification of percentage sand, gravel and silt. Figures 3.3a, b and c presented below illustrate in two dimensions the influence of the different principle components of sand, gravel and silt on the placement of the samples in their Cluster groupings and on the MDS ordination. Figure 3.3a illustrates how sand is the most dominant constituent of the sediments in the surveyed area. However, if we view both Figures 3.3 b and c and use the PC1 axis as indicating where the variance of the sample points is maximised, then the percentage of silt in the samples seems to be the most influential component in separating out the groupings.

It should be noted that the plots illustrate the distribution of superficial *surface* sediments only, and do not necessarily reflect the underlying geology. The sediment data was also taken from only one point source per site with no replication so any local variability in the surface sediments could not be assessed in the analyses or interpretation of the data.

Figure 3.3.a) 2-D Correlation-Based PCA Ordination of Site Sediment Particle Size Data.

a)

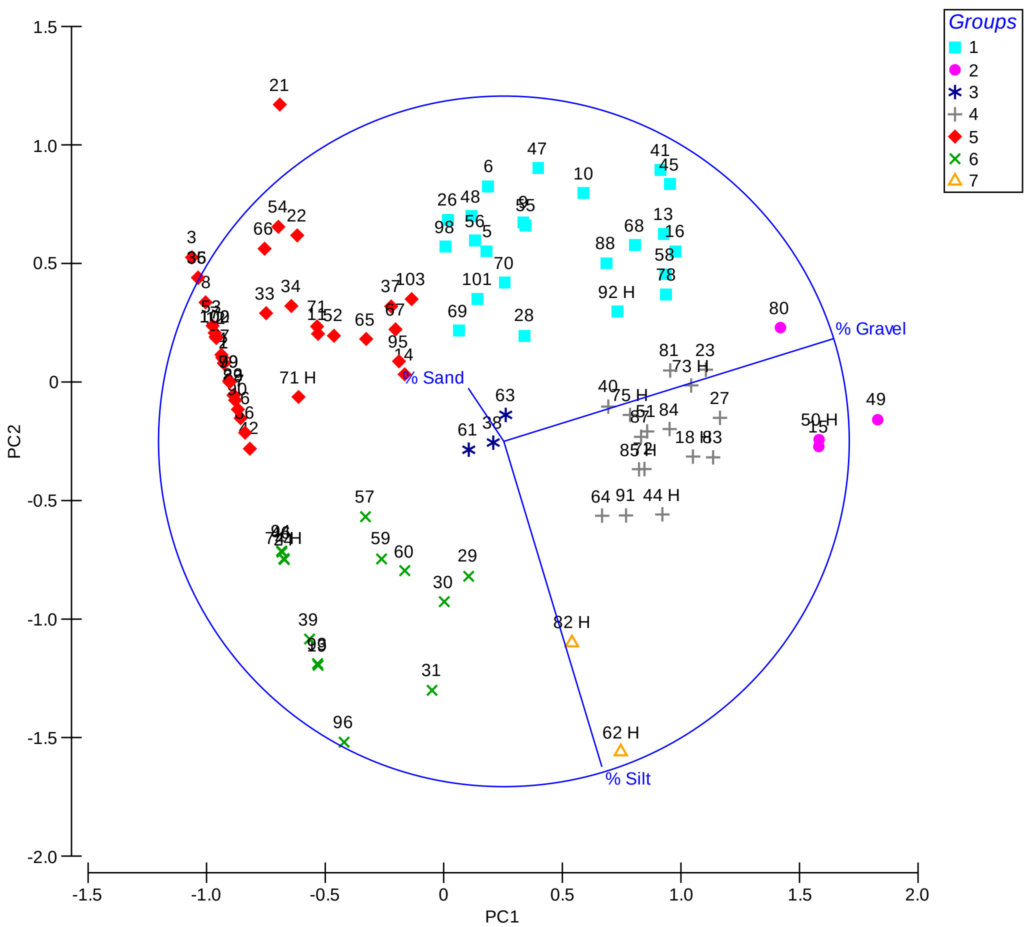
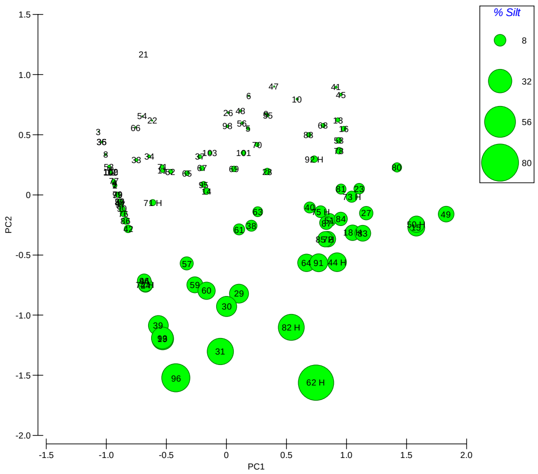


Figure 3.3 b & c) 2-D Correlation-Based PCA Ordination of Site Sediment Particle Size Data with Superimposed Circles Proportional in Diameter to Values of b) % silt and c) % gravel.

b)



c)

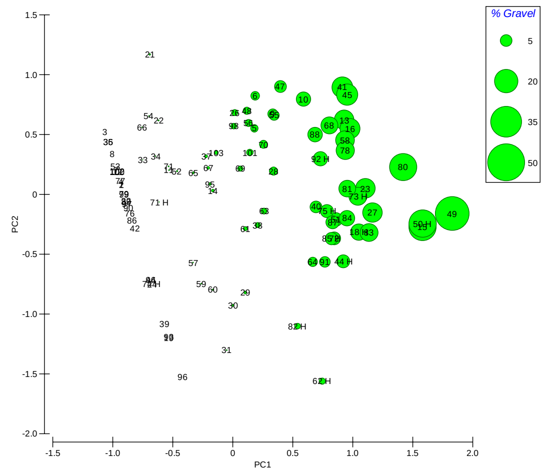


Table 3.1. Summary of Sample Sediment Data

Site no.	Water depth (m)	% Gravel	% Sand	% Silt	% Organic Carbon	Classification	Additional info from *In-situ* Observations	Depth of redox layer below surface (bs)	Sorting Index
1	9	0.000	99.059	0.941	0.773	Sand	Fine		Very well sorted
2	15	0.000	99.057	0.943	0.514	Sand	Silt balls on surface.		Very well sorted
3	2	0.000	99.931	0.069	0.751	Sand	Fine		Well sorted
4	17	0.000	99.147	0.853	0.475	Sand	Fine/med		Very well sorted
5	22	2.060	97.396	0.544	0.648	Sand	Small lumps grey clay		Moderately well sorted
6	10	2.706	97.167	0.127	2.457	Sand	Med		Moderately sorted
7	8	0.000	99.478	0.522	0.670	Sand	Coal fragments		Very well sorted
8	7	0.000	99.740	0.260	0.629	Sand	Sand and shell (50:50). Lumps black anoxic clay.		Very well sorted
9	25	3.620	95.998	0.383	0.710	Sand	Sand and shell (50:50). Patchy lumps of black anoxic clay.		Poorly sorted
10	6	7.560	92.144	0.296	0.984	Sand	Dead cockles and *Ensis*		Poorly sorted
11	10	0.030	99.029	0.941	0.579	Sand	Silt balls. Coal fragments		Very well sorted
12	21	0.000	99.419	0.581	0.487	Sand	Fine		Very well sorted
13	16	13.859	85.153	0.987	1.503	Sand	Large dead *Ostrea* valves		Very poorly sorted
14	3	0.263	97.228	2.509	0.762	Sand	Fine		Very well sorted
15	22	27.068	56.605	16.327	1.380	Silty gravelly sand	Silt over sandy/muddy gravel over clay layer.		Very poorly sorted
16	12	14.603	84.032	1.365	1.142	Sand	Big shells present.		Very poorly sorted
18 H	16	9.862	76.295	13.843	1.379	Silty sand	Sandy silty shell		Very poorly sorted
19	12	0.000	72.108	27.892	1.670	Silty sand	Silty sand over sloppy grey silt with lumps soft clay, Anoxic layer smells H_2S.	2cm bs	Poorly sorted
21	22	0.086	99.914	0.000	0.521	Sand	Med/coarse sand, ~20% shell. Reddish colour. Clump dead *Sabellaria*		Moderately well sorted
22	2	0.042	99.862	0.096	0.526	Sand	Fine		Moderately well sorted
23	28	13.920	79.593	6.487	1.234	Gravelly sand	Silty shelly sand/encrusting thick *Sabellaria* (not reef)		Very poorly sorted
24	19	0.000	88.302	11.698	0.957	Sand	Fine		Poorly sorted
26	6	1.358	98.423	0.219	0.885	Sand	Shelly sand		Moderately sorted
27	23	13.813	75.599	10.589	1.216	Silty gravelly sand	Silty shelly sand. Anoxic layer.	3cm bs	Very poorly sorted
28	6	2.418	95.139	2.444	0.783	Sand	Fine sand. Dead cockles		Very well sorted

Site no.	Water depth (m)	% Gravel	% Sand	% Silt	% Organic Carbon	Classification	Additional info from *In-situ* Observations	Depth of redox layer below surface (bs)	Sorting Index
29	10	0.270	78.850	20.880	1.393	Silty sand	Silt (5cm) over grey clay		Poorly sorted
30	10	0.121	76.210	23.669	1.486	Silty sand	Silty clay (grey)		Poorly sorted
31	16	0.032	59.581	40.388	2.054	Silty sand	Anoxic layer of clay with thin silty covering.	1mm bs.	Very poorly sorted
32	10	0.000	98.385	1.615	0.919	Sand	Silt balls. Coal fragments		Very well sorted
33	23	0.003	99.510	0.487	0.625	Sand	Large lumps of coal		Moderately well sorted
34	5	0.014	99.493	0.493	0.781	Sand	Fine		Well sorted
35	6	0.000	99.866	0.134	0.466	Sand	Coal fragments		Well sorted
36	18	0.000	99.868	0.132	0.471	Sand	Silty clay-like balls. Coal fragments		Moderately well sorted
37	24	0.309	98.821	0.870	0.735	Sand	Fine		Well sorted
38	27	0.957	91.764	7.280	1.030	Sand	Dead *Ensis*		Moderately sorted
39	31	0.000	77.062	22.938	1.646	Silty sand	Thin silty sand layer over solid strongly anoxic clay.	1 mm bs	Poorly sorted
40	16	5.008	87.826	7.166	0.779	Sand	Silty sandy shell		Very poorly sorted
41	16	15.787	83.933	0.280	1.163	Sand	Shelly sand		Very poorly sorted
42	20	0.000	96.530	3.470	0.831	Sand	Patches of anoxic sediment.		Very well sorted
44 H	13	6.169	73.560	20.271	1.224	Silty sand			Very poorly sorted
45	11	16.454	83.142	0.403	1.059	Sand	Sandy shell		Very poorly sorted
46	17	0.000	89.090	10.910	0.848	Sand	Brown sandy silt over grey sandy clay. Anoxic layer (smells H_2S).	4cm bs	Poorly sorted
47	20	5.140	94.745	0.115	0.377	Sand	Shelly med/coarse sand. Small clumps dead *Sabellaria*		Poorly sorted
48	21	1.940	97.823	0.237	0.725	Sand	Shelly medium sand with small amount silt. Patches anoxic sediment assoc. with silt.		Moderately sorted
49 H	13	41.781	43.908	14.311	1.705	Silty gravelly sand			Very poorly sorted
50 H	12	27.538	56.990	15.473	1.382	Silty gravelly sand	Silty sandy shell		Very poorly sorted
51	25	6.900	83.073	10.026	1.173	Sand	Whole dead shells		Very poorly sorted
52	24	0.052	98.894	1.053	0.776	Sand	Fine		Well sorted
53	4	0.000	99.551	0.449	0.558	Sand	Fine with silt balls		Very well sorted
54	6	0.022	99.916	0.061	0.639	Sand	Coal fragments. 1 clay lump		Moderately well sorted
55	24	3.694	95.894	0.412	0.474	Sand	Silt balls. Clay lumps		Poorly sorted

Site no.	Water depth (m)	% Gravel	% Sand	% Silt	% Organic Carbon	Classification	Additional info from *In-situ* Observations	Depth of redox layer below surface (bs)	Sorting Index
56	5	1.841	97.747	0.412	1.509	Sand	Shelly sand		Poorly sorted
57	24	0.021	89.936	10.043	0.831	Sand	Surface silty layer		Poorly sorted
58	23	12.704	85.458	1.838	0.718	Sand	Patches of anoxic clay		Poorly sorted
59	15	0.024	85.049	14.927	1.487	Sand	Silty sand overlying soft black clay anoxic layer.	8cm bs	Poorly sorted
60	20	0.049	82.658	17.293	1.361	Sand	Silty sand overlying grey anoxic silty soft clay.	3cm bs	Poorly sorted
61	24	0.604	92.138	7.258	0.765	Sand	Patches of anoxic clay		Moderately sorted
62 H	10	1.374	26.026	72.600	2.294	Sandy silt	Thick mud/clay		Very poorly sorted
63	27	1.330	92.945	5.725	0.764	Sand	Small silt balls with some shell		Moderately sorted
64	20	3.165	78.848	17.987	1.420	Silty sand	*Sabellaria* reef on silty sand		Poorly sorted
65	18	0.133	98.570	1.296	0.728	Sand	Fine with small silt balls		Very well sorted
66	12	0.009	99.886	0.106	0.495	Sand	Coal fragments		Moderately sorted
67	16	0.291	98.424	1.285	0.881	Sand	Patches of anoxic sediment. Dead *Ensis* shells.		Very well sorted
68	16	10.520	88.439	1.041	0.807	Sand	With shell		Poorly sorted
69	17	0.955	97.301	1.744	0.721	Sand	Lumps black anoxic clay. Dead eroded *Sabellaria* reef, dead piddock. Anoxic light grey layer.	6cm bs	Moderately sorted
70	17	2.300	96.660	1.040	0.714	Sand	Dead *Crassostrea*		Moderately sorted
71	11	0.032	99.141	0.828	0.650	Sand			Moderately well sorted
71 H	11	0.005	97.805	2.191	0.964	Sand	Small lumps of anoxic clay.		Moderately sorted
72	7	5.958	80.310	13.731	2.100	Sand	Dead cockles over sandy black clay anoxic layer.	2cm bs	Very poorly sorted
74 H	15	0.000	88.403	11.597	1.310	Sand	Fine		Poorly sorted
75 H	16	6.111	85.647	8.242	1.338	Sand	Med fine with shell		Very poorly sorted
76	10	0.000	97.713	2.287	0.625	Sand	Silt balls. Coal fragments		Very well sorted
77	12	0.000	99.193	0.807	0.798	Sand	Fine		Very well sorted
78	12	12.111	85.461	2.429	0.711	Sand	Dead cockles		Poorly sorted
79	17	0.000	98.718	1.282	0.678	Sand	Coal fragments		Very well sorted
80	8	26.936	68.026	5.038	0.747	Gravelly sand	Large dead shells		Very poorly sorted
81	20	10.229	83.839	5.931	0.916	Sand	Silty shelly sand		Very poorly sorted

Site no.	Water depth (m)	% Gravel	% Sand	% Silt	% Organic Carbon	Classification	Additional info from *In-situ* Observations	Depth of redox layer below surface (bs)	Sorting Index
82 H	25	1.197	59.472	39.331	1.608	Silty sand	Muddy sandy shells (1cm layer) over sandy clay		Very poorly sorted
83	26	11.734	73.700	14.566	1.520	Silty gravelly sand	Silty shelly sand. Grey near surface, not anoxic.		Very poorly sorted
84	31	8.616	81.001	10.383	0.935	Sand	Shelly silty sand. Coal fragments. Anoxic grey patches.		Very poorly sorted
85 H	29	5.632	80.777	13.592	1.459	Sand	Silty sand over black anoxic clay layer.	2cm bs	Very poorly sorted
86	26	0.000	97.197	2.803	0.678	Sand	Coal fragments		Very well sorted
87	17	6.385	83.257	10.358	1.620	Sand	Sandy silty shell		Very poorly sorted
88	16	7.683	91.089	1.228	1.294	Sand	Shelly sand		Poorly sorted
89	15	0.000	98.378	1.622	0.603	Sand	Fine		Very well sorted
90	3	0.000	97.989	2.011	0.718	Sand	Fine sand with silt covering surface. Anoxic clay patches.		Very well sorted
91	24	4.177	76.898	18.926	1.572	Silty sand	Black silty clay, overlying layer brown silt. Dead *Sabellaria* reef.		Very poorly sorted
92 H	18	7.396	90.076	2.528	0.788	Sand	Silty fine sand. Dead cockles. Anoxic grey streaks.		Very well sorted
93	3	0.000	72.469	27.531	1.442	Silty sand	Whole sample grey colour		Poorly sorted
94	3	0.000	89.219	10.781	1.183	Sand	Grey anoxic streaks		Poorly sorted
95	17	0.253	97.682	2.064	0.989	Sand	Fine		Moderately well sorted
96	16	0.000	53.732	46.268	2.309	Silty sand	Silt compacted. Whole sample grey colour		Poorly sorted
97	6	0.000	98.252	1.748	0.547	Sand	Fine		Very well sorted
98	2	1.164	98.446	0.390	0.597	Sand	Fine		Very well sorted
99	4	0.000	98.691	1.309	0.521	Sand	Fine		Very well sorted
100	19	0.000	99.432	0.568	0.548	Sand	Fine		Very well sorted
101	11	1.482	97.335	1.183	0.564	Sand	Fine. Anoxic clay patches		Very well sorted
102	3	0.000	99.434	0.566	0.358	Sand	Fine		Very well sorted
103	3	0.490	98.653	0.856	0.791	Sand	Fine. Coal fragments		Well sorted

3.2. Organic Matter Content

Organic matter content was calculated by the weight Loss on Ignition (LOI) technique. The results for percentage organic content in each sample are given in the sediment summary Table 3.1 above and illustrated on the survey map (Chart Figure 3.2, Figure Appendix).

The percentage organic content values across the whole survey area ranged from 0.358 (at Site 102) to 2.457 (at Site 6) with an average of 0.992. The samples with the greater than average values of organic content were the very poorly or poorly sorted silty or gravelly sands and those described visually as having with a degree of anoxic clay or an anoxic layer below the surface. These occurred primarily in the main channels and in the shallow inshore waters.

The Loss on Ignition technique is a common method for estimating organic matter content in marine sediments. However, the LOI technique has been reported to seriously overestimate organic content (Leong and Tanner 1999). The increase in recorded organic matter levels using this technique can be attributed to the presence of “bound” or “structural” water in the sample (Billen 1978). This bound water is not completely eliminated when a sediment is dried at lower oven temperatures and is thus measured as “organic matter” when the dried sediment is combusted at 440^{o}C (Mook & Hoskin 1982). Although the values can be compared to each other for the current survey, the error within the technique makes it unsuitable for comparison with values reported using other methodologies as the levels reported here may be higher than actual levels in the natural system.

It should also be noted that as the organic content value was determined for only one sample per site, any local variability could not be assessed, therefore, the single point values are not considered as a certain reflection on the true organic matter content levels at each site.

3.3. Biological Communities

3.3.1. Day and Mini-Hamon Grab Macrofaunal Data

The location of the all the grab sites are illustrated on Chart Figure 2.1, Figure Appendix. The complete species list and abundances for infauna and non-colonial epifauna (quantitative abundances for both), and colonial epifaunal species (abundance quantified using in-house method (MET/05) (Emu 2004b)) are presented in Volume II, Appendix IV.

Table 3.2 presents a summary of the macrofaunal invertebrate species data from the Day and Mini-Hamon Grabs combined for the whole study area, grouped into major taxonomic groups. The number of infaunal and epifaunal species, and the total number of species at each sample site are presented on the survey maps Chart Figures 3.3.a, b and c respectively in the Figure Appendix.

A total of 187 taxa were recorded from the grab samples collected over the Outer Thames Estuary sandbank survey area, 163 of which were infaunal species represented by 3033 individuals.

The most represented taxonomic group in the grab samples were the Polychaeta (>40% of the total taxa), followed by the Crustacea (29%) and the Mollusca (11%). However, conversely, the most individuals recorded within a taxonomic group were firstly in the Mollusca (1171), then the Crustacea (969) and the Polychaeta (593).

Sessile colonial animals were not enumerated using the same quantitative method as the infauna, therefore, the cumulative numerical abundances are not quoted. However, the most frequently recorded were *Alcyonidium diaphanum, A. mytili, A. parasiticum, Electra pilosa, E. monostachys and Aspidelectra melolontha*.

Table 3.2. Summary of Numbers of Macrofaunal Species in Each Taxonomic Group (Day and Mini-Hamon Grab Data combined).

Taxonomic Group	No. of Taxa Represented (Day & Mini-Hamon Grab Data)	No. of Individuals Within Each Taxonomic Group (post data rationalisation)
Porifera (sponges)	-	-
Hydrozoa (hydroids/sea firs)	9	-
Anthozoa (sea anemones)	2	7
Turbellaria (flat worms)	1	4
Nemertea (ribbon worms)	1	207
Sipuncula (peanut worms)	1	1
Annelida - Polychaeta (bristleworms) Oligochaeta	76 1	593 11
Crustacea (e.g. amphipods, isopods, crabs, shrimps, prawns, cumaceans, barnacles, sea spiders)	54	969
Mollusca (e.g. chitons, limpets, bivalves, snails)	21	1171
Bryozoa (sea mats)	12	-
Phoronida (horse-shoe worms)	1	31
Echinodermata (e.g. brittlestars, starfish, sea urchins)	6	72
Tunicata (sea squirts)	1	4
Pisces (fish)	1	1
Total No. of Epifaunal Taxa	**24**	-
Total No. of Infaunal Taxa	**163**	-
Total No. Taxa	**187**	-

The number of infaunal species recorded at each site was highly variable across the survey area reflecting the variability in the substrate types (Chart Figure 3.3.a, Figure Appendix). Epifaunal species were recorded at any sites where there was some shell or gravel (Chart Figure 3.3b, Figure Appendix). This was true of some sites that were classified as sand, but on visual inspection had a single or several large valves of dead oysters, cockles and razor shells.

The Ross worm *Sabellaria spinulosa* was present at 17 out of the 100 grab sites, but was only recorded in relatively large numbers during this current study at Site 64. The Ross worm can, on occasion, form biogenic reefs. Biogenic reef habitats are protected priority habitats under the terms of the UK Biodiversity Action Plan (UK BAP), Convention on Biological Diversity (CBD), Annex I of the Habitats Directive (1992) and the Wildlife and Countryside Act (1981).

Alien taxa found in the grab dataset and listed in Eno *et al* (1997) included the amphipod *Corophium sextonae* (found at Sites 18H, 64 and 69) and the American slipper limpet *Crepidula fornicata* (found at Site 15).

Large numbers of the boring bivalve *Barnea candida* were recorded at only one site (Site 62 H). The substrate in that locality was consolidated into thick cohesive clay revealing another substrate type within the sandbank system.

3.3.1.1. Univariate Measures on the Macrofaunal Grab Dataset

A summary of the standard univariate measurements of macrofaunal community diversity, species richness and evenness is presented in Table 3.3. These values are also illustrated on the location map on Chart Figures 3.4, 3.5 and 3.6 respectively provided in the Figure Appendix.

The distribution of the Shannon-Wiener diversity values (H') across the survey area are presented in Chart Figure 3.4., Figure Appendix. This statistical measure is an expression of the number of species within a sample and the distribution of abundance across these species. Benthic diversity across the survey area was quite variable but generally low with a minimum value (based on the rationalised faunal dataset) being 0.00 and maximum being 3.54. The Site with the lowest value (0.00) was Site 100, a shallow very well sorted sand site, with the highest value recorded at Site 18 H, a mid channel very poorly sorted silty sand site with shell. The lowest species diversity was found in the very well to moderately well sorted sands with lower silt content. The highest species diversity was mainly found in the very poorly sorted sands, silty sands, gravelly sands and silty gravelly sands with large shells.

The Margalef's species richness value (d) which is related to the number of species across the survey area was also calculated, the distribution of which is presented in Chart Figure 3.5., Figure Appendix. Values (per $0.1m^2$) were generally low, ranging from 0.00 (Site 100) to 9.25 (Site 18 H). Species richness value corresponded well with the Shannon-Wiener species diversity values with the lowest values again found in the well sorted sands and the highest values mainly associated with the very poorly sorted sands, silty sands, gravelly sands and silty gravelly sands.

Pielou's evenness index (J'), the evenness of the distribution of organisms between species, is important as it directly influences diversity. Populations can possess a high number of taxa but they may have highly uneven distributions between taxa (i.e. highly dominant taxa) which may reflect underlying habitat limitations or an effect of possible environmental stressors. The maximum value is obtained when all of the species in the sample are perfectly even with the same number of individuals per species. The evenness values across the survey area ranged considerably from no value (Site 100) to a maximum of 1.00 (at Site 3). Site 100 had only one species with three individuals present after rationalisation hence the no value score. Site 3 had two species with one individual each hence the high score of 1.00. Chart Figure 3.6., Figure Appendix, illustrates the spatial distribution of the evenness values across the survey area. The distribution of evenness was quite variable across the survey area because in some samples, certain species were more numerically dominant. The lowest values of J' compared to the higher values H' occurred at the sites were one species dominated the sample (e.g. *Sabellaria spinulosa* at Site 64, *Bathyporeia elegans* at Site 48, *Ophelia borealis* at Site 56 and *Spiophanes bombyx* at Site 84).

3.3.1.2. Multivariate Analysis of Grab Dataset

A Bray-Curtis similarity dendrogram was produced and SIMPROF and Multi-Dimensional Scaling (MDS) were performed on the faunal dataset from the Day and Mini-Hamon grabs. Prior to analysis, the data was rationalised as described in the methods section. The SIMPROF cluster dendrogram was produced for all the grab samples to statistically reveal the faunal site groupings within the dataset (Figure 3.4 below). The data was then transformed using the 4^{th} root transformation (found to be the most robust) to reduce the bias of the most numerically dominant species.

PRIMER runs of the dendrogram and the MDS plots were completed on the infaunal dataset alone, and the infauna and epifauna combined (using the log linear conversion on the epifaunal data). No significant differences were found between the dendograms for infauna only and infauna and epifauna combined, therefore, the full faunal dataset was used for the final grab PRIMER analysis.

After the initial run on PRIMER of all the full faunal dataset, Site 3 was found to be an extreme outlier on the dendrogram and was subsequently removed from the final MDS 2-D plot (Figure 3.5. below).

Whilst there was clear grouping of the PSA dataset using multivariate analysis, the clusters on the dendrogram and groupings on the MDS ordination of the macrofaunal data are more complex. Using the SIMPROF cluster analysis to assess the significance level of the faunal groupings, 9 major groups (labelled as A-I) were apparent within the dataset, with Group F divided into 7 possible sub-groups for more elucidation to aid with the faunal biotope classifications. The SIMPROF cluster groupings when viewed on the MDS plot show a close link between all groups and indistinct boundaries between the groupings with some degree of overlap. The stress level of 0.18 was relatively high and although this plot is a useful representation of the data, caution should be taken in its interpretation (Clarke & Warwick, 1994). Notably, the distance between stations on the 2-D plot is not wholly proportional to their similarity.

Figure 3.4. Macrofaunal Data. Bray-Curtis Similarity SIMPROF Dendrogram. Rationalised Epifaunal and Infaunal Data Combined, 4th Root Transformed (Site 3 Included). The Groupings (A-H) Identified by SIMPROF are Represented by Coloured Symbols.

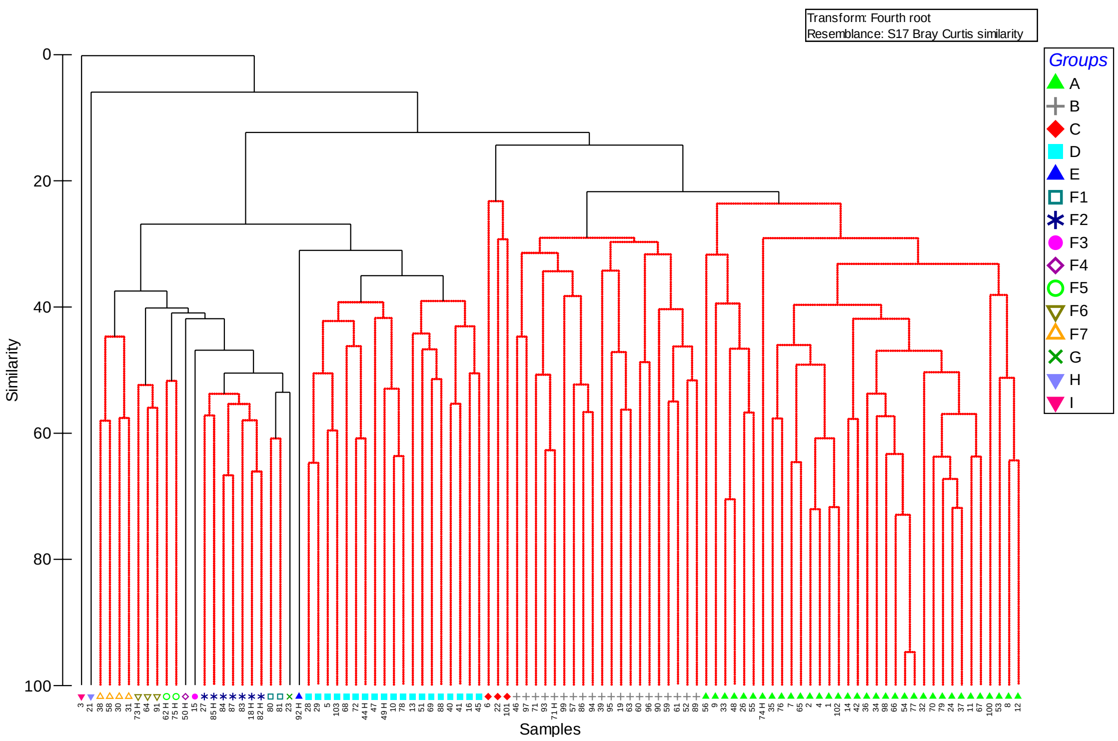
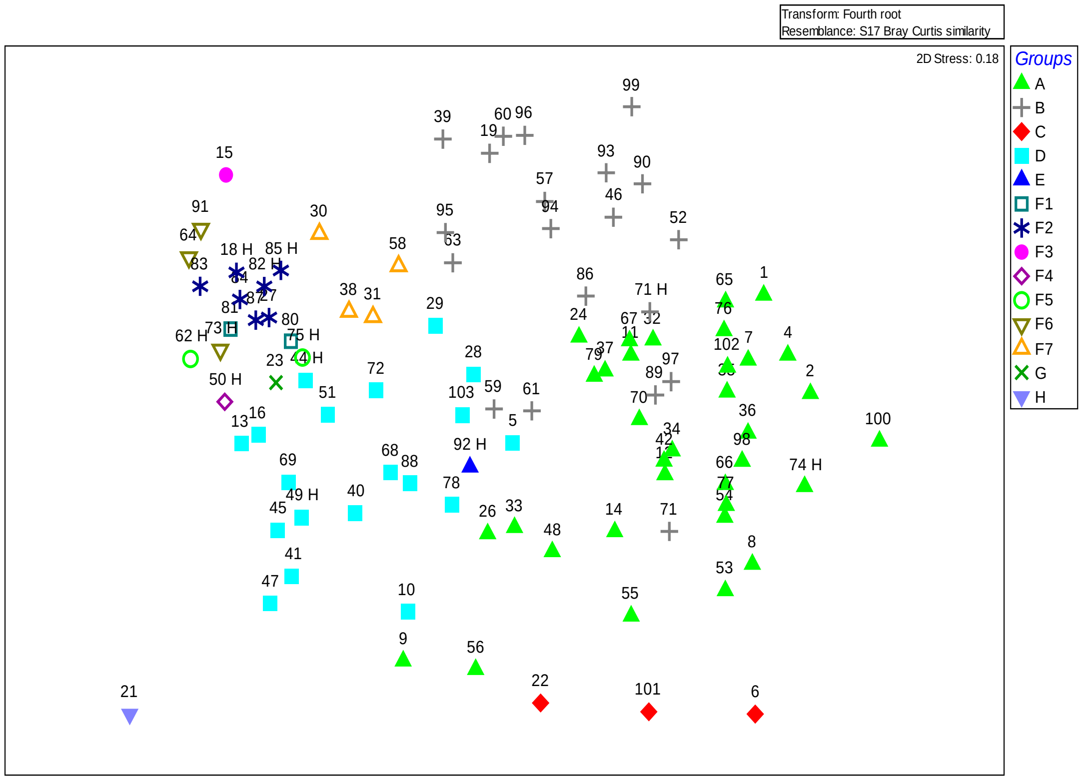


Figure 3.5. Macrofaunal Data. MDS Ordination of the Rationalised Epifaunal and Infaunal Data Combined, 4th Root Transformed (Site 3 Excluded). The Groupings (A-H) Identified by SIMPROF are Represented by Coloured Symbols.



3.3.1.3. Taxonomic Distinctness of the Grab Macrofaunal Dataset

The values calculated from the taxonomic distinctness test in PRIMER are given in the summary Table 3.3 below. The taxonomic distinctness test removes the dominating effects of species abundance distribution by leaving a measure that purely reflects the taxonomic hierarchy. The values revealed a difference between species richness and diversity compared to their taxonomic distinctness. The sites that could be considered relatively rich in abundance and fauna did not necessarily reveal a greater taxonomic richness. The taxonomic diversity of the species at the sites appeared to be independent of sediment composition or the amount of organic content within the sediment.

Taxonomic distinctness (Δ^*) (using species abundance data) and average taxonomic distinctness (Δ^+) (using presence/absence data) were compared within the cluster groups for the Day and Mini-Hamon grab dataset. The graphs (Figure 3.6.) are very similar and show that taxonomic distinctness of the different cluster groups was relatively similar across the area despite the differences in the habitat types these groups occupied. The similar values show that despite being located on the mobile sands, Group C has a relatively high value which shows that it has a broad taxonomic range relative to the other areas and is the natural community expected on this type environment. Group H (containing only Site 21) has a lower value compared to the other groups, a possible indication of disturbance.

Figure 3.6. Comparison of Taxonomic Distinctness and Average Taxonomic Distinctness between Cluster Groups (error bars +/-SD)

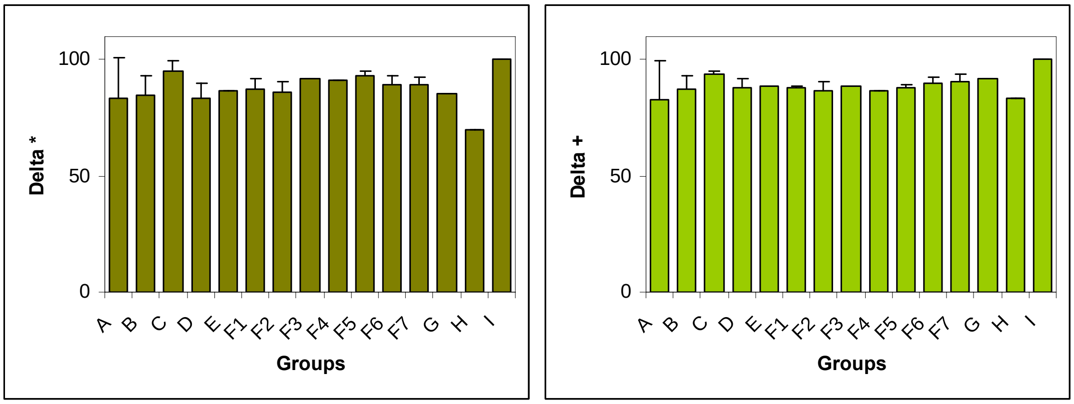


Table 3.3. Summary of diversity analysis through PRIMER of macrofauna from all grab samples (all faunal data rationalised)

Site	No of Species (S)	No. of Individuals (N)	Shannon-Wiener (H')	Species Richness (d)	Evenness (J')	Taxonomic Diversity (Δ)	Taxonomic Distinctness (Δ*)	Average Taxonomic Distinctness (Δ^+)
1	4	13	1.09	1.17	0.79	62.39	95.42	377.8
2	4	18	1.01	1.04	0.73	56.21	92.47	344.4
3	2	2	0.69	1.44	1.00	100.00	100.00	200
4	4	10	1.22	1.30	0.88	70.37	95.96	377.8
5	12	54	2.17	2.76	0.87	79.49	91.22	1058
6	4	7	1.35	1.54	0.98	77.78	90.74	366.7
7	3	13	0.79	0.78	0.72	27.56	55.13	150
8	4	17	0.96	1.06	0.69	50.98	92.44	344.4
9	7	22	1.68	1.94	0.86	69.91	87.30	611.1
10	6	22	1.58	1.62	0.88	54.69	68.66	473.3
11	10	48	1.66	2.32	0.72	60.05	83.31	903.7
12	6	13	1.52	1.95	0.85	75.00	94.35	520
13	26	147	2.37	5.01	0.73	74.67	88.10	2383
14	5	11	1.47	1.67	0.91	78.48	95.93	441.7
15	53	342	3.05	8.91	0.77	83.65	92.13	4703
16	31	121	2.80	6.26	0.82	71.94	78.94	2843
19	7	21	1.56	1.97	0.80	65.08	84.89	611.1
21	3	7	1.00	1.03	0.91	50.00	70.00	250
22	3	6	1.01	1.12	0.92	71.11	96.97	283.3
23	41	353	2.62	6.82	0.70	73.69	85.12	3754
24	10	34	2.09	2.55	0.91	75.88	85.65	863
26	9	16	2.10	2.89	0.96	84.86	91.74	833.3
27	30	146	2.52	5.82	0.74	75.33	89.58	2726
28	12	33	2.26	3.15	0.91	77.08	86.05	1061
29	13	43	2.19	3.19	0.85	80.86	92.78	1161
30	27	257	2.53	4.69	0.77	79.40	90.04	2542
31	17	139	2.35	3.24	0.83	79.86	90.36	1544
32	7	21	1.72	1.97	0.88	69.21	84.50	611.1
33	12	46	1.73	2.87	0.70	65.99	94.73	1021
34	9	22	1.83	2.59	0.83	72.37	87.52	820.8
35	4	7	1.15	1.54	0.83	56.35	78.89	322.2
36	4	27	1.05	0.91	0.76	39.32	65.71	322.2
37	8	36	1.43	1.95	0.69	52.43	81.16	623.8
38	36	215	2.45	6.52	0.68	75.67	91.99	3253
39	10	370	0.44	1.52	0.19	13.80	79.76	885.2
40	16	87	1.74	3.36	0.63	54.40	81.34	1256
41	11	65	1.91	2.40	0.80	69.42	87.62	956.7

Site	No of Species (S)	No. of Individuals (N)	Shannon-Wiener (H')	Species Richness (d)	Evenness (J')	Taxonomic Diversity (Δ)	Taxonomic Distinctness (Δ*)	Average Taxonomic Distinctness (Δ^+)
42	7	13	1.78	2.34	0.91	77.56	88.97	622.2
45	17	167	1.91	3.13	0.67	67.09	87.70	1542
46	5	13	1.33	1.56	0.82	63.46	85.34	475
47	8	14	1.93	2.65	0.93	72.53	80.49	723.8
48	8	82	1.04	1.59	0.50	44.45	97.76	681
51	14	82	2.07	2.95	0.78	70.86	83.78	1256
52	6	9	1.58	2.28	0.88	54.17	65.00	440
53	2	35	0.13	0.28	0.19	5.714	100.00	200
54	4	8	1.21	1.44	0.88	67.86	90.48	322.2
55	4	21	0.68	0.99	0.49	29.37	84.47	377.8
56	9	46	0.89	2.09	0.41	27.89	78.44	762.5
57	12	116	1.26	2.31	0.51	41.71	77.26	1118
58	19	139	2.06	3.65	0.70	64.54	84.36	1644
59	10	19	2.21	3.06	0.96	80.80	86.90	892.6
60	10	44	1.91	2.38	0.83	67.42	82.09	911.1
61	11	21	2.26	3.28	0.94	80.71	86.92	963.3
63	7	25	1.71	1.86	0.88	74.83	91.63	616.7
64	50	1390	1.04	6.77	0.27	26.88	85.86	4370
65	6	16	1.44	1.80	0.80	61.36	83.71	506.7
66	3	22	1.08	0.65	0.99	59.74	86.79	266.7
67	9	44	1.38	2.11	0.63	45.88	71.85	754.2
68	12	89	1.79	2.45	0.72	66.15	87.28	1076
69	12	69	1.73	2.60	0.69	61.02	86.34	1003
70	6	19	1.44	1.70	0.80	63.26	85.85	513.3
71	4	15	0.95	1.11	0.69	51.59	95.03	322.2
72	16	103	2.09	3.24	0.76	64.32	75.67	1451
76	6	16	1.63	1.80	0.91	68.06	81.67	493.3
77	4	7	1.28	1.54	0.92	72.22	89.22	322.2
78	10	29	2.01	2.67	0.87	69.66	80.35	914.8
79	10	27	2.06	2.73	0.89	74.83	84.73	840.7
80	32	292	2.71	5.46	0.78	81.57	90.40	2830
81	48	537	2.97	7.48	0.77	77.59	84.53	4215
83	48	413	3.17	7.80	0.82	82.43	88.43	4272
84	34	697	1.99	5.04	0.56	57.73	78.74	2723
86	11	53	1.37	2.52	0.57	41.69	72.45	900
87	31	209	2.65	5.62	0.77	76.92	85.73	2631
88	19	119	2.03	3.77	0.69	65.06	81.54	1626
89	5	6	1.56	2.23	0.97	83.33	89.29	425
90	7	15	1.71	2.22	0.88	72.06	85.98	588.9
91	44	191	3.19	8.19	0.84	84.75	90.66	4034
93	5	12	1.42	1.61	0.88	70.20	89.10	425
94	9	32	1.77	2.31	0.80	64.15	80.96	716.7
95	6	15	1.66	1.85	0.92	80.32	94.76	560
96	7	106	1.63	1.29	0.84	53.09	67.47	611.1
97	7	16	1.72	2.16	0.88	71.67	86.00	633.3
98	5	6	1.56	2.23	0.97	83.33	89.29	441.7
99	5	10	1.23	1.74	0.76	65.19	97.78	466.7
100	1	3	0.00	0.00	0.00	0.00	0.00	0
101	4	8	1.21	1.44	0.88	73.81	98.41	377.8
102	5	13	1.26	1.56	0.79	62.61	90.43	441.7
103	12	65	1.90	2.64	0.77	74.33	93.59	1085
18 H	52	248	3.54	9.25	0.90	84.50	87.59	4660
44 H	22	103	2.35	4.53	0.76	71.77	82.31	1957
49 H	8	25	1.81	2.17	0.87	61.33	73.31	709.5
50 H	26	113	2.80	5.29	0.86	84.57	91.53	2260
62 H	26	244	1.87	4.55	0.58	61.86	96.27	2320
71 H	4	9	1.00	1.37	0.72	52.78	90.48	377.8
73 H	44	234	3.16	7.88	0.84	86.61	92.19	4026
74 H	6	13	1.29	1.95	0.72	47.65	74.33	460
75 H	23	93	2.83	4.85	0.90	85.64	92.23	2030
82 H	41	306	2.81	6.99	0.76	81.72	91.60	3648

Site	No of Species (S)	No. of Individuals (N)	Shannon-Wiener (H')	Species Richness (d)	Evenness (J')	Taxonomic Diversity (Δ)	Taxonomic Distinctness (Δ*)	Average Taxonomic Distinctness (Δ^+)
85 H	39	290	2.57	6.70	0.70	68.50	81.42	3300
92 H	8	24	1.77	2.20	0.85	71.68	86.77	709.5

To test what physical factors were having the most influence on the distribution of the species across the survey area; the BIOENV routine was performed using the transformed faunal data and the categories of water depth, % Sand, % Gravel, % Silt and % Organic Matter Content. BIOENV provides a ranked list of the variables or the combination of variables that best explains the community pattern as indicated by the similarity matrix.

The results from the BIOENV showed that the combination of water depth, & gravel and organic content best explained the observed pattern of the data, but the correlation was not significant (r=0.102). The best single variable affecting the faunal distribution was organic matter content (r=0.051).

The faunal distinctiveness of Groups A to I were investigated by running the SIMPER (**sim**ilarities and **per**centages) statistical procedure also available through the PRIMER routines. SIMPER identifies those species that contribute most to the "within" group sample similarity and therefore most responsible for creating each group of samples. It also identifies those species which contribute most to the "between" group dissimilarity and which are most responsible for separating stations or samples into each group. Summary results of the SIMPER similarity analysis are provided in Table 3.4.

The output of the SIMPER analysis revealed some species (including *Spiophanes bombyx, Abra alba* and *Lagis koreni*) were common to many of the cluster groups. However, their average abundance and therefore their contributions to the different communities found in the Outer Thames Estuary survey area were very dissimilar hence the allocation of the groupings on the SIMPROF dendrogram. A certain amount of overlap between species was to be expected in a dynamic shallow sandbank system which is subject to frequent physical disturbance. The increase in epifaunal species and the presence of *Sabellaria spinulosa* and *Barnea candida* and their associated fauna being obvious causes of the dissimilarity between sediment types. The dissimilarities between the cluster groupings increased as the sediment type changed from the cleaner sands cluster to the more silty sands cluster to the gravelly sands cluster.

Table 3.4. Summary of SIMPER analysis – Species contributing most (Top 75%) to the within cluster similarity

Group	Species	Average Abundance	%Contribution to Similarity	Cumulative %
A Average within group similarity = 36.06 %	*Nephtys cirrosa*	1.28	43.38	43.38
	Magelona johnstoni	1	23.78	67.16
	Bathyporeia elegans	0.9	16.04	83.21
B Average within group similarity = 32.23%	*Nephtys hombergii*	1.23	33.1	33.1
	Abra alba	1.12	25.8	58.9
	Bathyporeia elegans	0.56	8.56	67.45
	Spiophanes bombyx	0.65	8.1	75.56
C Average within group similarity = 25.30 %	*Bathyporeia elegans*	1.2	100.00	100.00
D Average within group similarity = 38.91%	*Aspidelectra melolontha*	1.72	21.83	21.83
	Electra monostachys	1.64	20.89	42.72
	Conopeum reticulum	1.62	20.59	63.31
	Spiophanes bombyx	1.22	9.25	72.56
	Abra alba	0.69	4.77	77.33
F1 Average within group similarity = 60.91%	*Abra alba*	2.83	7.52	7.52
	Spiophanes bombyx	2.55	6.65	14.16
	Notomastus spp.	2.5	6.07	20.23
	Eumida bahusiensis	2.07	5.43	25.66
	Mysella bidentata	1.87	4.82	30.48
	Conopeum reticulum	1.87	4.41	34.89
	Electra monostachys	1.87	4.41	39.3
	Nemertea	1.78	4.06	43.36
	Lagis koreni	2.18	3.84	47.2
	Nereis longissima	1.64	3.57	50.77
	Euclymene oerstedii	1.32	3.57	54.34
	Ampelisca spinipes	1.52	3.57	57.91
	Alcyonidium mytili	1.32	3.57	61.48
	Aspidelectra melolontha	1.72	3.57	65.05
	Schizomavella auriculata	1.32	3.57	68.62
	Glycera alba	1.38	3.23	71.85
	Abludomelita obtusata	1.46	3.23	75.07
F2 Average within group similarity = 35.38%	*Spiophanes bombyx*	2.36	6.28	6.28
	Nemertea	1.98	5.81	12.08
	Lagis koreni	2.01	5.51	17.6
	Electra monostachys	1.97	5.51	23.1
	Conopeum reticulum	1.86	5.5	28.6
	Notomastus spp.	1.92	4.19	32.79
	Nereis longissima	1.46	4.16	36.95
	Glycera alba	1.26	3.74	40.69
	Aspidelectra melolontha	1.56	3.74	44.44
	Scalibregma inflatum	1.22	3.58	48.02
	Autolytus spp.	1.28	3.47	51.48
	Abra alba	1.59	3.42	54.9
	Lumbrineris gracilis	1.18	3.37	58.27
	Pholoe baltica	1.13	3.34	61.61
	Ampharete lindstroemi	1.24	2.99	64.6
	Goniada maculata	1.09	2.91	67.51

Group	Species	Average Abundance	%Contribution to Similarity	Cumulative %
F5 Average within group similarity = 51.77%	*Abludomelita obtusata*	1.57	8.92	8.92
	Notomastus spp.	1.71	8.06	16.98
	Nucula nucleus	1.41	8.06	25.05
	Mysella bidentata	1.37	7.5	32.55
	Alcyonidium diaphanum	1.32	7.5	40.05
	Conopeum reticulum	1.32	7.5	47.55
	Electra pilosa	1.32	7.5	55.06
	Aspidelectra melolontha	1.32	7.5	62.56
	Eteone longa/flava	1.19	6.78	69.34
	Mediomastus fragilis	1.48	6.78	76.12
F6 Average within group similarity = 53.62%	*Sabellaria spinulosa*	3.46	6.6	6.6
	Abra alba	2.05	5.6	12.2
	Pisidia longicornis	2	5.39	17.59
	Autolytus spp.	1.61	4.42	22
	Unciola crenatipalma	1.88	4.35	26.36
	Conopeum reticulum	1.69	4.22	30.58
	Electra pilosa	1.42	3.92	34.5
	Nereis longissima	1.33	3.67	38.16
	Spiophanes bombyx	1.36	3.66	41.83
	Eumida bahusiensis	1.29	3.54	45.37
	Lumbrineris gracilis	1.33	3.54	48.91
	Abludomelita obtusata	1.23	3.54	52.46
	Mediomastus fragilis	1.2	3.18	55.64
	Notomastus spp.	1.2	3.16	58.8
	Pilumnus hirtellus	1.2	3.16	61.96
	Mysella bidentata	1.13	3.16	65.12
	Nemertea	1.27	3.16	68.28
	Pholoe baltica	1.06	2.98	71.26
	Stenothoe marina	1.19	2.98	74.24
	Bodotria scorpioides	1.06	2.98	77.22
F7 Average within group similarity = 49.12%	*Spiophanes bombyx*	2.59	13.4	13.4
	Abra alba	2.15	10.52	23.92
	Nephtys hombergii	1.75	8.89	32.81
	Conopeum reticulum	1.55	8.68	41.49
	Obelia bidentata	1.59	8.11	49.6
	Notomastus spp.	1.32	6.75	56.35
	Mysella bidentata	1.38	3.97	60.33
	Lagis koreni	1.24	3.96	64.28
	Electra monostachys	1.14	3.89	68.17
	Aspidelectra melolontha	1.14	3.89	72.06
	Electra pilosa	0.99	3.56	75.62

3.3.2. Anchor Dredge Macrofaunal Data

The species list of macrofauna identified from the Anchor Dredge sampling is presented in Volume II, Appendix IV. The positions of each Anchor Dredge are illustrated geographically on Chart Figure 2.2 (Figure Appendix) with the actual figures given in the sample log (Volume II, Appendix I). The Anchor Dredge data was used in an attempt to record any deeper burrowing macrofauna that may be missed by the grabs or trawls and is semi-quantitative as only the conspicuous fauna were targeted for identification and enumeration, consequently, the data was not subjected to statistical analyses in PRIMER.

A total of 86 conspicuous taxa were recorded from the 33 Dredge samples collected in the study area. Of these 86 taxa, six were echinoderm species, 16 mollusc species (comprising infaunal and epifaunal taxa), 16 crustacean species (including infaunal and mobile epifaunal taxa and two pycnogonid species (sea spiders)), 31 polychaete species (bristleworms) (both infaunal and epifaunal), eight bryozoan species (sea mats), four hydroid species (sea firs), one epifaunal anemone species and one ascidian species.

The Ross worm *Sabellaria spinulosa* was recorded in five of the 33 Dredge samples (Sites D23, D51, D62, D83 and D93). *Obelia bidentata* was present in four samples (Sites D58, D75, D87, D94,) and is considered a nationally rare marine species (Sanderson 1996). The American slipper limpet *Crepidula fornicata*, a registered Alien species (Eno 1997) was recorded at Sites D20, D81 and D83.

The most widely occurring conspicuous epibenthic species (recorded at 23 of the 33 sites) was the burrowing bivalve *Abra alba* (Table 3.5. below). This was also the most abundant species sampled by the dredge with highest numbers recorded at sites D63 and D75. The trumpet worm *Lagis koreni* was recorded at 14 out of the 33 dredge samples taken and was the second most abundant species in the dataset. The highest numbers of *L. koreni* were recorded from Site D31. The encrusting bryozoans *Conopeum reticulum*, *Electra pilosa* and *Electra monostachys* were present in almost half the dredge samples on dead shells and stones. The Ross worm *Sabellaria spinulosa* was recorded at five sites, but was relatively abundant at Site D23.

Site D40 had the lowest number of species (with only one species recorded), whilst Sites D9, D69 and D103 had only two species at each site. The site with greatest return of species obtained was Site D83 (42 species in total). One factor attributable to the paucity of species at some sites in comparison others was the method of targeting the conspicuous fauna only within the sample taken. This would lead to some species being underestimated or overlooked.

Sampling with the Anchor Dredge revealed that the bivalve component of the community was much more dominant than indicated by the grab sampling alone, (particularly populations of *Abra alba*). However, apart from recording two individual prickly cockles *Acanthocardia tuberculata*, which were not found in the grabs (or the trawls), when visually comparing the Dredge and Grab species lists, the faunal assemblage was not unduly different from the Grab samples taken from the same sites.

Table 3.5. The Most Frequently Occurring Conspicuous Fauna Collected by Anchor Dredge Sampling.

Species name	MCS	No. of dredges
Abra alba	W2059	23
Conopeum reticulum	Y0172	15
Lagis koreni	P1107	14
Nephtys spp. juv.	P0494	12
Nephtys hombergii	P0499	12
Electra pilosa	Y0178	11
Electra monostachys	Y0177	10
Spiophanes bombyx	P0794	9
Glycera alba	P0256	8
Magelona johnstoni	P0803	8
Bathyporeia elegans	S0452	8
Alcyonidium diaphanum	Y0076	8
Nephtys cirrosa	P0498	7
Pagurus bernhardus	S1457	7
Mysella bidentata	W1906	7
Aspidelectra melolontha	Y0182	7
Ophiura albida	ZB0168	7
Actiniaria	D0662	6
Nemertea	G0001	6
Nephtys assimilis	P0495	6
Notomastus spp.	P0920	6
Ampelisca spinipes	S0438	6
Alcyonidium mytili	Y0080	6
Alcyonidium parasiticum	Y0081	6
Psammechinus miliaris	ZB0193	6
Obelia spp.	D0517	5
Nephtys caeca	P0496	5
Sabellaria spinulosa	P1117	5
Ophiura ophiura	ZB0170	5

3.3.3. Beam Trawl Macrofaunal Data

The start and end positions of each beam trawl are given in Volume II, Appendix I, and illustrated on the survey map in Chart Figure 2.3 (Figure Appendix).

The individual data on macrofaunal species collected by the beam trawl sampling are presented in Volume II, Appendix IV. The trawl data is semi-quantitative and it was for this reason that it was considered separately from the analysis of the Day and Mini-Hamon Grab macrofaunal dataset.

A total of 146 taxa were recorded from the 30 trawl samples collected. The most abundant species collected by trawl sampling are listed in Table 3.6. below.

Of these 146 taxa, 26 were fish species (both demersal and pelagic species), five echinoderm species, 23 mollusc species (comprising infaunal and epifaunal taxa), 39 crustacean species (including infaunal and mobile epifaunal taxa, three cirriped species (barnacles) and two pycnogonid species (sea spiders), 20 polychaete species (bristleworms) (both infaunal and epifaunal), 15 bryozoan species (sea mats), 12 hydroid species (sea firs), four epifaunal anemone species, two colonial ascidian species and one soft coral species.

Species of special interest in the trawl samples were the Ross worm *Sabellaria spinulosa* which was recorded in five trawl samples (T23, T26, T68, T81 and T83). The trawls also contained several Alien species listed in Eno *et al* (1997), the solitary ascidian *Styela clava* (recorded at T94), the barnacle *Elminius modestus* (recorded at T86) and the American slipper limpet *Crepidula fornicata* (recorded at T31, T51, T59, T62, T63 and T81). In addition, the nationally rare species of hydroid *Obelia bidentata* was recorded at 18 sites (Sanderson 1996).

Table 3.6. Top 30 most numerically abundant species collected by Beam trawl sampling (excluding colonial epifauna).

Species Name	Common name	MCS code	Abundance
Crangon crangon	Brown shrimp	S1385	23276
Psammechinus miliaris	Green sea-urchin	ZB0193	5760
Ophiura albida	Brittlestar	ZB0168	5533
Mytilidae juv.	Mussel spat	W1691	4001
Asterias rubens	Common starfish	ZB0100	3836
Lagis koreni	Trumpet worm	P1107	3486
Pandalus montagui	Pink shrimp	S1377	3048
Macropodia rostrata	Common spider crab	S1532	2269
Pagurus bernhardus	Common hermit crab	S1457	2255
Ophiura ophiura	Brittlestar	ZB0170	1131
Acanthodoris pilosa	Sea slug	W1333	915
Pomatoschistus minutes	Sand goby	ZG0479	878
Flabelligera affinis	Bristleworm	P0881	844
Liocarcinus holsatus	Flying crab	S1581	761
Sabellaria spinulosa	Ross worm	P1117	732
Abra alba	Bivalve	W2059	639
Balanus crenatus	Acorn barnacle	R0077	537
Pandalina brevirostris	Prawn	S1374	494
Ensis arcuatus	Razor shell	W1998	488
Solea solea	Dover sole	ZG0591	403
Pomatoceros triqueter	Keel worm	P1341	363
Mytilus edulis	Common mussel	W1695	260
Actinaria	Sea anemone	D0662	211
Liocarcinus spp. juv.	Swimming crab	S1577	163
Echinocardium cordatum	Sea potato	ZB0223	161
Idotea linearis	Isopod	S0939	136
Harmothoe spp.	Scale worm	P0050	126
Hippolyte varians	Chameleon prawn	S1350	108
Agonas cataphractus	Pogge	ZG0291	104
Schistomysis kervillei	Mysid	S0086	99

The most frequently occurring species (those recorded from all 30 trawled sites) are detailed in Table 3.7. below. The species recorded at all 30 sites was the brown shrimp *Crangon crangon*. The common hermit crab *Pagurus bernhardus* and the sole *Solea solea* were present in 29 of the 30 sites. Other species widely recorded across the survey area were the crabs, *Macropodia rostrata* and *Liocarcinus holstatus*, the pink shrimp *Pandalus montagui*, the sand goby *Pomatoschistus minutus* and whiting *Merlangus merlangus*, the common starfish *Asterias rubens* and the brittlestar *Ophiura albida*, the bryozoan species *Alcyonidium diaphanum* (Sea Chervil), *Conopeum reticulum*, *Electra pilosa*, the hydroids *Vesicularia spinosa* and *Hydractinia echinata* (commensal on the hermit crab shells) and the sea slug *Acanthodoris pilosa*.

Table 3.7. The Most Frequently Occurring Fauna Collected by Beam Trawl Sampling.

Species name	Common name	MCS	No. trawls
Crangon crangon	Brown shrimp	S1385	30
Pagurus bernhardus	Common hermit crab	S1457	29
Solea solea	Sole	ZG0591	29
Macropodia rostrata	Common spider crab	S1532	28
Liocarcinus holsatus	Flying crab	S1581	28
Alcyonidium diaphanum	Sea Chervil	Y0076	28
Electra pilosa	Hairy sea mat	Y0178	27
Asterias rubens	Common starfish	ZB0100	27
Pomatoschistus minutus	Sand Goby	ZG0479	26
Conopeum reticulum	Sea mat	Y0172	25
Pandalus montagui	Pink shrimp	S1377	24
Vesicularia spinosa	Bryozoa	Y0131	22
Ophiura albida	Brittlestar	ZB0168	22
Hydractinia echinata	Snail fur	D0273	20
Acanthodoris pilosa	Sea slug	W1333	20
Merlangus merlangus	Whiting	ZG0123	20
Obelia bidentata	Hydroid	D0518	18
Actiniaria spp.	Sea anemone	D0662	18
Hydrallmania falcata	Sickle hydroid	D0424	17
Alcyonidium mytili	Bryozoa	Y0080	17
Alcyonidium parasiticum	Bryozoa	Y0081	17
Ophiura ophiura	Brittlestar	ZB0170	17
Liocarcinus spp. juv.	Swimming crab	S1577	16
Agonas cataphractus	Pogge	ZG0291	16
Pandalina brevirostris	Pink shrimp	S1374	15
Psammechinus miliaris	Green sea urchin	ZB0193	15
Trisopterus luscus	Bib	ZG0143	15
Limanda limanda	Dab	ZG0572	14
Balanus crenatus	Acorn barnacle	R0077	13
Abra alba	Bivalve	W2059	13
Electra monostachys	Bryozoa	Y0177	13
Schistomysis kervillei	Mysid	S0086	12
Idotea linearis	Isopod	S0939	12
Sepiola atlantica	Little cuttle	W2329	12
Aspidelectra melolontha	Bryozoa	Y0182	12
Halecium spp.	Hydroid	D0390	11
Clytia hemisphaerica	Hydroid	D0503	11
Pisidia longicornis	Long-clawed porcelain crab	S1482	11
Trisopterus minutus	Poor cod	ZG0144	10

Table 3.8. Phyletic Composition of the 2 Metre Beam Trawl Samples.

Trawl Site	T7	T9	T11	T15	T19	T20	T23	T26	T31	T37	T44	T46	T48	T49	T50
Phylum	**Numbers of species recorded from each group**														
Hydrozoa (sea firs)	3	5	5	2	6	3	4	3	3	4	6	4	1	5	2
Anthozoa (anemones and soft corals)	0	1	0	2	0	0	1	2	5	0	0	0	1	1	1
Polychaeta (bristleworms)	1	1	0	2	0	2	9	5	5	1	1	0	0	3	1
Crustacea (sea spiders, barnacles, amphipods, crabs, shrimps etc.)	8	11	8	12	8	12	17	9	8	7	11	5	7	10	7
Mollusca (whelks, scallops, mussels, etc.)	1	3	4	4	1	1	2	3	12	2	3	0	0	2	2
Bryozoa (sea mats)	5	6	5	4	4	7	7	7	8	4	8	5	5	5	5
Echinodermata (starfish, brittlestars and sea urchins)	3	4	2	3	1	4	4	4	5	3	2	1	1	2	1
Tunicata (sea squirts)	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Pisces (fish)	8	10	8	8	5	9	5	6	7	8	9	3	5	6	4
Total Species (S)	**29**	**41**	**32**	**37**	**25**	**38**	**49**	**40**	**54**	**29**	**40**	**18**	**20**	**34**	**23**
Fish Species only	*8*	*10*	*8*	*8*	*5*	*9*	*5*	*6*	*7*	*8*	*9*	*3*	*5*	*6*	*4*
Colonial Sessile Epifaunal Species	*8*	*11*	*10*	*6*	*10*	*10*	*11*	*10*	*11*	*8*	*14*	*9*	*6*	*10*	*8*
Non-colonial Sessile Epifaunal Species	*1*	*2*	*0*	*3*	*1*	*1*	*2*	*3*	*2*	*1*	*0*	*0*	*1*	*2*	*0*
Infaunal species	*12*	*18*	*14*	*20*	*9*	*18*	*31*	*21*	*34*	*12*	*17*	*6*	*8*	*16*	*11*

Trawl Site	T51	T58	T59	T62	T63	T65	T68	T69	T75	T81	T83	T86	T87	T94	T98
Phylum	**Numbers of species recorded from each group**														
Hydrozoa (sea firs)	3	4	2	3	4	6	4	2	4	2	4	2	2	4	0
Anthozoa (anemones and soft corals)	1	2	1	1	1	1	1	1	0	2	1	1	2	1	0
Polychaeta (bristleworms)	0	4	3	1	2	2	3	1	2	5	5	0	3	2	0
Crustacea (amphipods, barnacles, crabs, shrimps etc.)	8	14	7	7	7	12	9	7	5	12	13	11	9	6	4
Mollusca (whelks, scallops, mussels, etc.)	5	5	4	5	5	1	3	2	2	5	2	1	3	3	3
Bryozoa (sea mats)	8	5	5	7	8	6	5	7	7	6	5	7	7	5	1
Echinodermata (starfish, brittlestars and sea urchins)	3	4	1	4	4	4	1	2	3	3	4	3	2	3	3
Tunicata (sea squirts)	0	0	0	0	0	0	0	0	1	9	0	0	1	1	0
Pisces (fish)	7	5	5	8	4	6	8	8	5	1	8	6	10	6	2
Total Species (S)	**35**	**43**	**28**	**36**	**35**	**38**	**34**	**30**	**29**	**45**	**42**	**31**	**39**	**31**	**13**
Fish Species only	*7*	*5*	*5*	*8*	*4*	*6*	*8*	*8*	*5*	*1*	*8*	*6*	*10*	*6*	*2*
Colonial Sessile Epifaunal Species	*11*	*9*	*7*	*10*	*12*	*12*	*9*	*9*	*11*	*9*	*9*	*9*	*9*	*9*	*1*
Non-colonial Sessile Epifaunal Species	*2*	*2*	*2*	*1*	*1*	*1*	*2*	*3*	*1*	*2*	*1*	*2*	*4*	*2*	*0*
Infaunal species	*15*	*27*	*14*	*17*	*18*	*19*	*15*	*10*	*12*	*33*	*24*	*14*	*16*	*14*	*10*

The phyletic composition of each trawl sample is given above in Table 3.8. and illustrated geographically in Chart Figure 3.7. (Figure Appendix). Site T98 was noted to have the lowest number of species (14 species in total), with the greatest return of species obtained from sites T23 and T31 (50 species in total at each site). The most likely factor attributable to the paucity of species at site T98 in comparison to the remaining 29 trawl sites is the presence of large numbers of the razor shell *Ensis arcuartus*. At site T98, the dense population of razor clams dominated the sample site and this may have reduced the area that could be colonised by other fauna. Trawl sites were located in various water depths (between 2.4 and 30m below sea level (bsl)) but this did not seem to affect the species assemblages found at each site. Although the length of tow varied slightly between sites (see Chart Figure 2.3, Figure Appendix and the trawl sample log, Volume II, Appendix I) the length of tow was not directly proportional to the number of species caught i.e. the longest distance tow did not yield the highest number of species.

Decapod crustaceans (crabs and shrimps: typically mobile epibenthic scavengers) as a group were widely distributed and recorded from all trawl sites (Volume II, Appendix IV). Amphipod and isopod crustaceans (mainly infaunal) were rarely recorded by comparison. The paucity of amphipods and isopods does not truly reflect their distribution across the survey area as they are not adequately sampled by trawling techniques. A more accurate assessment of the amphipod and isopod crustacean component of the survey area has been made using the grab data. However, it is noteworthy that the amphipod species *Gammarus locusta* (recorded at two trawl sites) and the isopod *Idotea linearis* (recorded at 12 trawl sites) were only sampled within the study area using the trawl and were absent from the grab and dredge datasets. The capture of these species in the trawls was probably a result of their cryptic behaviour of living on other epifaunal species.

Molluscs were also widely distributed across the trawl sites. Species identified included those typically associated with sands and sandy gravels these included (but were not limited to) burrowing bivalves (*Abra alba* and *Ensis arcuartus*), sessile epibenthic bivalves (*Mytilus edulis*), mobile epibenthic bivalves (*Aequipecten opercularis*), epibenthic nudibranchs (*Acanthodoris pilosa*), sediment dwelling gastropods and mobile scavenging gastropods (*Buccinum undatum*). There were two cephalopod species caught in the trawls, the little cuttle *Sepiola atlantica* and the common squid *Loligo vulgaris*. Of the mollusc species identified, the sea slug *Acanthodoris pilosa*, the burrowing bivalve *Abra alba* and the little cuttle *Sepiola atlantica* were the most frequently occurring (recorded from 20, 13 and 12 of the 30 trawl sites respectively). The razor shell *Ensis arcuartus* was present at only one site (T98), however, at this site it was the most dominant species within the trawl sample.

Echinoderm species were widespread across the survey area but with a relatively small variety of species recorded from the trawl samples. Those species recorded included the common starfish *Asterias rubens* (recorded at 27 sites out of the 30 sites), the green sea-urchin *Psammechinus miliaris* (recorded at 15 sites) and the brittlestars *Ophiura albida* and *Ophiura ophiura* (recorded at 22 and 17 sites out of 30 sites respectively). The sea potato *Echinocardium cordatum* was only recorded at two sites (T9 and T31), however, at T31, it was quite numerous.

Twenty species of polychaete were recorded from the trawl samples. These included the epifaunal species, *Pomatoceros triqueter* (keel worm) which builds calcareous tubes on hard substrata such as stones and shells, and the ross worm *Sabellaria spinulosa* (recorded at five sites). Several scale worm species were recorded including the burrowing sea mouse *Aphrodita aculeata* (recorded at seven sites out of 30 sites). The trawls also included the infaunal tube-dwelling species *Lagis koreni* (trumpet worm) which was recorded at six sites. This was present in low numbers at five sites but was highly abundant at site T31. Other infaunal tube-dwelling species present in low numbers were *Owenia fusiformis*, *Lanice conchilega* (mason worm) and *Sabella pavonina* (each species found at only one site each out of the 30 trawl sites sampled). *Flabelligera affinis* and *Nereis fucata* were present at few sites because they live in close associations with other fauna present in the samples. (*Flabelligera affinis* lives on *Psammechinus miliaris* and *Nereis fucata* occupies the shells of the hermit crab *Pagurus bernhardus*).

The polychaetes are generally not sampled effectively by beam trawling and therefore the trawl data does not truly reflect their distribution across the survey area. As a result a more accurate assessment of the infaunal polychaete component of the survey area has been made using the grab data. However, the polychaete worm *Orbinia latreillii* was recorded in one trawl (T59) but was not sampled in the study area by grab or dredge.

3.3.3.1. Epifaunal Species

Colonial and sessile epifaunal species (e.g. Hydrozoa and Bryozoa) were fairly widespread in their distribution across the entire survey area (Tables 3.7. and 3.8.). The most noticeable bryozoan species occurring in 28 trawls was *Alcyonidium diaphanum* (sea chervil). Other common bryozoans included the flat encrusting species *Electra pilosa* (Hairy sea mat) and *Conopeum reticulum* as well as *Vesicularia spinosa*. Hydroids were relatively widespread and were recorded from 20 out of the 30 trawl sites. The most prevalent hydroid species within the trawls were *Obelia bidentata*, *Hydrallmania falcata* and *Hydractinia echinata* (living commensally and exclusively on the common hermit crab *Pagurus bernhardus*). These species occurred at 18, 17 and 20 out of the 30 trawl sites respectively. Sea anemones were found at 20 of the 30 trawl sites, tunicates were present at seven sites. Sponges were notably absent from all sampled sites.

3.3.3.2. Fish Species

The 28 fish species which were caught by 2m beam trawl have been isolated from the main trawl dataset and presented separately in Table 3.9 below. Commercially important species are indicated in bold. A total of seven exploitable fish species were identified from the survey area, comprising of four flat fish species, one sand eel species, one elasmobranch species and one fin fish species.

Of these seven commercially important species only three (dab, whiting and sole) were relatively widespread across the survey area (recorded from 14, 20 and 29 sites out of the 30 sites respectively). Plaice and dogfish were less frequent (recorded from eight and seven sites out of the 30 sites respectively), whilst the Lemon Sole and Sand Eels were at only one site each out of the 30 trawl sites.

With the exception of *Pomatoschistus minutus* (sand goby), *Agonas cataphractus* (pogge), *Trisopterus luscus* (bib) and *Trisopterus minutus* (poor cod) the non-commercially important fish species caught were not widely distributed across the Outer Thames Estuary survey area rather, their distributions were sporadic. Numbers of individuals of each fish species were generally low across all trawl sites.

The sporadic distributions and low counts of sand eels, plaice, dogfish and lemon sole and some of the non-commercially important demersal species may be an artefact of the sampling technique rather than a true reflection of their distributions or actual numbers given the paucity of trawls taken in such a large geographic area.

Table 3.9. Fish Species Recorded During the 2 Metre Beam Trawl Sampling.

Taxon	Common Name	MCS code
Scyliorhinus canicula	**Lesser Spotted Dogfish**	ZF0028
Raja clavata	**Thornback Ray**	ZF0089
Ciliata mustela	5 Bearded Rockling	ZG0111
Merlangus merlangus	**Whiting**	ZG0123
Trisopterus luscus	Bib	ZG0143
Trisopterus minutus	Poor Cod	ZG0144
Syngnathus acus	Greater Pipefish	ZG0245
Syngnathus rostellatus	Nilsson's Pipefish	ZG0246
Trigla lucerna	Tub Gurnard	ZG0269
Agonus cataphractus	Pogge	ZG0291
Liparis montagui	Montagu's Sea Snail	ZG0297
Dicentrarchus labrax	Sea Bass	ZG0312
Echiichthys vipera	Lesser Weever	ZG0405
Pholis gunnellas	Butterfish	ZG0440
Ammodytes tobianus	**Sand Eel**	ZG0444
Callionymus lyra	Dragonet	ZG0452
Gobiidae	Unidentified Goby	ZG0455
Pomatoschistus spp.	Unidentified Goby	ZG0476
Pomatoschistus microps	Common Goby	ZG0478
Pomatoschistus minutus	Sand Goby	ZG0479
Pomatoschistus pictus	Painted Goby	ZG0481
Lepidorhombus whiffiagonis	Megrim	ZG0549
Limanda limanda	**Dab**	ZG0572
Microstomus kitt	**Lemon Sole**	ZG0574
Pleuronectes platessa	**Plaice**	ZG0578
Buglossidium luteum	Solenette	ZG0585
Solea solea	**Sole**	ZG0591

3.3.3.3. Statistical analysis of the Trawl Data

The PRIMER cluster, SIMPROF and MDS ordination were applied to the rationalised trawl faunal dataset using a presence/absence transformation. The results revealed no significant differences between the majority of the trawl sites (Group A consisting of 28 trawl sites), with the exception of two outliers, Sites T15 (Group B) and T98 (Group C) (Figures 3.7. and 3.8.). Site T15 was located on the eastern extreme of the surveyed area adjacent to a dredging area. This displayed a relatively high number of mobile predators including shrimps and prawns, crabs, whelks and echinoderms (*Psammechinus miliaris* and *Ophiura albida*), but a low number of burrowing species such as bivalves and less epifaunal species. As mentioned previously, T98 was different to the other sites as it contained a large number of dead and living *Ensis arcuartus* which dominated the trawl with only a very few other species present.

There was no clear pattern observed between sediment types, depth, organic matter content and the composition and number of species recorded at the sites trawled in the surveyed area.

Figure 3.7. Two Metre Beam Trawl Macrofaunal Data. Bray-Curtis Similarity SIMPROF Dendrogram. Rationalised Epifaunal and Infaunal data, presence/absence transformed.

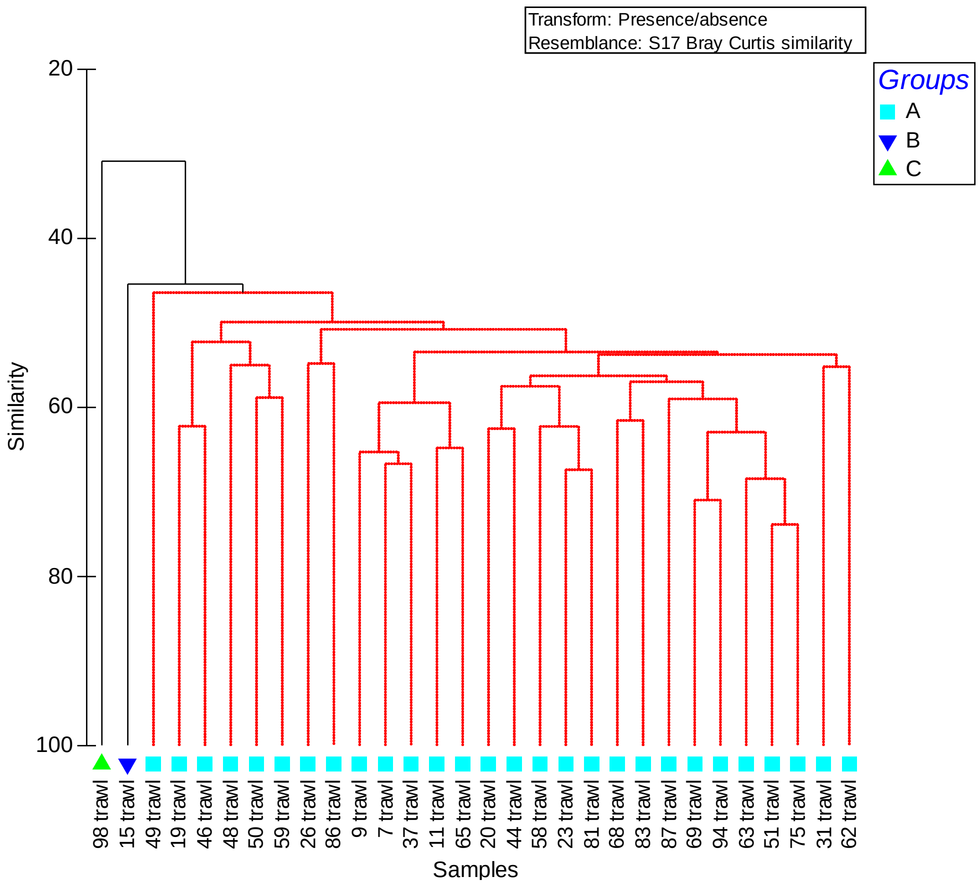
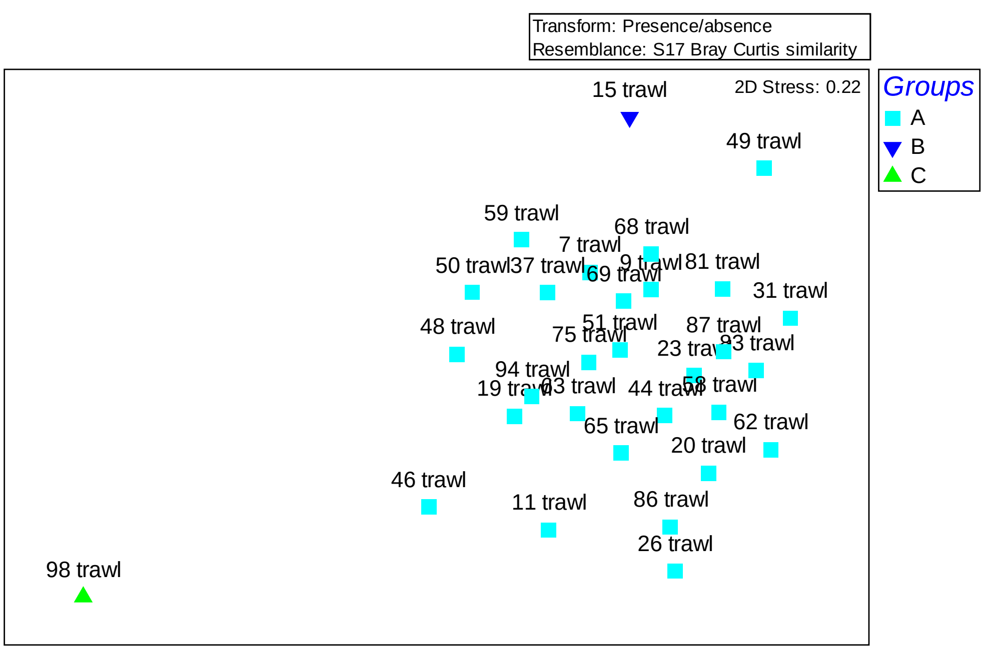


Figure 3.8. 2 Metre Beam Trawl Macrofaunal Data. MDS Ordination of the Two Metre Beam Trawl Faunal Dataset, presence/absence transformation.



3.4. Biotope classification

Biotopes descriptions based on the JNCC biotope classification of Connor *et al* (2004) were assigned to Groups A to I by reviewing the species abundance and percentage occurrence of species within the groupings produced on the combined MDS and cluster analyses and SIMPER for the grab dataset, the dredge species dataset, the physical data on water depth, sediment composition.

The tables below provide a summary of the biotope classifications chosen at this time along with the mean physical data for samples within the groupings taken from this survey, the previous biotope codes (from 1997) are provided for reference. Where biotopes/features did not perfectly match those published, or there appeared to be transition between biotopes, a combination of biotope classifications has been provided.

The infaunal biotopes described for the grab and dredge datasets and summarised in the tables below have been overlaid onto the Admiralty chart in Chart Figure 3.8, Figure Appendix. The boundaries of the biotopes were fitted by eye using the acoustic side scan results as a guide to changes in substrate type (see Volume I, Part I for acoustic data).

Four main infaunal biotopes classified the Outer Thames Estuary region surveyed. Three were found in conjunction with the sandbank features:

- **SS.SSa.IFiSa.NcirBat**. (*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand)

- **SS.SSa.IMuSa.FfabMag** (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand).

- **SS.SSa.IFiSa.IMoSa** (Infralittoral mobile clean sand with sparse fauna)

And one found in the tide-swept channels between the sandbank features:

- **SS.SMx** (sublittoral mixed sediment)

Unlike the infaunal datasets which showed a variety of biotope types, the epibenthic faunal dataset provided by the trawls was fairly homogenous. The epibenthic data was given two biotope classifications and these are plotted in discrete locations on a separate chart at the sites where the biotopes were found (Chart Figure3.9, Figure Appendix).

The two biotopes that best classified the epibenthic habitat were:

- **SS.SMX.CMx.FluHyd** (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment)

- **SS.SSA.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles).

A third biotope was found from analysing the trawl, grab and dredge at Site 98:

- **SS.SSa.IMuSa.EcorEns (***Echinocardium cordatum* and *Ensis* spp. in lower sublittoral slightly muddy sand).

It is still undetermined if this is a biotope in itself or a biotope complex at a higher level, however, it fits well as an overlying biotope on the **FfabMag** area.

Site 15 has a species composition typical of the region but more similar to those found on mixed sediment of sands and harder substrates. A definite description of the epibenthic biotope was not possible from the dataset as it appeared to be a complex of different biotopes under the broad heading of **SMX.CMx**.

It should be noted that the macrofauna in this study were identified using the most recent taxonomic keys. Any changes in species names than those provided by Conner *et al* (2004) have been noted alongside the biotope descriptions provided in the tables below.

Cluster		**Group A**	**Number of Faunal Sites**		34
Total No. Species		48	**Range Water Depth *m (bsl)***		3-25
Species	**mean**	6.029412	**% Gravel**	**max**	3.694
	stdev	2.634104		**min**	0.000
Abundance	**mean**	22.5	**% Sand**	**max**	99.916
	stdev	16.17752		**min**	88.302
Richness	**mean**	1.685693	**% Silt**	**max**	11.698
	stdev	0.70774		**min**	0.061
Evenness	**mean**	0.772773	**% Organic Carbon**	**max**	1.509
	stdev	0.173924		**min**	0.358
Diversity	**mean**	1.31358	**Sediment Classification**	**Very well to poorly sorted sands**	
	stdev	0.4803			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**			*Nephtys cirrosa** *Magelona johnstoni** *Bathyporeia elegans** *Spiophanes bombyx* *Abra alba* *Bathyporeia guilliamsoniana* *Scolelepis bonnieri* *Ophelia borealis* *Nephtys hombergii* *Scoloplos armiger*		
Best Fit Biotope Classification			**SS.SSa.IFiSa.NcirBat**. *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand		
Previous biotope code			**IGS.NcirBat** - Version: 97.06		

JNCC Biotope Description

Well-sorted medium and fine sands characterised by *Nephtys cirrosa* and *Bathyporeia* spp. (and sometimes *Pontocrates* spp.) which occur in the shallow sublittoral to at least 30 m depth. This biotope occurs in sediments subject to physical disturbance, as a result of wave action (and occasionally strong tidal streams). The magelonid polychaete *Magelona mirabilis* may be frequent in this biotope in more sheltered, less tideswept areas whilst in coarser sediments the opportunistic polychaete *Chaetozone setosa* may be commonly found. The faunal diversity of this biotope is considerably reduced compared to less disturbed biotopes (such as **FfabMag**) and for the most part consists of the more actively-swimming amphipods. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others) and spionid polychaetes such as *Spio filicornis* and *S. martinensis* may also be present. Occasional *Lanice conchilega* may be visible at the sediment surface. Stochastic recruitment events in the *Nephtys cirrosa* populations may be very important to the population size of other polychaetes present and may therefore create a degree of variation in community composition (Bamber 1994).

As sediment disturbance increases **NcirBat** may grade into **IMoSa** with only the most robust species able to tolerate the mobile sand environment.

As sediment disturbance decreases and the finer silt fraction can begin to sediment out of the water column **NcirBat** may grade into the muddy sand biotope **FfabMag**.

Typical Physical Features	Full salinity (30-35ppt); exposed to moderately exposed; weak (>1 kn) to negligible tidal stream; sandy mud; infralittoral; 0-10 metres.
Site Specific Biotope Description	Although the biotope allocated to Group A were for infralittoral sediments, it reports to be present down to 30 metres and is therefore a good match for the suite of species and sediment type reported here. Located on flat featureless sand and low lying ripples.

Cluster		Group B	Number of Faunal Sites		20
Total No. Species		41	Range Water Depth *m (bsl)*		2-31
Species	mean	7.4	% Gravel	max	1.330
	stdev	2.521487		min	0.000
Abundance	mean	46.35	% Sand	max	99.141
	stdev	82.01558		min	44.686
Richness	mean	2.030873	% Silt	max	46.268
	stdev	0.559672		min	0.828
Evenness	mean	0.787594	% Organic Carbon	max	2.309
	stdev	0.184937		min	0.521
Diversity	mean	1.514603	Sediment Classification	Very well to poorly sorted sand and a few poorly sorted silty sands	
	stdev	0.420121			

Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). * = Characterising species from SIMPER	*Nephtys hombergii** *Abra alba** *Spiophanes bombyx** *Bathyporeia elegans** *Goniada maculata* *Magelona johnstoni* *Nephtys cirrosa* *Bathyporeia guilliamsoniana* *Fabulina fabula* *Scoloplos armiger*
Best Fit Biotope Classification	**SS.SSa.IMuSa.FfabMag** *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand
Previous biotope code	**IGS.FabMag** - Version: 97.06

JNCC Biotope Description

In stable, fine, compacted sands and slightly muddy sands in the infralittoral and littoral fringe, communities occur that are dominated by venerid bivalves such as *Chamelea gallina*. This biotope may be characterised by a prevalence of *Fabulina fabula* and *Magelona mirabilis* or other species of *Magelona* (e.g. *M. filiformis)*. Other taxa, including the amphipod *Bathyporeia* spp. and polychaetes such as *Chaetozone setosa*, *Spiophanes bombyx* and *Nephtys* spp. are also commonly recorded. In some areas the bivalve *Spisula elliptica* may also occur in this biotope in low numbers. The community is relatively stable in its species composition; however, numbers of *Magelona* and *F. Fabulina* tend to fluctuate. Around the Scilly Isles numbers of *F. fabulina* in this biotope are uncommonly low whilst these taxa are often found in higher abundances in muddier communities (presumably due to the higher organic content). Consequently it may be better to revise this biotope on the basis of less ubiquitous taxa such as key amphipod species (E.I.S. Rees pers. comm. 2002) although more data is required to test this. **FfabMag** and **MoeVen** are collectively considered to be the 'shallow *Venus* community' or 'boreal off-shore sand association' of previous workers (see Petersen 1918; Jones 1950; Thorson 1957). These communities have been shown to correlate well with particular levels of current induced 'bed-stress' (Warwick & Uncles 1980). The 'Arctic *Venus* Community' and 'Mediterranean *Venus* Community' described to the north and south of the UK (Thorson 1957) probably occur in the same habitat and appears to be the same biotope described as the *Ophelia borealis* community in northern France and the central North Sea (Knitzer *et al.* 1992). Sites with this biotope may undergo transitions in community composition. The epibiotic biotopes **EcorEns** and **AreISa** may also overlay this biotope in some areas.

FfabMag forms part of a continuum of communities found along the depth and sand/silt gradients with an increase in silt/clay leading to the development of **AalbNuc** in deeper water.

As sediment disturbance increases and the finer silt fraction is unable to sediment out of the water column **FfabMag** may grade into the sandy biotope **NcirBat**.

Typical Physical Features	Full (30-35 ppt); moderately strong (3 kn) to very weak tidal stream; sandy mud, infralittoral, 5-20 metres, organically enriched.
Site Specific Biotope Description	Good fit with this biotope. **FfabMag** sites seemingly adjacent to the **NcirBat** exhibiting the gradation of one biotope into another. (*Magelona johnstoni* replaces *M. mirabilis*).

Cluster		**Group C**	**Number of Faunal Sites**		3
Total No. Species		9	**Range Water Depth *m (bsl)***		3-10
Species	**mean**	3.666667	**% Gravel**	**max**	2.706254
	stdev	0.57735		**min**	0.04185
Abundance	**mean**	7	**% Sand**	**max**	99.86201
	stdev	1		**min**	97.16694
Richness	**mean**	1.37	**% Silt**	**max**	1.183295
	stdev	0.222641		**min**	0.096141
Evenness	**mean**	0.923575	**% Organic Carbon**	**max**	2.457333
	stdev	0.050118		**min**	0.526001
Diversity	**mean**	1.192065	**Sediment Classification**	**Very well, moderately and moderately well sorted sands**	
	stdev	0.171154			

Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**	*Bathyporeia elegans**
Best Fit Biotope Classification	**SS.SSa.IFiSa.IMoSa** Infralittoral mobile clean sand with sparse fauna
Previous biotope code	**IGS.Mob** - Version: 97.06

JNCC Biotope Description

Medium to fine sandy sediment in shallow water, often formed into dunes, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples in conjunction with low numbers of mysids such as *Gastrosaccus spinifer*, the polychaete *Nephtys cirrosa* and the isopod *Eurydice pulchra*. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). This biotope is more mobile than **SSA.NcirBat** and may be closely related to **LSa.BarSa** on the shore. Common epifaunal species such as *Pagurus bernhardus*, *Liocarcinus depurator*, *Carcinus maenas* and *Asterias rubens* may be encountered and are the most conspicuous species present.

Where sediment disturbance decreases in less exposed or weaker tidal currents, **IMoSa** may grade into **NcirBat** with an increase in species richness as the environment becomes more stable.

Typical Physical Features	Full salinity (30-35 ppt); exposed, moderately exposed, sheltered; strong to very weak tidal streams (1-6 kn); medium to fine sand; infralittoral; 0-20 metres.
Site Specific Biotope Description	The species listed in this biotope description are a very good match for Group C (including *Ammodytes* spp. and *Gastrosaccus spinifer*). Littoral biotopes were considered and rejected as none of the fauna found in Group C matched those listed.

Cluster		Group D	Number of Faunal Sites		19
Total No. Species		86	Range Water Depth *m (bsl)*		6-17
Species	mean	14.57895	% Gravel	max	12.11083
	stdev	6.300933		min	0.269776
Abundance	mean	75.63158	% Sand	max	98.65349
	stdev	43.62748		min	43.90788
Richness	mean	3.185513	% Silt	max	2.428639
	stdev	1.080523		min	0.114821
Evenness	mean	0.789547	% Organic Carbon	max	1.293735
	stdev	0.087024		min	0.377416
Diversity	mean	2.033976	Sediment Classification	**Well to very poorly sorted sand,** very poorly to poorly sorted silty sands and silty gravelly sand	
	stdev	0.284251			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). * = Characterising species from SIMPER			*Aspidelectra melolontha** *Electra monostachys** *Conopeum reticulum** *Spiophanes bombyx** *Abra alba** *AlcyonidIum mytili* Nemertea *Ophelia borealis* *Lagis koreni* *Notomastus* spp. *Nephtys cirrosa*		
Best Fit Biotope Classification			**SS.SMx** Sublittoral mixed sediment		
Previous biotope code			**IMX** in part – Version: 97.06, **CMX** in part – Version 97.06		
JNCC Biotope Description					
Sublittoral mixed (heterogeneous) sediments found from the extreme low water mark to deep offshore circalittoral habitats. These habitats incorporate a range of sediments including heterogeneous muddy gravelly sands and also mosaics of cobbles and pebbles embedded in or lying upon sand, gravel or mud. There is a degree of confusion with regard nomenclature within this complex as many habitats could be defined as containing mixed sediments, in part depending on the scale of the survey and the sampling method employed. The BGS trigon can be used to define truly mixed or heterogeneous sites with superficial sediments which are a mixture of mud, gravel and sand. However, another 'form' of mixed sediment includes mosaic habitats such as superficial waves or ribbons of sand on a gravel bed or areas of lag deposits with cobbles/pebbles embedded in sand or mud and these are less well defined and may overlap into other habitat or biotope complexes. These habitats may support a wide range of infauna and epibiota including polychaetes, bivalves, echinoderms, anemones, hydroids and Bryozoa. Mixed sediments with biogenic reefs or macrophyte dominated communities are classified separately in the **SBR** and **SMP** habitat complexes respectively.					
Typical Physical Features		Full to variable salinity (18-35 ppt); moderately exposed to ultra sheltered; moderately strong (3 kn) to very weak tidal stream; mixed sediments; 0-50 metres.			
Site Specific Biotope Description		A complex of several biotopes because of the silt and dead shell component.			

<table>
<tr><td colspan="2">Cluster</td><td>Group E (Outlier)</td><td colspan="2">Number of Faunal Sites</td><td>1</td></tr>
<tr><td colspan="2">Total No. Species</td><td>8</td><td colspan="2">Range Water Depth m (bsl)</td><td>3</td></tr>
<tr><td rowspan="2">Species</td><td>mean</td><td>8</td><td>% Gravel</td><td>max</td><td>7.396</td></tr>
<tr><td>stdev</td><td>N/A</td><td></td><td>min</td><td>N/A</td></tr>
<tr><td rowspan="2">Abundance</td><td>mean</td><td>24</td><td>% Sand</td><td>max</td><td>90.076</td></tr>
<tr><td>stdev</td><td>N/A</td><td></td><td>min</td><td>N/A</td></tr>
<tr><td rowspan="2">Richness</td><td>mean</td><td>2.202606</td><td>% Silt</td><td>max</td><td>2.528</td></tr>
<tr><td>stdev</td><td>N/A</td><td></td><td>min</td><td>N/A</td></tr>
<tr><td rowspan="2">Evenness</td><td>mean</td><td>0.850366</td><td>% Organic Carbon</td><td>max</td><td>0.788</td></tr>
<tr><td>stdev</td><td>N/A</td><td></td><td>min</td><td>N/A</td></tr>
<tr><td rowspan="2">Diversity</td><td>mean</td><td>1.768287</td><td rowspan="2">Sediment Classification</td><td colspan="2" rowspan="2">Very well sorted sand</td></tr>
<tr><td>stdev</td><td>N/A</td></tr>
<tr><td colspan="3">Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).</td><td colspan="3">Conopeum reticulum
Aspidelectra melolontha
Magelona johnstoni
Nucula nitidosa
Sigalion mathildae
Nephtys hombergii
Spiophanes bombyx
Donax vittatus</td></tr>
<tr><td colspan="3">Best Fit Biotope Classification</td><td colspan="3">SS.SSa.IMuSa
Infralittoral muddy sand</td></tr>
<tr><td colspan="3">Previous biotope code</td><td colspan="3">IMS.FaMS - Version: 97.06</td></tr>
<tr><td colspan="6">JNCC Biotope Description</td></tr>
<tr><td colspan="6">Non-cohesive muddy sand (with 5% to 20% silt/clay) in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly polychaetes (Magelona mirabilis, Spiophanes bombyx and Chaetozone setosa), bivalves (Fabulina fibula and Chamelea gallina) and the urchin Echinocardium cordatum.</td></tr>
<tr><td colspan="2">Typical Physical Features</td><td colspan="4">Full to variable salinity (18-35 ppt); moderately exposed, sheltered; moderately strong (3 kn) to very weak tidal stream; infralittoral; 0-20 metres.</td></tr>
<tr><td colspan="2">Site Specific Biotope Description</td><td colspan="4">Silty anoxic sand sample, species poor. Rejected the IFiSa biotope because of the increased level of silt and fines.</td></tr>
</table>

Cluster		Group F1	Number of Faunal Sites		2
Total No. Species		54	Range Water Depth *m (bsl)*		20-25
Species	mean	40	% Gravel	max	26.93613
	stdev	11.31371		min	10.22943
Abundance	mean	414.5	% Sand	max	83.83919
	stdev	173.2412		min	68.02632
Richness	mean	6.468901	% Silt	max	5.931383
	stdev	1.425575		min	5.037555
Evenness	mean	0.773505	% Organic Carbon	max	0.9161209
	stdev	0.010715		min	0.74744
Diversity	mean	2.836044	Sediment Classification	Very poorly sorted sand and very poorly sorted gravelly sand	
	stdev	0.182461			

Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**	*Abra alba** *Spiophanes bombyx** *Notomastus* spp.* *Lagis koreni** *Eumida bahusiensis** *Conopeum reticulum** *Electra monostachys** *Mysella bidentata** Nemertea* *Aspidelectra melolontha**
Best Fit Biotope Classification	**SS.SMx.CMx** Circalittoral mixed sediment
Previous biotope code	**CMX** – Version: 97.06

JNCC Biotope Description

Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii* are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as *Nemertesia* spp and *Hydrallmania falcata*. The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the SCS complex. However, infaunal data for this biotope complex is limited to that described under the biotope **MysThyMx**, and so are not representative of the infaunal component of this biotope complex.

Typical Physical Features	Full salinity (30-35 ppt); moderately exposed (3 kn) to very sheltered; moderately strong to very weak; mixed sediment (with stones and shells); circalittoral; 5-50 metres.
Site Specific Biotope Description	A mixture of sediments present in the Group F1 producing a range of habitats.

Cluster		Group G	Number of Faunal Sites		1
Total No. Species		41	Range Water Depth *m (bsl)*		28
Species	mean	41	% Gravel	max	13.920
	stdev	N/A		min	N/A
Abundance	mean	353	% Sand	max	79.593
	stdev	N/A		min	N/A
Richness	mean	6.818413	% Silt	max	6.487
	stdev	N/A		min	N/A
Evenness	mean	0.704672	% Organic Carbon	max	6.487
	stdev	N/A		min	N/A
Diversity	mean	2.616851	Sediment Classification	Very poorly sorted gravelly sand	
	stdev	N/A			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).			*Sabellaria spinulosa* *Spiophanes bombyx* *Lagis koreni* *Electra monostachys* *Anoplodactylus petiolatus* *Abludomelita obtusata* *Alcyonidium diaphanum* *Alcyonidium mytili* *Conopeum reticulum* *Electra pilosa*		
Best Fit Biotope Classification			**SS.SMx.CMx** Circalittoral mixed sediment		
Previous biotope code			**CMX** – Version: 97.06		
JNCC Biotope Description					
Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii* are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as *Nemertesia* spp and *Hydrallmania falcata*. The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the SCS complex. However, infaunal data for this biotope complex is limited to that described under the biotope **MysThyMx**, and so are not representative of the infaunal component of this biotope complex.					
Typical Physical Features		Full salinity (30-35 ppt); moderately exposed (3 kn) to very sheltered; moderately strong to very weak; mixed sediment (with stones and shells); circalittoral; 5-50 metres.			
Site Specific Biotope Description		The presence of encrusting thick layer of *Sabellaria* at this site, not considered reef.			

Cluster		Group F2	**Number of Faunal Sites**		7
Total No. Species		91	**Range Water Depth *m (bsl)***		16-29
Species	**mean**	39.28571	**% Gravel**	**max**	8.61595
	stdev	8.40068		**min**	1.197363
Abundance	**mean**	329.8571	**% Sand**	**max**	83.25697
	stdev	182.1057		**min**	59.47211
Richness	**mean**	6.745562	**% Silt**	**max**	13.59157
	stdev	1.44302		**min**	10.35802
Evenness	**mean**	0.749676	**% Organic Carbon**	**max**	1.619722
	stdev	0.10345		**min**	0.934984
Diversity	**mean**	2.748902	**Sediment Classification**	**Very poorly sorted sand, very poorly sorted silty sand and very poorly sorted silty gravelly sand**	
	stdev	0.498173			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**			*Spiophanes bombyx** *Lagis koreni** *Electra monostachys** Nemertea* *Conopeum reticulum** *Nereis longissima** *Autolytus* spp.* *Glycera alba** *Lumbrineris gracilis** *Scalibregma inflatum**		
Best Fit Biotope Classification			**SS.SMx.CMx** Circalittoral mixed sediment		
Previous biotope code			**CMX** – Version: 97.06		

JNCC Biotope Description

Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii* are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as *Nemertesia* spp and *Hydrallmania falcata*. The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the SCS complex. However, infaunal data for this biotope complex is limited to that described under the biotope **MysThyMx**, and so are not representative of the infaunal component of this biotope complex.

Typical Physical Features	Full salinity (30-35 ppt); moderately exposed (3 kn) to very sheltered; moderately strong to very weak; mixed sediment (with stones and shells); circalittoral; 5-50 metres.
Site Specific Biotope Description	Mixed sediments increasing species complexity.

Cluster		Group F3	Number of Faunal Sites		1
Total No. Species		53	Range Water Depth *m (bsl)*		72
Species	mean	53	% Gravel	max	27.068
	stdev	N/A		min	N/A
Abundance	mean	342	% Sand	max	56.605
	stdev	N/A		min	N/A
Richness	mean	8.91	% Silt	max	16.327
	stdev	N/A		min	N/A
Evenness	mean	0.77	% Organic Carbon	max	1.380
	stdev	N/A		min	N/A
Diversity	mean	3.05	Sediment Classification	Very poorly sorted silty gravelly sand	
	stdev	N/A			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).			*Abra alba* *Euclymene oerstedii* *Ophiura albida* *Photis longicaudata* *Lumbrineris gracilis* *Mediomastus fragilis* *Ampelisca spinipes* *Caulleriella alata* *Ampharete lindstroemi* *Pomatoceros triqueter*		
Best Fit Biotope Classification			**SS.SMx.CMx** Circalittoral mixed sediment		
Previous biotope code			**CMX** – Version: 97.06		

JNCC Biotope Description

Mixed (heterogeneous) sediment habitats in the circalittoral zone (generally below 15-20m) including well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in or lying upon mud, sand or gravel. Due to the variable nature of the seabed a variety of communities can develop which are often very diverse. A wide range of infaunal polychaetes, bivalves, echinoderms and burrowing anemones such as *Cerianthus lloydii* are often present in such habitat and the presence of hard substrata (shells and stones) on the surface enables epifaunal species to become established, particularly hydroids such as *Nemertesia* spp and *Hydrallmania falcata*. The combination of epifauna and infauna can lead to species rich communities. Coarser mixed sediment communities may show a strong resemblance, in terms of infauna, to biotopes within the SCS complex. However, infaunal data for this biotope complex is limited to that described under the biotope **MysThyMx**, and so are not representative of the infaunal component of this biotope complex.

Typical Physical Features	Full salinity (30-35 ppt); moderately exposed (3 kn) to very sheltered; moderately strong to very weak; mixed sediment (with stones and shells); circalittoral; 5-50 metres.
Site Specific Biotope Description	Close to dredging area.

Cluster		**Group F4**	**Number of Faunal Sites**		1
Total No. Species		26	**Range Water Depth *m (bsl)***		12
Species	**mean**	26	**% Gravel**	**max**	27.538
	stdev	N/A		**min**	N/A
Abundance	**mean**	113	**% Sand**	**max**	56.990
	stdev	N/A		**min**	N/A
Richness	**mean**	5.29	**% Silt**	**max**	15.473
	stdev	N/A		**min**	N/A
Evenness	**mean**	0.86	**% Organic Carbon**	**max**	1.382
	stdev	N/A		**min**	N/A
Diversity	**mean**	2.80	**Sediment Classification**	**Very poorly sorted silty gravelly sand**	
	stdev	N/A			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).			*Conopeum reticulum* *Ampelisca spinipes* *Pomatoceros triqueter* *Abra alba* *Electra monostachys* *Schizomavella auriculata* Nemertea *Lumbrineris gracilis* *Mediomastus fragilis* *Lagis koreni*		
Best Fit Biotope Classification			**SS.SMx** Sublittoral mixed sediment		
Previous biotope code			**IMX** in part – Version: 97.06 **CMX** in part – Version 97.06		
JNCC Biotope Description					
Sublittoral mixed (heterogeneous) sediments found from the extreme low water mark to deep offshore circalittoral habitats. These habitats incorporate a range of sediments including heterogeneous muddy gravelly sands and also mosaics of cobbles and pebbles embedded in or lying upon sand, gravel or mud. There is a degree of confusion with regard nomenclature within this complex as many habitats could be defined as containing mixed sediments, in part depending on the scale of the survey and the sampling method employed. The BGS trigon can be used to define truly mixed or heterogeneous sites with surficial sediments which are a mixture of mud, gravel and sand. However, another 'form' of mixed sediment includes mosaic habitats such as superficial waves or ribbons of sand on a gravel bed or areas of lag deposits with cobbles/pebbles embedded in sand or mud and these are less well defined and may overlap into other habitat or biotope complexes. These habitats may support a wide range of infauna and epibiota including polychaetes, bivalves, echinoderms, anemones, hydroids and Bryozoa. Mixed sediments with biogenic reefs or macrophyte dominated communities are classified separately in the **SBR** and **SMP** habitat complexes respectively.					
Typical Physical Features		Full to variable salinity (18-35 ppt); moderately exposed to ultra sheltered; moderately strong (3 kn) to very weak tidal stream; mixed sediments; 0-50 metres.			
Site Specific Biotope Description		A complex of several biotopes because of the silt and dead shell component.			

Cluster		Group F5	**Number of Faunal Sites**		2
Total No. Species		35	**Range Water Depth *m (bsl)***		10
Species	**mean**	39.28571	**% Gravel**	**max**	6.11105
	stdev	8.40068		**min**	1.37372
Abundance	**mean**	329.8571	**% Sand**	**max**	85.64662
	stdev	182.1057		**min**	26.02637
Richness	**mean**	6.745562	**% Silt**	**max**	72.59991
	stdev	1.44302		**min**	8.242332
Evenness	**mean**	0.749676	**% Organic Carbon**	**max**	2.294053
	stdev	0.10345		**min**	1.338283
Diversity	**mean**	2.748902	**Sediment Classification**	**Very poorly sorted sand and very poorly sorted sandy silt**	
	stdev	0.498173			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**			*Barnea candida* *Abra alba* *Notomastus* spp.* *Mediomastus fragilis** *Abludomelita obtusata** *Corophium volutator* *Ampelisca spinipes* *Spiophanes bombyx* *Nucula nucleus** *Nereis longissima*		
Best Fit Biotope Classification			**SS.SMu / SS.SSa.CFiSa** Sublittoral cohesive mud and sandy mud communities / Circalittoral fine sand		
Previous biotope code			Part of **IMU**, **CMU** and **IMS** – Version 97.06 / Part of **CGS** – Version 97.06		

JNCC Biotope Description

Sublittoral mud and cohesive sandy mud extending from the extreme lower shore to offshore, circalittoral habitats. This biotope is predominantly found in sheltered harbours, sealochs, bays, marine inlets and estuaries and stable deeper/offshore areas where the reduced influence of wave action and/or tidal streams allow fine sediments to settle. Such habitats are often by dominated by polychaetes and echinoderms; in particular brittlestars such as *Amphiura* spp. Seapens such as *Virgularia mirabilis* and burrowing megafauna including *Nephrops norvegicus* are common in deeper muds. Estuarine muds tend to be characterised by infaunal polychaetes and oligochaetes.

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Clean fine sands with less than 5% silt/clay in deeper water, either on the open coast or in tide-swept channels of marine inlets in depths of over 15-20m. The habitat may also extend offshore and is characterised by a wide range of echinoderms (in some areas including the pea urchin *Echinocyamus pusillus*), polychaetes and bivalves. This habitat is generally more stable than shallower, infralittoral sands and consequently supports a more diverse community.

Typical Physical Features	Full to reduced salinity (18-35 ppt); moderately exposed to ultra sheltered; moderately strong to very weak tidal streams; mud and sandy muds; infralittoral, circalittoral; 0-30 metres / Full to reduced salinity (18-35 ppt); moderately exposed to very sheltered; weak to very weak tidal streams; clean fine sands; circalittoral; 0-50 metres.
Site Specific Biotope Description	Thick muddy clay with boring bivalve population.

<table>
<tr><td colspan="2">**Cluster**</td><td>**Group F6**</td><td colspan="2">**Number of Faunal Sites**</td><td>3</td></tr>
<tr><td colspan="2">**Total No. Species**</td><td>79</td><td colspan="2">**Range Water Depth *m (bsl)***</td><td>15-20</td></tr>
<tr><td rowspan="2">**Species**</td><td>**mean**</td><td>46</td><td>**% Gravel**</td><td>**max**</td><td>11.8061</td></tr>
<tr><td>**stdev**</td><td>3.464102</td><td></td><td>**min**</td><td>3.165314</td></tr>
<tr><td rowspan="2">**Abundance**</td><td>**mean**</td><td>605</td><td>**% Sand**</td><td>**max**</td><td>80.89298</td></tr>
<tr><td>**stdev**</td><td>680.1698</td><td></td><td>**min**</td><td>76.89764</td></tr>
<tr><td rowspan="2">**Richness**</td><td>**mean**</td><td>7.613283</td><td>**% Silt**</td><td>**max**</td><td>18.92579</td></tr>
<tr><td>**stdev**</td><td>0.74543</td><td></td><td>**min**</td><td>7.300924</td></tr>
<tr><td rowspan="2">**Evenness**</td><td>**mean**</td><td>0.648091</td><td>**% Organic Carbon**</td><td>**max**</td><td>1.571901</td></tr>
<tr><td>**stdev**</td><td>0.331691</td><td></td><td>**min**</td><td>1.313299</td></tr>
<tr><td rowspan="2">**Diversity**</td><td>**mean**</td><td>2.463795</td><td rowspan="2">**Sediment Classification**</td><td colspan="2" rowspan="2">**Very poorly to poorly sorted silty sand** and very poorly sorted sand</td></tr>
<tr><td>**stdev**</td><td>1.235617</td></tr>
<tr><td colspan="3">**Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).**

*** = Characterising species from SIMPER**</td><td colspan="3">*Sabellaria spinulosa**
*Abra alba**
*Unciola crenatipalma**
*Pisidia longicornis**
*Conopeum reticulum**
Autolytus spp.*
Electra pilosa
*Lumbrineris gracilis**
*Spiophanes bombyx**
Nemertea*</td></tr>
<tr><td colspan="3">**Best Fit Biotope Classification**</td><td colspan="3">**SS.SBR.PoR.SspiMx / SS.SSa.IfiSa**
Sabellaria spinulosa on stable circalittoral mixed sediment / Infralittoral fine sand</td></tr>
<tr><td colspan="3">**Previous biotope code**</td><td colspan="3">**CMX.SspiMx** – Version 97.06 / **IGS.FaS** – Version 97.06</td></tr>
<tr><td colspan="6">**JNCC Biotope Description**</td></tr>
<tr><td colspan="6">The tube-building polychaete *Sabellaria spinulosa* at high abundances on mixed sediment. These species typically forms loose agglomerations of tubes forming a low lying matrix of sand, gravel, mud and tubes on the seabed. The infauna comprises typical sublittoral polychaete species such as *Protodorvillea kefersteini*, *Pholoe synophthalmica, Harmothoe* spp, *Scoloplos armiger*, *Mediomastus fragilis*, *Lanice conchilega* and cirratulids, together with the bivalve *Abra alba,* and tube building amphipods such as *Ampelisca* spp. The epifauna comprise a variety of bryozoans including *Flustra foliacea*, *Alcyonidium diaphanum* and *Cellepora pumicosa*, in addition to calcareous tubeworms, pycnogonids, hermit crabs and amphipods. The reefs formed by *Sabellaria* consolidate the sediment and allow the settlement of other species not found in adjacent habitats leading to a diverse community of epifaunal and infauna species. The development of such reefs is assisted by the settlement behaviour of larval *Sabellaria* which are known to selectively settle in areas of suitable sediment and particularly on existing *Sabellaria* tubes (Tait and Dipper, 1997; Wilson 1929). These reefs are particularly affected by dredging or trawling and in heavily dredged or disturbed areas an impoverished community may be left (e.g. **Pkef**) particularly if the activity or disturbance is prolonged. However, it is likely that reefs of *S. spinulosa* can recover quite quickly from short term or intermediate levels of disturbance as found by Vorberg (2000) in the case of disturbance from shrimp fisheries and recovery will be accelerated if some of the reef is left intact following disturbance as this will assist larval settlement of the species. *S. spinulosa* reefs are often found in areas with quite high levels of natural sediment disturbance. In some areas the reefs are periodically destroyed by storm events leading to a cyclical shift in biotopes from **SspiMx** to other biotopes e.g. **Pkef** or **AalbNuc** with re-establishment of the *Sabellaria* colonies in the following year.

Clean sands which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (*Bathyporeia*) and robust polychaetes including *Nephtys cirrosa* and *Lanice conchilega*.</td></tr>
<tr><td colspan="2">**Typical Physical Features**</td><td colspan="4">Full salinity (30-35 ppt); moderately exposed, sheltered; strong to moderately strong tidal stream; mixed sediment of sandy mud, muddy sand with gravel, pebbles and cobbles; 10-30 metres. Full salinity (30-35 ppt); exposed, moderately exposed, sheltered; strong to very weak tidal stream; medium to very fine sand; 0-20 metres.</td></tr>
<tr><td colspan="2">**Site Specific Biotope Description**</td><td colspan="4">*S. spinulosa* present at all sites in Group F5 but only in high numbers at Site 64.</td></tr>
</table>

<table>
<tr><td colspan="2">Cluster</td><td>Group F7</td><td colspan="2">Number of Faunal Sites</td><td>4</td></tr>
<tr><td colspan="2">Total No. Species</td><td>52</td><td colspan="2">Range Water Depth m (bsl)</td><td>10-27</td></tr>
<tr><td rowspan="2">Species</td><td>mean</td><td>24.75</td><td rowspan="2">% Gravel</td><td>max</td><td>12.70425</td></tr>
<tr><td>stdev</td><td>8.655441</td><td>min</td><td>0.031872</td></tr>
<tr><td rowspan="2">Abundance</td><td>mean</td><td>187.5</td><td rowspan="2">% Sand</td><td>max</td><td>91.76366</td></tr>
<tr><td>stdev</td><td>58.56905</td><td>min</td><td>59.58053</td></tr>
<tr><td rowspan="2">Richness</td><td>mean</td><td>4.52317</td><td rowspan="2">% Silt</td><td>max</td><td>40.3876</td></tr>
<tr><td>stdev</td><td>1.461479</td><td>min</td><td>1.838196</td></tr>
<tr><td rowspan="2">Evenness</td><td>mean</td><td>0.745188</td><td rowspan="2">% Organic Carbon</td><td>max</td><td>2.05415</td></tr>
<tr><td>stdev</td><td>0.067175</td><td>min</td><td>0.718187</td></tr>
<tr><td rowspan="2">Diversity</td><td>mean</td><td>2.347865</td><td rowspan="2">Sediment Classification</td><td colspan="2" rowspan="2">Moderately to poorly sorted sand and very poorly to poorly sorted silty sand</td></tr>
<tr><td>stdev</td><td>0.206923</td></tr>
<tr><td colspan="3">Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster).

* = Characterising species from SIMPER</td><td colspan="3">Spiophanes bombyx*
Abra alba*
Nephtys hombergii*
Obelia bidentata*
Conopeum reticulum*
Notomastus spp.*
Mysella bidentata*
Lagis koreni*
Electra monostachys*
Aspidelectra melolontha*</td></tr>
<tr><td colspan="3">Best Fit Biotope Classification</td><td colspan="3">SS.SSa.IMuSa / SS.SSa.CMuSa
Infralittoral muddy sand / Circalittoral muddy sand</td></tr>
<tr><td colspan="3">Previous biotope code</td><td colspan="3">Part of IMS.FaMS – Version 97.06 / CMS – Version 97.06</td></tr>
<tr><td colspan="6">JNCC Biotope Description</td></tr>
<tr><td colspan="6">Clean sands which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly amphipods (Bathyporeia) and robust polychaetes including Nephtys cirrosa and Lanice conchilega.
/
Non-cohesive muddy sand (with 5% to 20% silt/clay) in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly polychaetes (Magelona mirabilis, Spiophanes bombyx and Chaetozone setosa), bivalves (Fabulina fibula and Chamelea gallina) and the urchin Echinocardium cordatum.</td></tr>
<tr><td colspan="2">Typical Physical Features</td><td colspan="4">Full salinity to variable (18-35 ppt); moderately exposed, moderately strong to very weak tidal streams; fine to very fine sand with silt fraction; infralittoral; 0-20 metres. / Full salinity (30-35 ppt); exposed, moderately exposed; moderately strong to very weak tidal stream; fine to very fine sand with a silt fraction, circalittoral; 10-50 metres.</td></tr>
<tr><td colspan="2">Site Specific Biotope Description</td><td colspan="4">Nucula nucleus and Nucula nitidosa present.</td></tr>
</table>

Cluster		**Group H**	**Number of Faunal Sites**		1
Total No. Species		3	**Range Water Depth *m (bsl)***		22
Species	**mean**	3	**% Gravel**	**max**	0.086
	stdev	N/A		**min**	N/A
Abundance	**mean**	7	**% Sand**	**max**	0.086
	stdev	N/A		**min**	N/A
Richness	**mean**	1.027797	**% Silt**	**max**	99.914
	stdev	N/A		**min**	N/A
Evenness	**mean**	0.914101	**% Organic Carbon**	**max**	0.521
	stdev	N/A		**min**	N/A
Diversity	**mean**	1.004242	**Sediment Classification**	**Moderately well sorted sand**	
	stdev	N/A			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). *** = Characterising species from SIMPER**			*Aspidelectra melolontha* *Phylactella labrosa* *Nereis longissima*		
Best Fit Biotope Classification			**SS.SSa.IFiSa.IMoSa** Infralittoral mobile clean sand with sparse fauna		
Previous biotope code			**IGS.Mob** - Version: 97.06		

JNCC Biotope Description

Medium to fine sandy sediment in shallow water, often formed into dunes, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples in conjunction with low numbers of mysids such as *Gastrosaccus spinifer*, the polychaete *Nephtys cirrosa* and the isopod *Eurydice pulchra*. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). This biotope is more mobile than **SSA.NcirBat** and may be closely related to **LSa.BarSa** on the shore. Common epifaunal species such as *Pagurus bernhardus*, *Liocarcinus depurator*, *Carcinus maenas* and *Asterias rubens* may be encountered and are the most conspicuous species present.

Where sediment disturbance decreases in less exposed or weaker tidal currents, **IMoSa** may grade into **NcirBat** with an increase in species richness as the environment becomes more stable.

Typical Physical Features	Full salinity (30-35 ppt); moderately exposed, sheltered; strong to moderately strong tidal stream; mixed sediment of sandy mud, muddy sand with gravel, pebbles and cobbles; 10-30 metres. Full salinity (30-35 ppt); exposed, moderately exposed, sheltered; strong to very weak tidal stream; medium to very fine sand; 0-20 metres.
Site Specific Biotope Description	*S. spinulosa* present at all sites in Group F5 but only in high numbers at Site 64.

Cluster		Group I	Number of Faunal Sites		1
Total No. Species		2	Range Water Depth *m (bsl)*		2
Species	mean	2	% Gravel	max	0.00
	stdev	N/A		min	N/A
Abundance	mean	2	% Sand	max	99.931
	stdev	N/A		min	N/A
Richness	mean	1.442695	% Silt	max	0.069
	stdev	N/A		min	N/A
Evenness	mean	1	% Organic Carbon	max	0.751
	stdev	N/A		min	N/A
Diversity	mean	0.693147	Sediment Classification	Well sorted sand	
	stdev	N/A			
Most dominant fauna (Ranked in terms of % frequency of occurrence within the sample cluster). * = Characterising species from SIMPER			*Chaetozone* sp. *Urothoe brevicornis*		
Best Fit Biotope Classification			**SS.SSa.IFiSa.IMoSa** Infralittoral mobile clean sand with sparse fauna		
Previous biotope code			**IGS.Mob** - Version: 97.06		

JNCC Biotope Description

Medium to fine sandy sediment in shallow water, often formed into dunes, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples in conjunction with low numbers of mysids such as *Gastrosaccus spinifer*, the polychaete *Nephtys cirrosa* and the isopod *Eurydice pulchra*. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). This biotope is more mobile than **SSA.NcirBat** and may be closely related to **LSa.BarSa** on the shore. Common epifaunal species such as *Pagurus bernhardus*, *Liocarcinus depurator*, *Carcinus maenas* and *Asterias rubens* may be encountered and are the most conspicuous species present.

Where sediment disturbance decreases in less exposed or weaker tidal currents, **IMoSa** may grade into **NcirBat** with an increase in species richness as the environment becomes more stable.

Typical Physical Features	Full salinity (30-35 ppt); exposed, moderately exposed, sheltered; strong to very weak tidal streams (1-6 kn); medium to fine sand; infralittoral; 0-20 metres.
Site Specific Biotope Description	The species listed in this biotope description are a very good match for Group C. Littoral biotopes were considered and rejected as none of the fauna found in Group C matched those listed.

Trawl Group 1 (excluding T15 and T98)	
Characterising species from SIMPER	*Crangon crangon* *Solea solea* *Alcyonidium diaphanum* *Pagurus bernhardus* *Macropodia rostrata* *Liocarcinus holsatus* *Electra pilosa* *Asterias rubens* *Conopeum reticulum* *Pomatoschistus minutus* *Pandalus montagui* *Vesicularia spinosa* *Ophiura albida* *Hydractinia echinata* *Acanthodoris pilosa* *Merlangus merlangus* *Obelia bidentata* *Alcyonidium mytili* Actiniaria *Alcyonidium parasiticum* *Hydrallamania falcata*
	SS.SMX.CMx.FluHyd (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment) / **SS.SSA.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles).
Previous biotope code	**MCR.Flu.SerHyd** - Version: 97.06 **IGS.Scup** - Version: 96.7

JNCC Biotope Description

This biotope represents part of a transition between sand-scoured circalittoral rock where the epifauna is conspicuous enough to be considered as a biotope and a sediment biotope where an infaunal sample is required to characterise it and is possibly best considered an epibiotic overlay. *Flustra foliacea* and the hydroid *Hydrallmania falcata* characterise this biotope; lesser amounts of other hydroids such as *Sertularia argentea*, *Nemertesia antennina* and occasionally *Nemertesia ramosa*, occur where suitably stable hard substrata is found. The anemone *Urticina felina* and the soft coral *Alcyonium digitatum* may also characterise this biotope. Barnacles *Balanus crenatus* and tube worms *Pomatoceros triqueter* may be present and the robust bryozoans *Alcyonidium diaphanum* and *Vesicularia spinosa* appear amongst the hydroids at a few sites. *Sabella pavonina* and *Lanice conchilega* may be occasionally found in the coarse sediment around the stones. In shallower (i.e. upper circalittoral) examples of this biotope scour-tolerant robust red algae such as *Polysiphonia nigrescens*, *Calliblepharis* spp. and *Gracilaria gracilis* are found. This biotope is found around most coasts, although regional differences are seen where one or two similarly scour-tolerant species such as *Styela clava* and *Crepidula fornicata* (Solent) occupy the hard substrata.
/
Shallow sands with cobbles and pebbles, exposed to strong tidal streams, with conspicuous colonies of hydroids, particularly *Hydrallmania falcata* and to a lesser extent *Sertularia cupressina* and *S. argentea*. These hydroids are tolerant to periodic submergence and scour by sand. Both diving and dredge surveys will easily record this biotope. *Flustra foliacea, Balanus crenatus* and *Alcyonidium diaphanum* may also occur on the more stable cobbles and pebbles, with *Urticina felina* and occasional *Lanice conchilega* present in the sand. Infaunal components of the other biotopes in the SSA or SCS complex may occur in this biotope as may elements of the 'Venus' associations; indeed, this biotope may be at one extreme of the spectrum of such associations (E.I.S. Rees pers. comm. 1997) and this biotope may be best considered an epibiotic overlay. The less scoured biotope **FluHyd** occurs in deeper water where there is less sand and a higher proportion of stones and cobbles.

Typical Physical Features	Full salinity (30-35 ppt); moderately exposed, sheltered; strong to very weak tidal streams (>1-6 kn); medium to fine sand with pebbles / cobbles; circalittoral, infralittoral; 0-20 m.
Site Specific Biotope Description	Combination of the two biotopes describes the epibenthos.

Trawl Site 98	
Characterising species	*Crangon crangon* *Ensis arcuatus* *Pomatoschistus minutus* *Ophiura albida* *Liocarcinus arcuatus* *Asterias rubens* *Spisula elliptica* *Idotea linearis* *Nephtys cirrosa* *Pagurus bernhardus* *Ophiura ophiura* *Abra alba* *Donax vittatus* *Magelona johnstoni* *Parvicardium ovale* *Bathyporeia elegans* *Pontocrates altamarinus* Nemertea *Mysella bidentata* *Mactra stultorum* *Echinocardium cordatum*
	SS.SSa.IMuSa.EcorEns *Echinocardium cordatum* and *Ensis* spp. In lower sublittoral slightly muddy sand
Previous biotope code	**IGS.EcorEsil** - Version: 96.7
JNCC Biotope Description	
Sheltered lower shore and shallow sublittoral sediments of sand or muddy fine sand in fully marine conditions, support populations of the urchin *Echinocardium cordatum* and the razor shell *Ensis siliqua* or *Ensis ensis*. Other notable taxa within this biotope include occasional *Lanice conchilega*, *Pagurus* and *Liocarcinus* spp. and *Asterias rubens*. This biotope has primarily been recorded by epifaunal dive, video or trawl surveys where the presence of relatively conspicuous taxa such as *E. cordatum* and *Ensis* spp. have been recorded as characteristic of the community. However, these species, particularly *E. cordatum* have a wide distribution and are not necessarily the best choice for a characteristic taxa (Thorson, 1957). Furthermore, detailed quantitative infaunal data for this biotope is often rather scarce, possibly as a result of survey method as remote grab sampling is likely to under-estimate deep-burrowing species such as *Ensis* sp. (Warwick & Davis 1977). Consequently, it may be better to treat this biotope as an epibiotic overlay which is likely to overlap a number of other biotopes such as **FfabMag**, **NcirBat** and **AalbNuc** with infaunal components of these biotopes occurring within **EcorEns**. The precise nature of this infaunal community will be related to the nature of the substratum, in particular the quantity of silt/clay present. Infaunal species may include the polychaetes *Spiophanes bombyx*, *Magelona mirabilis*, *Nephtys cirrosa* and *Chaetozone setosa* and the amphipod *Bathyporeia* spp. This biotope is currently broadly defined and needs further consideration as to whether it should be placed at biotope or biotope complex level. **AreISa** is another biotope based primarily on epibiotic data. It is likely that this biotope and **EcorEns** form a wider epibiotic sand /muddy sand community with **EcorEns** biased towards sandier areas and **SSA.AreISa** towards slightly muddier areas.	
Typical Physical Features	Full salinity (30-35 ppt); exposed, moderately exposed, sheltered; moderately strong to very weak tidal streams (>1-3 kn); medium to fine sand, slightly muddy sand; infralittoral; 0-30 metres.
Site Specific Biotope Description	Low numbers of *E. cordatum* at site but dominated by *Ensis.* Overlays onto infaunal biotope of **FfabMag.**

4.0 DISCUSSION

4.1 Seabed Sediment Environment of the Outer Thames Estuary

The Southern North Sea is characterised by shallow water depths, high tidal current streams and mobile substrates (Jennings *et al* 1999). Closer inshore, within the Thames Estuary, riverine inputs can affect water salinity, hydrodynamic flow, siltation and organic inputs. It is these factors that have the strongest influence on the character and distribution of the seabed habitats and associated macrobenthic fauna within the current study area.

The Outer Thames Estuary itself is characterised by its many shallow sandbanks comprised of well sorted mobile fine sands arranged in a linear formation, aligned along the axis of the principal tidal flows. In between the sandbanks, the seabed comprises of a mixture of shell, mud, gravel and sand with frequent incursions of sand derived from the nearby sandbanks (Norton *et al* 1981; BGS 1988).

The acoustic character of the seabed revealed by the sidescan sonar data obtained during the current survey (detailed in Volume I, Part I) is also consistent with the known character of the sandbank region. The majority of the area surveyed consisted of sediments of sand and fine gravel with occasional small dimension ripples with a ripple height of less <0.7m and the wavelength <6m, typically in the SW part of the study area. The second most often observed sediment type was flat featureless sandy seabed with occasional presence of gravel or shells. This sediment type was located mainly in the areas around the sandbanks and the shallower parts of the survey area. In the northern area the sandbanks consisted of fine sand with medium dimension ripples (height >0.7m and wavelength >6m). In the deeper parts of the region the seabed consisted of sand with small dimension well-developed ripples (height<0.5m and wavelength<4m). The rest of the seabed types were patchy in distribution. These were of low height and wavelength with under-developed ripples in sandy seabed, flat sandy seabed or seabed consisting of coarse sand with occasional relief.

The physical sediment data collected from the benthic sampling survey of the Outer Thames Estuary sandbanks also indicated a mixed range of sediment types from very well sorted sands to poorly sorted silty sands to silty gravelly sands across the area; the predominant sediment sampled being that of well sorted sands. This also concurs with the previous descriptions (Norton *et al* 1981; BGS 1988) and other surveys of the Thames Estuary southern sandbank systems (around Kentish Flats (Emu 2002), Princes Channel (MES 1999), the Edinburgh Channel, Long Sands, Shingles Patch and the Shingles (Emu 2003). The well sorted sands were clearly associated with the sandbanks, whilst the more gravelly sediments consisting of both shell and gravel were located in the deeper channels between the sandbanks.

Local variation in the sediments was related to the increasing silt levels within the samples. Continuous inputs of fine sediment material from the major estuaries in this region and physical disturbance from storms, wave action, extreme tidal flows and anthropogenic activities such as dredging, dumping and commercial fishing will all cause fluctuations in the rate and amount of siltation within the sandbank system. In areas of lower flow, the sediments are more compact, well sorted and stable and the siltation levels are seen to increase. Conversely, in areas of high flow, where the sands accumulate to build the exposed banks, the silt is stripped away.

The variation in silt levels was seen to directly affect the percentage of organic matter in the surface sediments in this study. In areas of extensive sediment recycling, there is often a close correlation between organic matter and grain size, the smaller the grain size, the greater the surface area for bacterial colonisation and the greater the levels of organic carbon recorded. This was borne out by the visual observations and sediment analysis during this study. In the majority of the samples, the greater the silt content, the greater was the percentage organic carbon. Visually there was evidence of anoxia occurring within the surface sediment which is also characteristic of increasing silt, sediment stability, and organic content. The increase in anaerobic activity was clearly displayed by the presence of a redox discontinuity layer in some of the siltier surface sediments.

The presence of anoxia and/or a redox discontinuity layer directly affects the overall fauna composition, attracting a suite of species, such as deposit feeders that can exploit the increase in organic content. However, depending on the species, these animals are restricted by the depth that they can exist within the sediments as the anoxic layer gets shallower and the hydrogen sulphide content increases (Barnes & Hughes 1988).

4.2 Macrobenthic communities of the Outer Thames Estuary

The variability in the sediment composition within the Outer Thames Estuary caused by the variation in the deposition of silt, levels of organic matter content, and sediment stability is reflected by the variability in the faunal composition. However, the benthic macrofauna of the Outer Thames Estuary study area may be regarded as relatively typical of shallow water sand, gravelly sand and silty sand substrates around the UK, and particularly those located within the Southern North Sea.

A total of 187 species were recorded during the grab sampling survey in August and September 2005 with 24 of 187 species represented by sessile epifaunal taxa. The top ranking macrobenthic species recorded during this study such as *Spiophanes bombyx*, *Scoloplos armiger*, *Goniada maculata*, *Mysella bidentata, Bathyporeia elegans, Magelona johnstoni* and *Notomastus* spp. are among the 30 most frequently recorded species in the North Sea (Heip & Craeymeersch, 1995). Species identified across the area comprised a mixture of sand-dwellers such as the polychaetes *Nephtys cirrosa* (and other Nephtyidae species), *Ophelia borealis*, *Urothoe* spp. and *Bathyporeia* spp. and those species indicative of relatively stable substrata affected by mobile sediments such as the Sand Mason worm *Lanice conchilega*. In the siltier sediments, more deposit feeders and burrowers were recorded including the bivalves *Abra alba*, *Nucula nitidosa*, *Macoma baltica*, and the polychaetes, *Nephtys hombergii* and *Ampharete lindstroemi* (Wood 1987).

Epifaunal species were recorded at any sites where there was some shell or gravel to colonise. Epifauna were recorded at sites that were classified as sand, but on visual inspection had a single or several large valves of dead oysters, cockles and razor shells, revealing the opportunistic nature of settlement of these colonial sessile animals. Overall, the abundance of epifauna species was considered to be low compared to more sheltered coastal areas because of the paucity of suitable substrate for settlement and the stochastic nature of the flow regime around the sandbank area.

Alien taxa (those introduced to the UK from outside Europe in and after the 1800's) found in the region and listed in Eno *et al* (1997) included the amphipod *Corophium sextonae*, the American Slipper Limpet *Crepidula fornicata*, the ascidian *Styela clava* and the barnacle *Elminius modestus*. All these species are opportunistic and can endure variable salinities and turbidities and are now well established in the south (see NBN Gateway 2006) and all reported to occur in the Outer Thames Estuary region.

The Ross worm *Sabellaria spinulosa* was present at 17 out of the 100 grab sites although numbers were generally very low (1-48/0.1m^2). *Sabellaria spinulosa* is naturally common around the British Isles with a wide distribution and in the majority of its geographical range does not form reefs but is mostly solitary living attached to small pebbles etc. However, the larval stages are attracted to the chemical signature of the adults and this encourages settlement in large numbers in discrete locations when the right conditions prevail (Tait & Dipper 1997). The biogenic 'reefs' this worm can build are protected priority habitat under the terms of the UK Biodiversity Action Plan (UK BAP), Convention on Biological Diversity (CBD), Annex I of the Habitats Directive (1992) and the Wildlife and Countryside Act (1981).

Sabellaria spinulosa was recorded in relatively large numbers (1151 individuals) at Site 64 compared to the rest of the samples, and the sample visibly contained a healthy conglomeration of worm tubes and associated fauna on board the vessel. However, as only one grab sample was taken at this location and no biogenic structures were visible on the sidescan outputs, the designation of the biotope code of **SS.SBR.PoR.SspixMx** is very tentative. Caution is recommended before classifying it as an actual reef formation as it may be a very discrete and ephemeral clump. *Sabellaria spinulosa* were also recorded at Site 23 located in the north of the surveyed area by the Grabs, Anchor Dredge and Trawl, and in Trawl 68 located the south of the study area as well as at a few other trawl sites in low numbers in areas of mixed sediments. In Trawl 23, chunks of *Sabellaria* tubes were recorded, but this can not be confirmed as a reef habitat. As the trawls were sub-sampled, the actual numbers of *Sabellaria* at sites 23 and 64 are not known. The presence of *Sabellaria* at various locations in the surveyed area does reveal the sporadic nature of its colonisation.

The similarity analysis of the macrobenthic grab data identified 15 sample cluster groupings which exhibited some biological differences. Group A contained sites located on the low sand ripples and flats sands surroundings the sandbanks and in more open areas. This group was characterised by the polychaetes *Nephtys cirrosa, Magelona johnstoni, Scoloplos armiger, Ophelia borealis* and *Spiophanes bombyx*, *Abra alba* was the dominant bivalve with some *Spisula elliptica* and *Mactra stultorum*, with the amphipods represented by *Bathyporeia* spp. These animals are a combination of mobile sand tolerant species and those which are typical sand burrowers. They exhibit high mobility, flexible body structures and rapid re-burrowing capabilities and are thus tolerant of this type of disturbed environment. All these species are indicative of infralittoral well sorted sands in high energy environments and were given the biotope code of **SS.SSa.IFiSa.NcirBat**. The low abundance associated with this cluster is further evidence that the sediments supporting this faunal association are relatively mobile.

Mobile sands may be regarded as continually disturbed environments where the substrate is subjected to tidal or wave driven movement. This has important consequences for colonising macrofauna especially in relation to abrasion, compaction and scouring. The substrate is also usually well sorted, due to the grading action of repetitive water movements. The generally good fractionation of the sediments results in a simple and homogeneous habitat for macrofauna. The lack of habitat complexity offers little in the way of exploitable micro-niches that might other wise be colonized by a multitude of animals. Well sorted, mobile sands therefore have a low species carrying capacity and will often have a lower richness and diversity than more complex, heterogeneous sediments. Mobile sands are typical of the habitat type found within this area of North Sea (Atrill *et al* 1996 cited in Hiscock *et al* 2002; Emu 2002; Emu 2003; Emu 2004c; MES 2002).

Group C had a very low abundance and a suite of species typical of highly mobile clean sand and clearly formed a biotope type **SS.SSa.IMob**. The species indicative of this biotope are the polychaete genus *Nephtys* spp., amphipod genus *Bathyporeia* spp., *Scoloplos armiger*, sand eels *Ammodytes* spp. and the mysid *Gastrosaccus spinifer*. Groups H and I were also included in this biotope as these contained very few species and were also located on the regularly exposed shallow sandbanks areas. This biotope is closely aligned with the **NcirBat** biotope and is formed as the sediment disturbance increases, typically with more wave action, and the sands become more aerially exposed. However, Group H did reveal a greater degree of taxonomic distinctness compared to the other groupings which may be an indication, in this case, of a physical disturbance other than the natural disturbance caused by the mobile sands. Indeed, Site 21 (the single entrant under Group H) was located in a designated dredging zone on the Admiralty Chart. It is possible that this anthropogenic impact could affect a change on the community structure and species composition at this site, but the limited sampling conducted in this area gives little evidence for this and prevents any further conclusions being drawn.

Specific consequences of mobile sand substrates to macrofauna may include the abrasive action of scouring by sediment laden waters for filter feeding organisms, which may suffer damage to sensitive feeding apparatus. Also, compaction forces within the constantly moving bed sediments would prevent colonisation by many infaunal species. Fauna can also be "washed out" if exposed to particularly fast tidal current streams. Epifauna would be excluded due to the lack of suitable, stable surfaces for attachment. Settlement of larvae may also be prevented due to sediment scouring. Furthermore, where near seabed currents are sufficiently strong, fine organically enriched particles would be prevented from settling and accumulating. This would deprive deposit-feeding organisms of food material and inhibit their colonisation of mobile sand substrates (Barnes & Hughes 1988; Wood 1987).

The Group B biotope **SS.SSa.IMuSa.FfabMag** is also closely aligned to **NcirBat** but forms as the sediment disturbance decreases, the sediment becomes more stable and the finer silt fraction increases thus increasing the organic content for more deposit feeders to exist. The fauna found in this group are typical of the **FfabMag** biotope. These included the bivalves *Abra alba, Fabulina fabula, Nucula nitidosa* and the polychaete *Nephtys cirrosa.*

The close associations of the biotopes **NcirBat**, **FfabMag** and **IMob** and the gradual transition between one biotope into another will inevitably lead to patchy mixed areas with overlapping faunal compositions. This was apparent in the dataset obtained from the grab sampling as many species were seen to be replicated in the groups even though the sites statistically fell into separate clusters. It must also be noted that without any replication of the sample effort at each of the chosen sample sites, the tightness of the fit to a biotope is not going to be significantly high and this was indeed the case as the MDS 2-D Ordination of the faunal groupings from the grab sampling showed a high stress level.

The absence of replication at each site and the difficulty of separating biotopes in the more mixed sediment habitats meant that Groups D, F1, F2, F3, F4 and G have all been classified under a broad infralittoral and circalittoral mixed sediment biotope of **SMx** and **CMx** depending on the depth of the sites. These more gravelly and silty seabed areas offer a more stable and more complex habitat allowing settlement of an increased variety of colonizing species. Cryptic and crevice fauna utilize spaces between or underneath larger particles as micro-niches. In addition, the comparatively stable conditions allow settlement of fine, organically enriched food particles providing sufficient food material for surface deposit and sub-surface deposit feeding organisms thus increasing the potential for a climax community to exist. Consequently, mixed, heterogeneous substrates are described as having an increased species carrying capacity relative to more homogeneous substrates (Barnes & Hughes 1988; Wood 1987). This study clearly demonstrates the high faunal richness and diversity of the mixed gravelly sand substrates compared to the mobile sand substrates within the Outer Thames Estuary study area. Diversities, species' numbers and abundances for sites within these groups were relatively high in comparison to other studies conducted in the area where mobile sand was the predominant substrate type (Emu 2003; Norton *et al* 1981).

The species' found in the mixed sediments exhibit a wide range of feeding habits and substrate requirements. For example *Spiophanes bombyx* and *Notomastus* spp. are deposit feeding polychaetes whereas *Glycera alba* is an errant predator. The tube-building Sand Mason worm *Lanice conchilega* was regularly recorded from the mixed sediments groups. The tube that the Sand Mason builds provides structure within the sediment and stabilizes or consolidates it enabling other species to establish themselves thus increasing faunal diversity (Wood 1987).

Group E was an outlier and was species poor in its composition. The species that characterised this group were the bivalves *Nucula nitidosa* and *Donax vittatus,* and the polychaete *Nephtys hombergii.* All these species are known from more poorly sorted, silty areas of reduced water flow and have been classified in this study in a broader biotope **SS.SSa.IMuSa**. Group F7 was also considered as being part of this biotope because of its species composition and as part of **CMuSa** as the sites moved into deeper waters.

Group F5 was unusual to this survey as it contains the only site that had cohesive thick consolidated muddy clay substrata. The site (62 H) was dominated by the white piddock *Barnea candida*, a relatively common southern UK species that bores into soft rocks on the lower shores (Ballerstedt 2005). The biotope classification was given for cohesive sands and muds, **SS.SMu** at this particular location, however, the extent and the frequency of consolidated patches of this type could not be assessed during this study.

It must be noted that although the infaunal biotopes were assessed using a single grab sample taken at each sample station with no replication to increase confidence in the results, the biotopes described in this report fit very well with the expected community structure for a sandbank system in that geographic location.

4.3 Epibenthic and fish communities of the Outer Thames Estuary

The 30 trawls taken during this study were spaced out across the survey area and apart from two trawls (T15 and T98), had statistically similar faunal compositions despite the changes in substrate, sediment classification and varying infaunal biotope classifications recorded across the surveyed area. The epibenthos was therefore classified separately from the infaunal and could be described as a combination of the biotopes **SS.SMX.CMx.FluHyd** (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment) and **SS.SSA.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles).

Trawl Site 98 was dominated by the razor shell *Ensis arcuartus* with very few other species present. Whether the razor shells precluded other fauna from the area by taking up space or changing the suitability of the sediment for other fauna to occupy can not be assessed at this time. Also, the extent of the Razor shell bed is not known. However, taking into account the grab and dredge data also gathered at this location, a biotope classification of **SS.SSa.IMuSa.EcorEns** was allocated, which is reported to overlay the biotopes **NcirBat** and **FfabMag.** The **EcorEns** biotope is still only a broad description and it is unsure whether this is a biotope in itself or a biotope complex (Conner *et al* 2004). Trawl 15 was categorised as **SMX.CMx,** the same description as the grab sample taken there as a distinctive biotope was not seen. However, the species list recorded at T15 was not unusual for the region and was comparable to the species lists provided for the sublittoral areas north of Gunfleet Sands (cited on the NBN Gateway 2006).

Fauna caught within the beam trawls were broadly characteristic of the estuarine assemblage described by Rees *et al* (1999) and those described by Jennings *et al* (1999) for the southern North Sea area. The assemblages found are extremely similar to those found during other studies of the southern region of the Outer Thames Estuary sandbanks, namely Kentish Flats and the banks surrounding the Edinburgh Channel (Emu 2002; 2003; 2004c). Generally, these assemblages were characterised by the brown shrimp, *Crangon crangon*, sessile epifauna, *Electra pilosa* (seamat), Hydroid turf (sea firs), hermit crabs (Paguridae), spider crabs *Macropodia* spp, *Alcyonium diaphanum*, *Vesiculosa spinosa, Hydrallmania falcata, Flustra foliacea* and Gobies (Gobiidae). Other species, which were characteristic of the study area, included the swimming crab *Liocarcinus depurator* and the hydroid *Obelia bidentata.* This type of assemblage has been previously described as typical for the region (Emu 2002; 2003; 2004c).

Many of the species found are capable of surviving the rigours of mobile sandbanks across the Outer Thames Estuary study area. The larger epibenthic species, such as *Crangon crangon*, the hermit crab *Pagurus bernhardus*, swimming crabs, *Liocarcinus* spp., the common starfish, *Asterias rubens* and the brittlestars *Ophiura* spp. may avoid the compaction and abrasion forces of the mobile sand sediments by living on the surface rather than within the substrate itself.

The beam trawling identified 28 fish species within the study area, seven of which may be deemed commercially important. Of these seven commercially important species only three (dab, whiting and sole) were relatively widespread across the survey area. This observation reflects the importance of the wider Thames Estuary to flatfish. Plaice and dogfish were less frequent, whilst the Lemon Sole and Sand Eels were at only one site each out of the 30 trawl sites.

With the exception of *Pomatoschistus minutus* (sand goby), *Agonas cataphractus* (pogge), *Trisopterus luscus* (bib) and *Trisopterus minutus* (poor cod) the non-commercially important fish species caught were not widely distributed across the Outer Thames Estuary survey area rather, their distributions were sporadic.

The current list of fish species found in this study is not exhaustive since many fish would appear within the Outer Thames Estuary on a seasonal basis. The species inventory will, therefore, only reflect those fish present during the period of the field sampling. Other commercially important finned fish in the vicinity of the study area, and which may occur in greater abundance than indicated here, include bass, mullet, Thornback rays and sprats (Ford 2001). These species may be sampled if the sandbank area was trawled again at other times of the year.

In comparison with previous studies in the region, fish assemblages were generally the same, with the exception of herring and sprat which were the most abundant commercially exploitable fish within the Edinburgh Channel study area and were absent from the current study of the Outer Thames Estuary. However, this is probably caused by temporal differences in sampling during the year and natural sporadic recruitment of juveniles into the system on an annual basis.

It is also noted that the numbers of individuals of each fish species were generally low across all trawl sites. The sporadic distributions and low counts of fish species as a whole may be an artefact of the sampling technique rather than a true reflection of their distributions or actual numbers given the paucity of trawls taken in such a large geographic area.

Shellfish, particularly oysters, cockles and whelks constitute important local fisheries. These shellfish species were rarely identified in this study, or in the previous studies at Kentish Flats (Emu 2002), Edinburgh Channel and Princes Channel (Emu 2003; 2004c), although it must be recognised that the trawling methods employed were not specifically targeting these species. Nevertheless, a successful cockle fishery does exist in the Outer Thames Estuary and several cockle boats were witnessed in the area at the time of sampling. The catch landed from the specific gear used for cockle fishing was about 12 tonnes a day per boat over the 2005 fishing season.

Epibenthic Community Structure

The influence of sediment composition and its control over the benthic communities is well reported (see review by Newell *et al* 1998). Fine mobile deposits, typical within estuaries, are characterised by large populations of a restricted number of opportunistic species that are well adapted to colonising regularly disturbed sediments. The more stable undisturbed habitats containing coarser sands and gravels, and consolidated fine sands and mud are colonised by more long lived, slower growing ‘equilibrium’ species, and generally support richer communities. The community composition is not controlled by one factor, but a combination of sediment physical properties, an array of environmental variables, and complex biological and chemical interactions occurring over a long time period.

The homogenous community structure of the epibenthic assemblage compared to the more complex infaunal communities seen in the Outer Thames Estuary is seen as a reflection the life history strategies of the two communities and their susceptibility to impacts. The whole area has been fished for centuries, an activity that has steadily increased in intensity in the last few centuries. The epibenthic assemblage is therefore dominated by opportunistic scavenging species that feed on the remains left by the heavy trawling activities (Jennings *et al* 1999). Our results show no evidence of any slower growing sessile fauna such as sponges and corals. Therefore, the structure of the benthic communities within the Outer Thames Estuary are to a great extent a product of the intensive fisheries impacts (Rumohr & Kujawski 2000), and not the communities which would exist if these activities ceased. This important fact has to be taken into account when viewing or implementing future changes within this sandbank system.

5.0 Conclusions

The Outer Thames shallow sandbank system is considered to be typical of its type and for a coastal area which lies within the southern North Sea. The composition of the communities in this particular sandbank system are not controlled by one factor, but a complex combination of sediment physical properties, environmental variables, complex biological and chemical interactions and anthropogenic impacts occurring over a long time period. The faunal assemblages found in this study are also subject to variations seasonally, sporadic settlement behaviour and annual fluctuations in recruitment failures and successes. Species richness and diversity was seen to increase as the substrate complexity and the stability of that substrate increased thus allowing greater species colonisation.

Despite the fact that only a single sample was taken at each sample station, the macrofaunal composition of the grabs, dredges and trawls and the corresponding biotope classifications provided in this current survey of the Outer Thames Estuary closely match those expected for the sediment types and the classifications provided in previous studies carried out in the same region using replicated data on a much smaller scale (these include Kentish Flats, Gunfleet Sands, Long Sand, Shingles, the Edinburgh Channel region and the Barrows) (Hiscock *et al* 2002). The variations found in the fish composition to the previous studies can be attributed to seasonal changes in the species' composition rather than an overall change in the fish populations.

The infaunal biotope classifications that best describe the majority of the sediments in the current surveyed area of the Outer Thames Estuary are **SS.SSa.IFiSa.NcirBat** (*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand) and **SS.SSa.IMuSa.FfabMag** (*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand) with **SS.SSa.IMob** (Infralittoral mobile clean sand with sparse fauna) on the exposed surface of the sandbanks themselves. The silty gravelly sands were more complex and were best described with the biotopes for mixed sediments **SMx** and **CMx**.

There appears to be a combination of two main biotopes overlying the **IFiSa** and **IMuSa** infaunal communities which can best describe the epibenthic community found, namely **SS.SMX.CMx.FluHyd** (*Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment) and **SS.SSA.IFiSa.ScupHyd** (*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral sand with cobbles or pebbles). However, one site displays the characteristics of the biotope **SS.SSa.IMuSa.EcorEns** (*Echinocardium cordatum* and *Ensis* spp. in lower sublittoral slightly muddy sand).

Both **SS.SSa.IFiSa.NcirBat** and **SS.SSa.IMuSa.FfabMag** are listed under the UK Biodiversity Action Plan and the EC Habitats Directive, Annex I under the heading 'Sandbanks which are slightly covered by sea water all the time'. These areas are nationally important nursery grounds for both flat fish and round fish as well as an important food source for sea birds and marine mammals. The biotope is considered as potentially at risk from fishing activities on sandy substrata, e.g. dredging for scallops (Eleftheriou & Robertson 1992), beam trawling for flatfish as well as extraction of sand by the aggregate industry (Eno *et al* 1991). It is also considered that the locally based cockle industry may have an important effect on these biotopes. Other, localised impacts that could have an effect on the habitat are construction of wind farms, waste discharges from shipping, whether deliberate or by accident, and the accidental introduction of alien species.

The presence of the Ross worm *Sabellaria spinulosa* was noted as this is an important species under the EC Habitats Directive and part of the UK Biodiversity Action Plan. Although the worm at a few sites was relatively abundant compared to other sites across the study area, this study was not adequate enough to assess if the numbers were significant for conservation purposes. Therefore, a further study is recommended to resolve this issue with use of video footage to assess the faunal communities *in situ*.

The epibenthic communities found within the Outer Thames Estuary are apparently modified as a direct result of impact caused by the intensive anthropogenic activities occurring within the southern North Sea, and these have strongly influenced the community structures that are now seen in this region.

6.0 M(apping) E(uropean) S(eabed) H(abitats) - Actions and Further Comments

As outlined in the General Introduction, this survey of the Outer Thames Estuary candidate SAC area is directly relevant to the objectives of the project “Mapping European Seabed Habitats” (MESH) (MESH 2006). In order to help bring out the relevance and learning from the survey to the project, the following provides an overview and guide to those aspects of the survey that are most relevant to specific ‘tasks’ set out in the MESH project (see www.searchmesh.net) together with additional discussion where required. The tasks are broken down into sub actions on the MESH pages on the Joint Nature Conservation Committee (JNCC) website (www.jncc.gov.uk). Those relevant to the current survey are stated below with comments to suit.

MESH Project Actions

Sub Action 1.2 - Meta-database catalogue of habitat mapping studies.

> A meta-database of mapping studies will be developed (or adapted from existing databases), defining who undertook each study, when, its purpose and geographical area. This "discovery meta-database" will be implemented along rules recommended by the EU Inspire project of setting up a European Spatial Data infrastucture (ESDI). The "Dublin core" standard will be considered. The meta-database will also hold information on the techniques and standards used, the types of data collected and where these are archived. The database will help partners identify sources of data to develop and test protocols (Action 2 and Action 3) and encourage improved meta-data standards for mapping studies.

Emu task - To complete meta-data spreadsheets for the acoustic and biological surveys. To comment on the utility of spreadsheet and suggest improvements.

Comments

Meta-data spreadsheets have been provided by Emu Limited in the MESH format to the Joint Nature Conservation Committee (JNCC) for inclusion into the MESH meta-database as requested.

The Emu Limited report data were not initially presented in a format that suited the MESH meta-database, however, the geographical and background survey details were, in general, relatively easy to enter into the meta-database catalogue.

MESH Sub Action 1.4. - Review consistency in interpretation and presentation of habitat maps.

> From Action 1.3 identify the range of habitat types defined from each mapping technique and their degree of consistency between studies; feed outcomes into Action 2 (including updating the EUNIS classification to take account of studies in this project). Review the range of presentation styles for habitat maps

Emu task - Review the ability to map the targeted habitats from the survey techniques used. What can be learnt from this specific survey on this objective.

Comments

The remit of the Outer Thames Estuary Sandbank Survey was to design a broadscale survey covering a large geographical area and to sample as many different possible habitat types in an efficient and cost effective way. To achieve this it was necessary to provided acoustic survey tracks that were geographically well spaced out. The survey lines were located across known physical gradients, including hydrographic features and physical seabed types, both taken from admiralty charts. In addition consideration was made of larger trends relating to distance from sheltered conditions within the Thames to relatively exposed conditions in the Outer Thames Estuary.

Benthic sampling stations were then chosen after initial analysis of the acoustic survey tracks to target specific substrate types and possible transition zones or boundaries, which would reveal the diversity of benthic macrofaunal community structure across the surveyed region. Only one faunal Day grab sample plus a PSA sub-sample were taken per station. At certain sites, alternative or additional sampling was undertaken including two metre Beam Trawling, Anchor Dredging and Mini-Hamon Grabbing to suit substrate types. Samples were geographically well spaced out to ground-truth as wide a variety of different substrate types as possible.

The cost constraints on the survey and the need for good coverage of a large area meant that the faunal composition at each station was not verified through analysis of any replicate data. Video surveying was planned but was not possible as there was zero visibility in the area throughout the survey period. However, developments in video systems mean that video can now be collected using a low visibility box, which operates in near to zero visibility conditions. Unfortuantely, this was not developed in time to use during this Outer Thames Sandbank survey.

The single sample per station and the broadscale nature of sampling effort naturally affected confidence at the habitat mapping stage. Whilst it was possible to describe the main biotopes found in the surveyed area with good confidence, the geographical extent and boundary designations of the biotopes had to be extrapolated from the physical and biological data available and mapped using expert judgement but with greatly reduced confidence. The survey techniques applied were adequate in targeting the different biotopes but the accuracy of mapping the true extent of these habitats during this current survey would have obviously benefited from more intense surveying, grab sampling replication at each site and seabed video / photography.

The actual presentation style of the habitat maps was not dictated to Emu Limited by English Nature so the format used was one designed around a standard developed in-house. It would be useful from the outset of future projects to have a standard layout and configuration to follow if the data is to become part of MESH, UKSeaMap or similar databases so that time consuming reformatting is avoided.

MESH Sub Action 1.5. **-** Correlate habitat maps with EUNIS and Habitats Directive types.

> Correlate the habitat maps in GIS with the European Environment Agency's EUNIS habitat types. As the original data will be of varying detail, the correlation will be to appropriate levels in the EUNIS hierarchy. Correlate the maps with the Annex I habitat types of the EC Habitats Directive. Further correlations to other classification schemes, e.g. Essential Fish Habitat, may be undertaken (dependent on outcomes of end-user feedback in Action 5).

Emu task - Identify Habitat Directive types and classify biological communities using biotope classification where feasible.

Comments

Biotopes were allocated after statistical analysis of the faunal data in PRIMER (Section 3.0 Results) and expert interpretation of the raw data using the marine habitat classification MNCR version 04.05. Fitting biotope codes to the faunal groupings found was not easy on a geographically spaced out and limited dataset, there is also the complication of possible sampling transitional communities which would confuse the interpretation. However, the main biotopes reported (see Section 3.4.) are given with a good degree of confidence and are typical of the physical habitat and the region. The report highlights the main biotopes as typical of a sub-tidal sandbank system and flags the whole Outer Thames Estuary sandbank system as an excellent candidate for future SAC status.

Future consideration should be given to application of a quantified biotope matching technique based on PRIMER.

MESH Sub Action 1.6. - Apply confidence ratings to maps

From a confidence assessment rating developed in Action 2, apply the rating system (high confidence to low confidence) to the available habitat maps in the GIS.

Emu task - To comment on cost:benefit of collecting increasing quantity of acoustic and ground truth data for the purposes of mapping the target habitats.

Comments

Although it would increase confidence in the dataset when mapping the extent of each of the biotopes recorded, the benefits of increasing the number of sample stations against the extra costs in this particular study is debatable. This is because the remit of the study was to map the different habitats found in the sandbank system on a broadscale basis to assess the conservational importance of the area as a whole in the most economical way and this seemed to be fulfilled by the current survey. However, it would have been beneficial at the statistical analysis stage to have had at least triplicate replication of the grab samples at each of the sample stations to define the existence of biotope transitional zones and understand the extent of the localised heterogeneity across the survey region. This would have greatly increased the statistical confidence of the results delivered by the PRIMER Cluster groupings although the cost would be correspondingly increased, i.e. sample analysis costs would be increased threefold.

The narrow width of the acoustic tracks made mapping of the bathymetric features and sediment contouring across the whole surveyed region impossible. However natural difficulties were encountered based on the physical nature of the survey in areas due to the very shallow water and extensive drying areas. Based on the collected data there was no confidence in extrapolating the physical data to fill in the unsurveyed gaps. Using a more advanced swath bathymetry system would have given better resolution for this current survey, along the original survey track lines, but it would have doubled the costs. These data would have considerably enhanced the side scan sonar survey data. However, it was still felt that producing a map of the bathymetric features across the whole survey site by extrapolation would not be possible even using a more advanced swath bathymetry system. The only way to produce maps with confidence would be to increase the number of survey lines to leave no data gaps but this would be very cost prohibitive, probably in the order of £750,000 for field survey alone. For the purposes of this study the extra expenditure would have been unnecessary. An alternative option would be to complete an initial survey with widely spaced survey lines, to then identify the range of biotopes in the area. Should any particular biotopes or habitats of importance or interest be identified, then targeted hydrographic survey can be completed to measure the extents of these features. Costs will clearly be more (probably double for the hydrographic components) but the returns in terms of fully mapped limits of the most important feature may be valuable in terms of establishing extents.

MESH Sub Action 1.7. Revise and update habitat maps (and contribute to sub action 1.1 & 1.3)

Reinterpretation of existing data (Action 2.4), new data collected during the course of the project (including Action 3), and results from the modelling (Action 4) will be fed into the GIS for each country to add further detail and generally improve the quality of the available maps. Summary data will be transferred into a single GIS to provide a composite set of maps for north-west Europe.

Emu task – Provide GIS and mapped outputs as proposed (TAB files in MapInfo as well as shape files in DEF).

Comments

This task was completed by Emu Limited. The outputs supplied in TAB and shape files to for MESH to feed into GIS are shown in the Figures Appendix in this current report.

MESH Sub Action 2.2. Standards and protocols for shallow and subtidal mapping techniques.

Formulate a strategy for surveying over different spatial scales. Establish standards and protocols for relevant remote sensing techniques (satellite & aerial sensing and imagery). Determine minimum requirements for ground-truthing the remote sensing techniques (e.g. by intertidal and diver surveys). Establish standards and protocols for the ground-truthing techniques which may themselves be valid mapping techniques at the smaller spatial scale. Develop guidelines for data management.

Emu task - Give explicit explanation and discussion of survey strategy in relevant sections of report. Possibly comment on MESH document on survey strategy when available.

Comments

The description of the survey strategy is given in the methodology in Part II, Section 2.0. Further comments relevant to the survey strategy are given below and in Sub-Action 1.6 above.

The survey strategy was designed following the specific instructions given by English Nature in the original tender document. The aim was to describe the extent of the sandbank habitats and describe the matrix of habitats and biotopes which occur within the overall sandbank system. The survey was a general, broadscale overview rather than a detailed survey employing a substantial and detailed acoustic survey with overlapping coverage. The ecological sampling strategy was informed by the sonar data and different sampling techniques were employed dependant on the substratum. Single replicates were requested by English Nature from the outset. The core requirements of the highest priority were to record the species composition and key biotopes in the region.

Although the sample locations were chosen by initial interpretation of the different possible habitats based on the acoustic data on its own, the acoustic data was eventually ground-truthed by the PSA data and the visual descriptions of the sediment and photographs of the samples made onboard the survey vessel. In the original survey strategy, underwater digital video of each habitat type located by the acoustic survey was planned in order to record the *in-situ* faunal communities and any biological disturbance on the surface sediment to further support the survey results (i.e. animal burrows and tracks). However, the conditions for underwater photography were unsuitable in that particular region throughout the whole survey period. Indeed, the local fishermen reported the underwater visibility to have been unusually bad throughout the whole year so this *in-situ* technique has its obvious limitations compared to physically sampling the sediment. The same limitations would have applied for any scuba diving ground-truthing survey.

Improvements to the survey strategy may have been possible if on-board identification from grab samples of predetermined key species, including abundance estimates, would have been undertaken. On this basis, the extent of biotopes may be more rapidly confirmed, although clear drawbacks exist for the biotopes that are based on relatively (visually and taxonomically) insignificant fauna. Retention and analysis of representative benthic samples would still be needed but the level of analysis could, potentially, be reduced. As indicated above for Action 1.4, data collected using low visibility video systems would also be advantageous and would now be possible.

MESH Sub Action 2.4. – Standardised interpretation of habitat mapping data. Collating images into a catalogue of seabed signatures for different habitats against different techniques.

Define procedures for the analysis of: Remote-sensed optical data (including LIDAR, satellite, aerial data) (Ifremer). Remote-sensed acoustic data (including old and new side-scan data (BGS), AGDS (Envision), multibeam (Marine Institute) Video data (DARD) Benthic sample data (CEFAS). Development will need re-analysis of certain datasets to derive consistency in resultant habitat types.

Emu task - Provide relevant images and required metadata.

Comments

Side scan sonar data are provided with corresponding descriptions of physical conditions (see Part I, Section 3.3.1.), and equivalent information included in the signatures catalogue on the MESH website (www.rebent.org/mesh/signatures).

Seabed images from video could not be provided at the time of surveying due to zero visibility preventing photography. If they had been, EMU Limited could have provided a more visual interpretation of the biotope maps alongside the physical data. This would have been a good technique to back up the sidescan imagery with the actual seabed appearance.

MESH Sub Action 3.2. – Infaunal/epibiota links

Establish relationship between infaunal and epibiota communities (where defined separately in the habitat classification) through field sampling of both elements (cores, grabs, video, diver, trawls) for a wide range of sediment habitats; also examine existing data where both aspects are available.

Emu task – Assessment of infaunal/epibiota links.

Comments

Epifaunal species found in the grabs were scored on an abundance scale and subjected to a numerical conversion factor so that all the fauna found at each station could be included in the final multivariate analysis and thus increase confidence in the description of the full community composition. Analysis of the grab data were performed with and without epifauna, however, as epifauna was not a large component of the sandbank system due to the nature of the majority of the sediment being unsuitable for colonisation their inclusion did not greatly affect the final results (rationalisation explained in Part II, Section 3.3.1.).

Epibiota were more conspicuous in the trawls, but this is not surprising as the beam trawls were dragged across hundreds of metres of seabed, in comparison to the grabs that take a $0.1m^2$ 'bite' of sediment from a fixed point.

When mapping the habitats of the Outer Thames Estuary, the biotopes described for the grab datasets and trawl datasets could not be reconciled using the current MNCR biotope codes. Whilst a whole suite of biotopes existed for the infaunal communities, two different biotopes dominated the epibiotic communities (depending on depth) and overlaid all the different infaunal biotopes across the whole surveyed region. This is not an unacceptable outcome as several of the MNCR biotope codes specifically state that they exist with one overlying another. The problem with biotope reconciliation goes back to the origins of the definition of biotopes, which was built on *in-situ* diver observational data, the descriptions based on faunal grab data being added at a later stage. These latter biotopes are substantially based on the infauna as epifauna is notoriously difficult to provide on a quantified basis from grab samples and is frequently excluded, overlooked or considered only on the basis of presence/absence. As a result the current descriptions of biotopes have divided based on the type of technique employed to acquire the data rather than on the basis of real ecological interaction of the infauna with the epifauna. This probably needs to be recognised at the level of the organisations providing the biotope descriptions as well as at the user level.

Although within the current data set the existence of the epifauna in the grab samples did not appear to influence the distribution of the infaunal biotopes directly, without the trawl data, the overlying epibiotic communities would have been overlooked and their importance to the whole biological system underestimated. The colonisation by epibiota can increase sediment stability, change the localised flow dynamics and provide both shelter and food. The existence of epibiota increases the diversity of cryptic and grazing species which in turn attracts larger predatory species such as fish and crustaceans. This will inevitably feedback to the infaunal community. In addition the presence of epibiota and the species found with this community can be an indicator of the level of physical disturbance in the area. Reporting their presence (or where appropriate, their possible absence) in relation to the infaunal community is important to understanding the health and stability and management of the system as a whole.

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8.0 AUDIT TRAIL

Title : Benthic Survey of the Outer Thames Estuary Sandbank System			
Report No.	06/J/1/03/0837/0572		
Emu Job no.	J/1/03/0837		
Client Name	English Nature		
Client Contact	Dr Simon Brockington		
Project Manager	Dr Dawn Powell		
Acoustic field work team	Mr Christos Angelopoulos Mr Luke Gaches		
Biological field work team	Dr Dawn Powell Miss Jo Weir Mr Ian Campbell Mr Adrian Cherry Mr Alec Moore		
Laboratory team	Dr Dawn Powell Dr Grant Rowe Miss Tamsin Gamble Mr James Hutchinson Miss Raffaella Nobili Miss Hayley O'Connor		
Data analysis undertaken by	Dr Dawn Powell Mr Christos Angelopoulos		
Acoustic Report written by	Mr Christos Angelopoulos		
Benthic Report written by	Dr Dawn Powell		
Report checked by	Mr Martin Farley Dr Nigel Thomas		
Report authorised by	Dr Nigel Thomas		
Report status	Final		
Issue date	16/08/2006		

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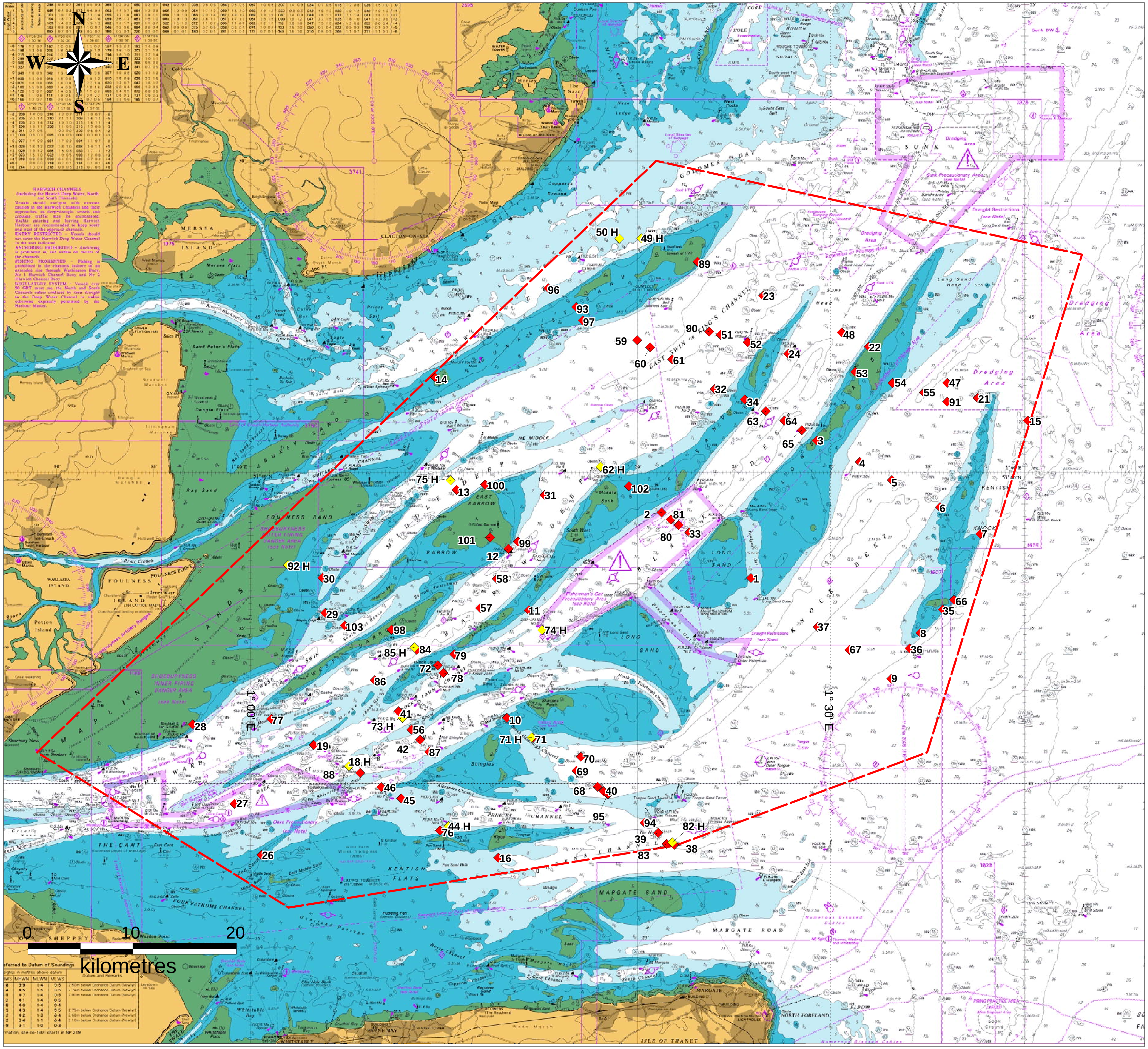


Legend

- Mini-Hamon Grab Sample Stations
- Day Grab Sample Stations
- Survey Area

Figure 2.1

Coordinate System	Long/Lat WGS84		
Notes			
Drawn by RLC	Approved by DKP	Checked by	
Date drawn 25/2/06	Date issued	Sheet size A3	
Rev.	Date	Description	Initials

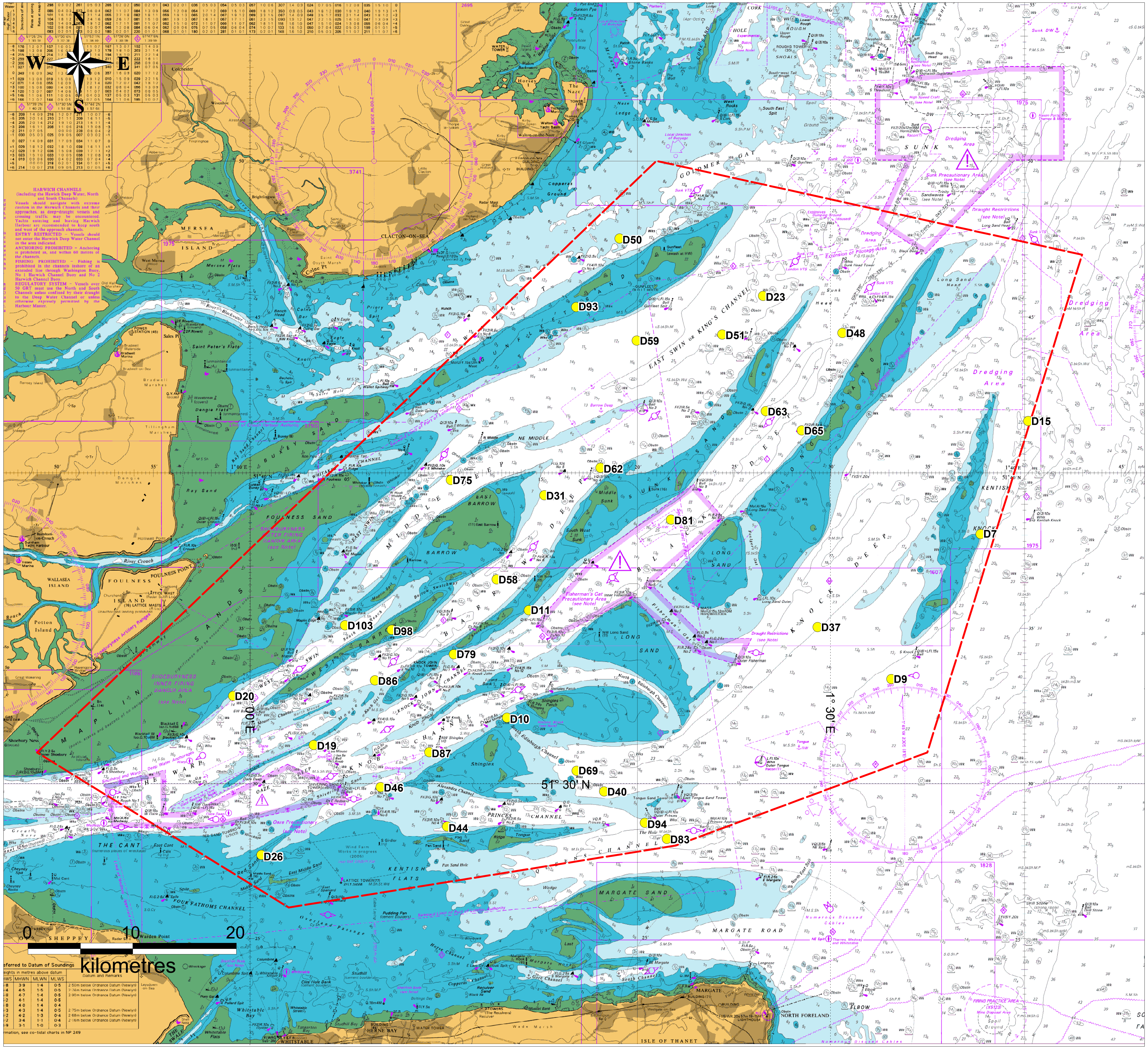
Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Location of All Grab Sample Stations

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051



Legend

Anchor Dredge Sample Stations

Survey Area

Figure 2.2

Coordinate System	Long/Lat WGS84		
Notes			
Drawn by RLC	Approved by DKP	Checked by	
Date drawn 25/2/06	Date issued	Sheet size A3	
Rev.	Date	Description	Initials

Project Title

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Drawing Title

Location of Anchor Dredge Sample Stations

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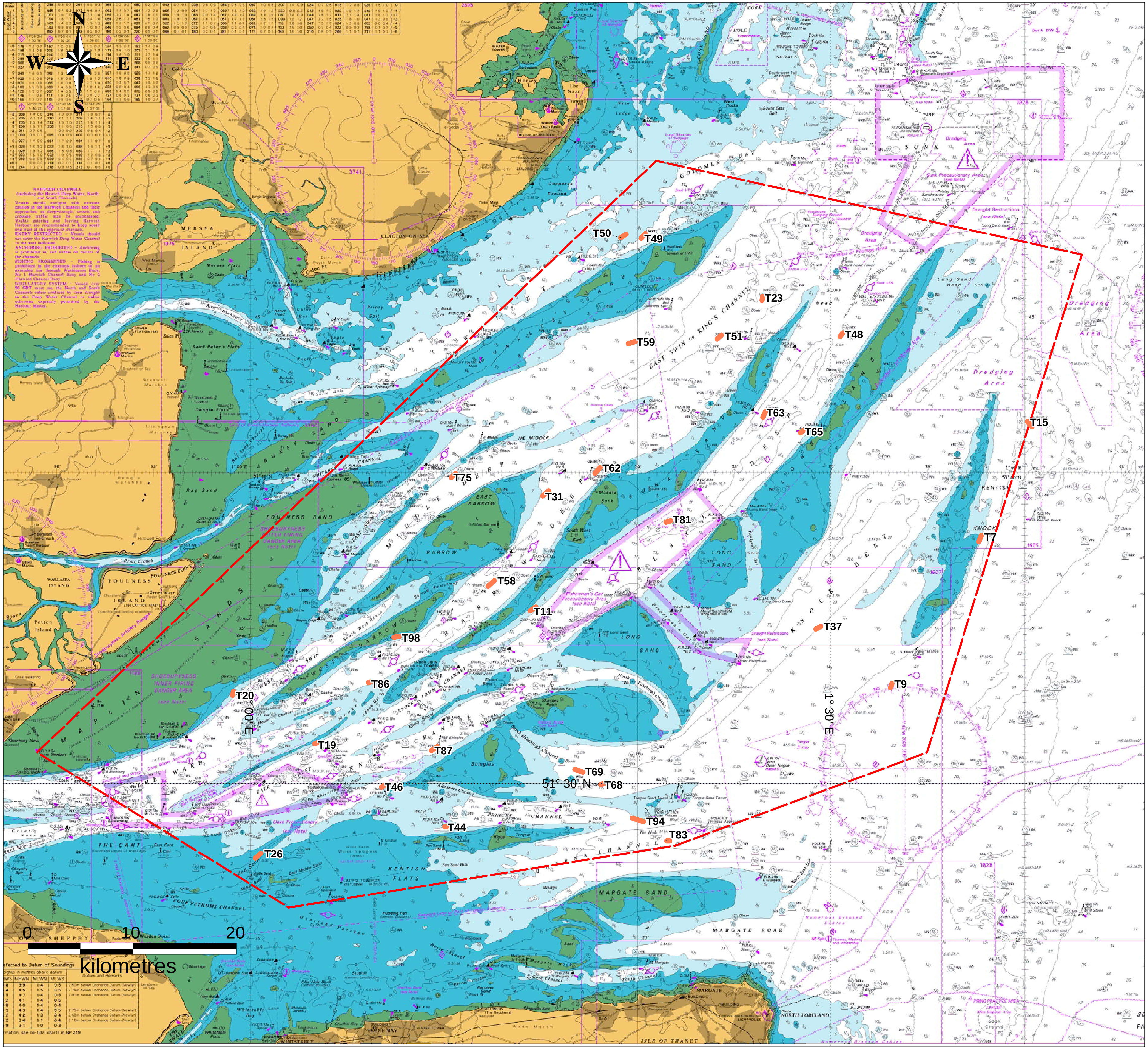

Legend

Trawl Sample Stations

Survey Area

Figure 2.3

Coordinate System	Long/Lat WGS84	
Notes		
Drawn by RLC	Approved by DKP	Checked by
Date drawn 25/2/06	Date issued	Sheet size A3

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Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Location of Trawl Sample Stations

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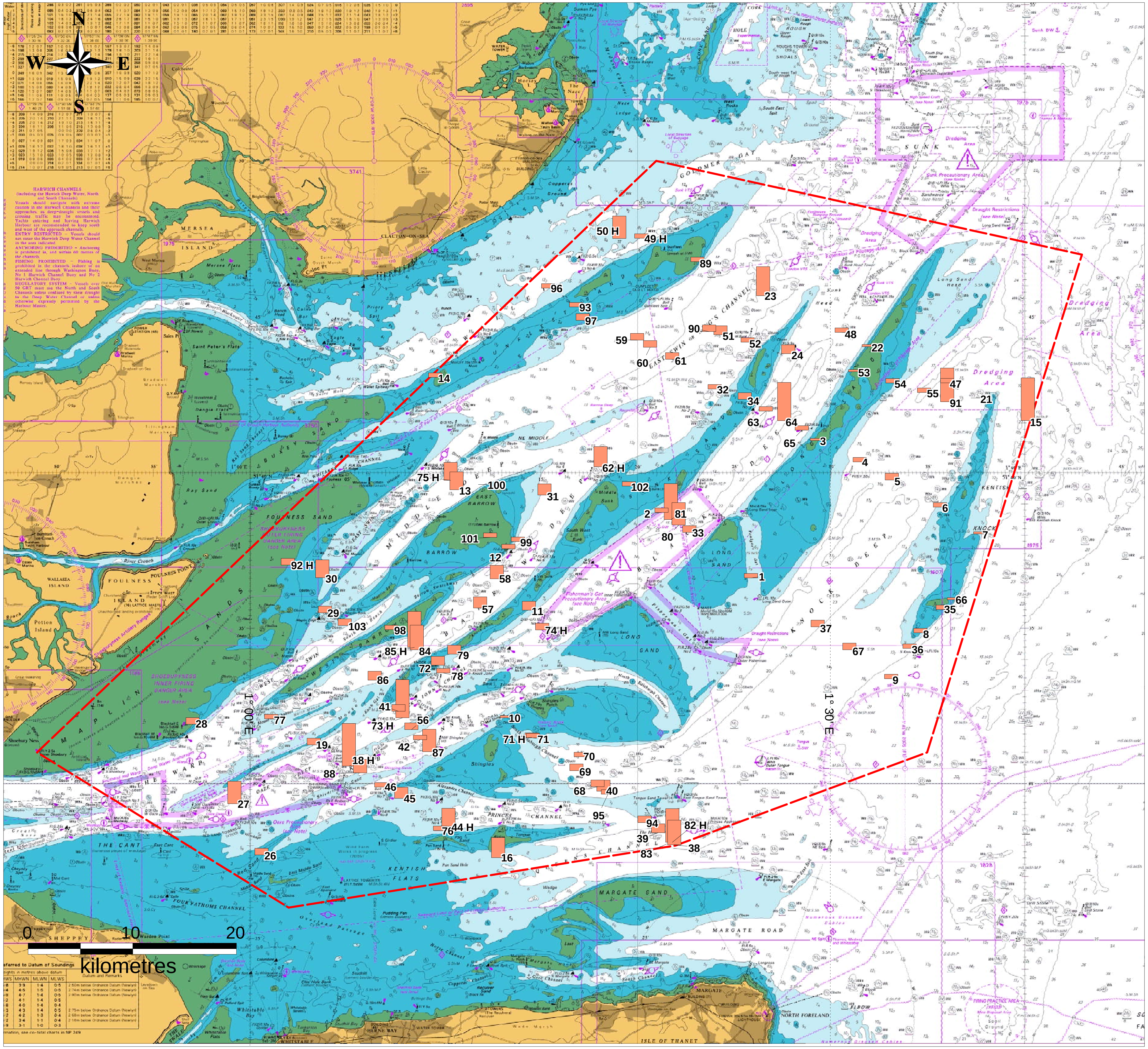

Legend

Survey Area

Bar Chart of Number_of_species_at_grab_stat

49

Infaunal

Figure 3.3a

Coordinate System	Long/Lat WGS84		
Notes			
Drawn by RLC	Approved by DKP	Checked by	
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Rev.	Date	Description	Initials

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Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Number of Infaunal Species at All Grab Stations

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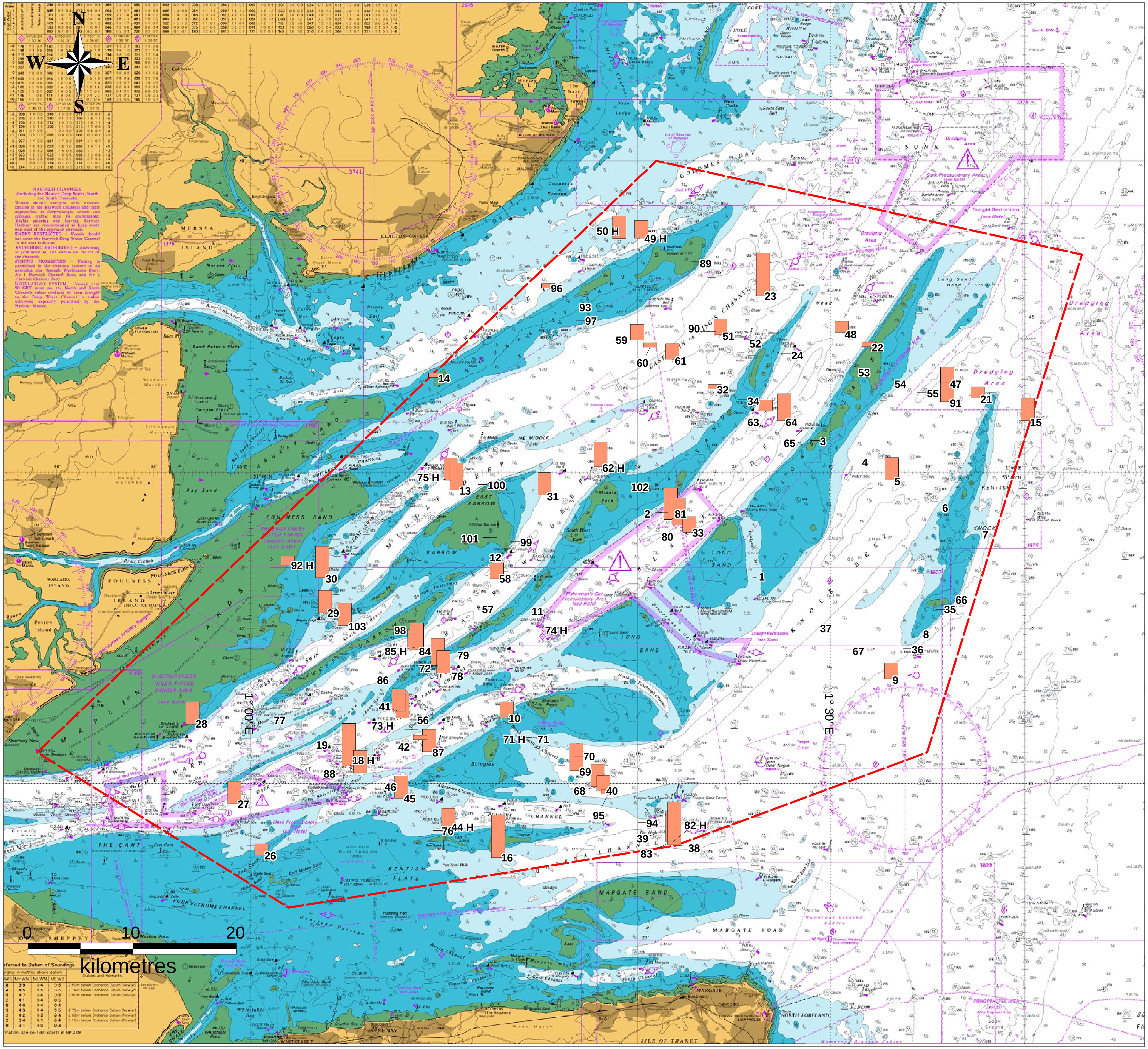

Legend

Survey Area

Number of Species at Grab Stations

8

Epifaunal

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Figure 3.3b

Coordinate System	Long/Lat WGS84
Notes	

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Date drawn	Date issued	Sheet size	
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Rev.	Date	Description	Initials

Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Number of Epifaunal Species at All Grab Stations

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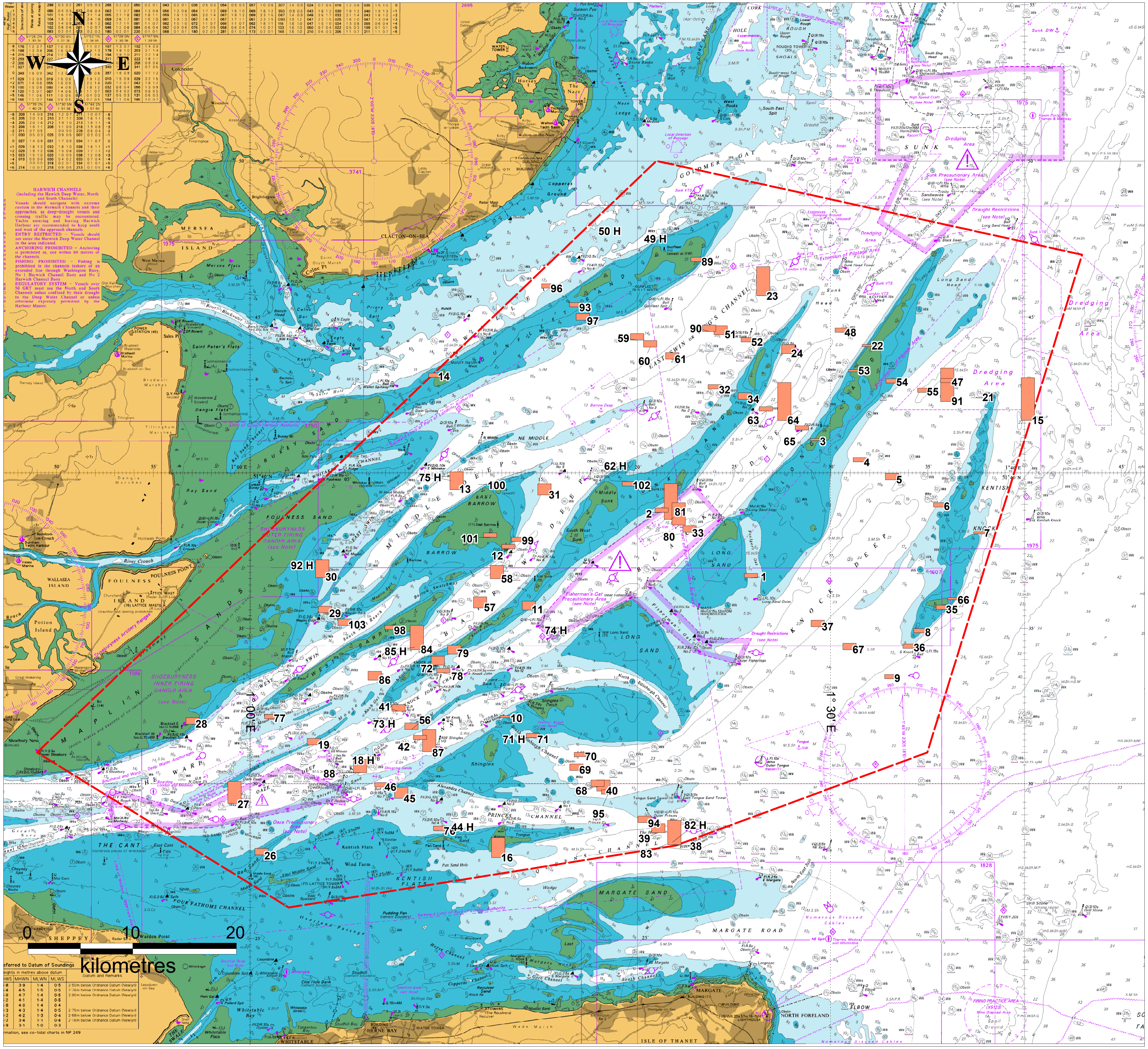

Figure 3.3c

Coordinate System: Long/Lat WGS84

Notes

Drawn by	Approved by	Checked by	
RLC	DKP		
Date drawn	Date issued	Sheet size	
25/2/06		A3	
Rev.	Date	Description	Initials

Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Total Number of Species at All Grab Stations

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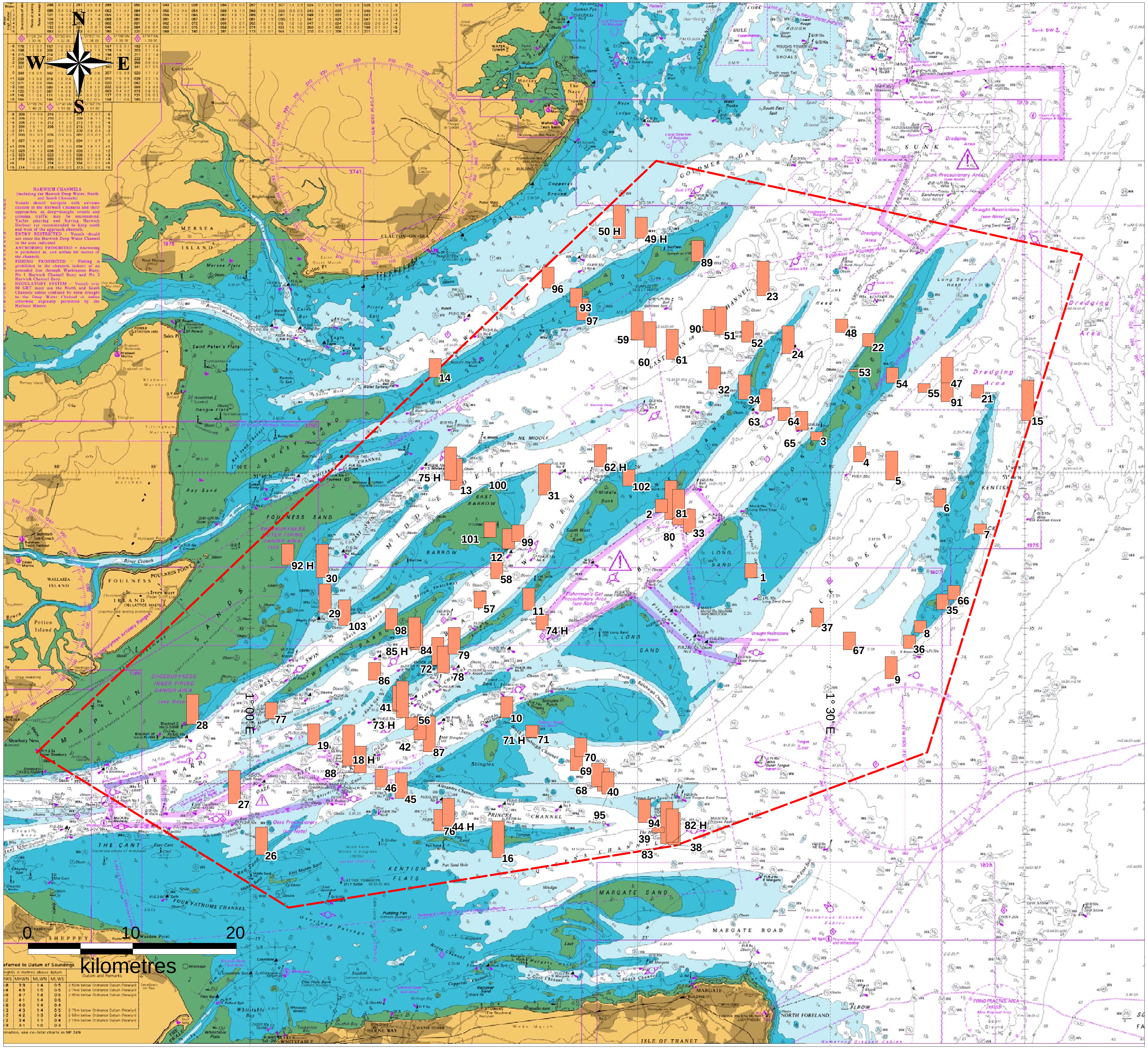

Legend

Survey Area

Species Diversity at Grabs

3.6

Species Diversity (H' loge)

Figure 3.4

Coordinate System	Long/Lat WGS84		
Notes			
Drawn by RLC	Approved by DKP	Checked by	
Date drawn 25/2/06	Date issued	Sheet size A3	
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Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Species Diversity (H' Loge) at All Grab Samples

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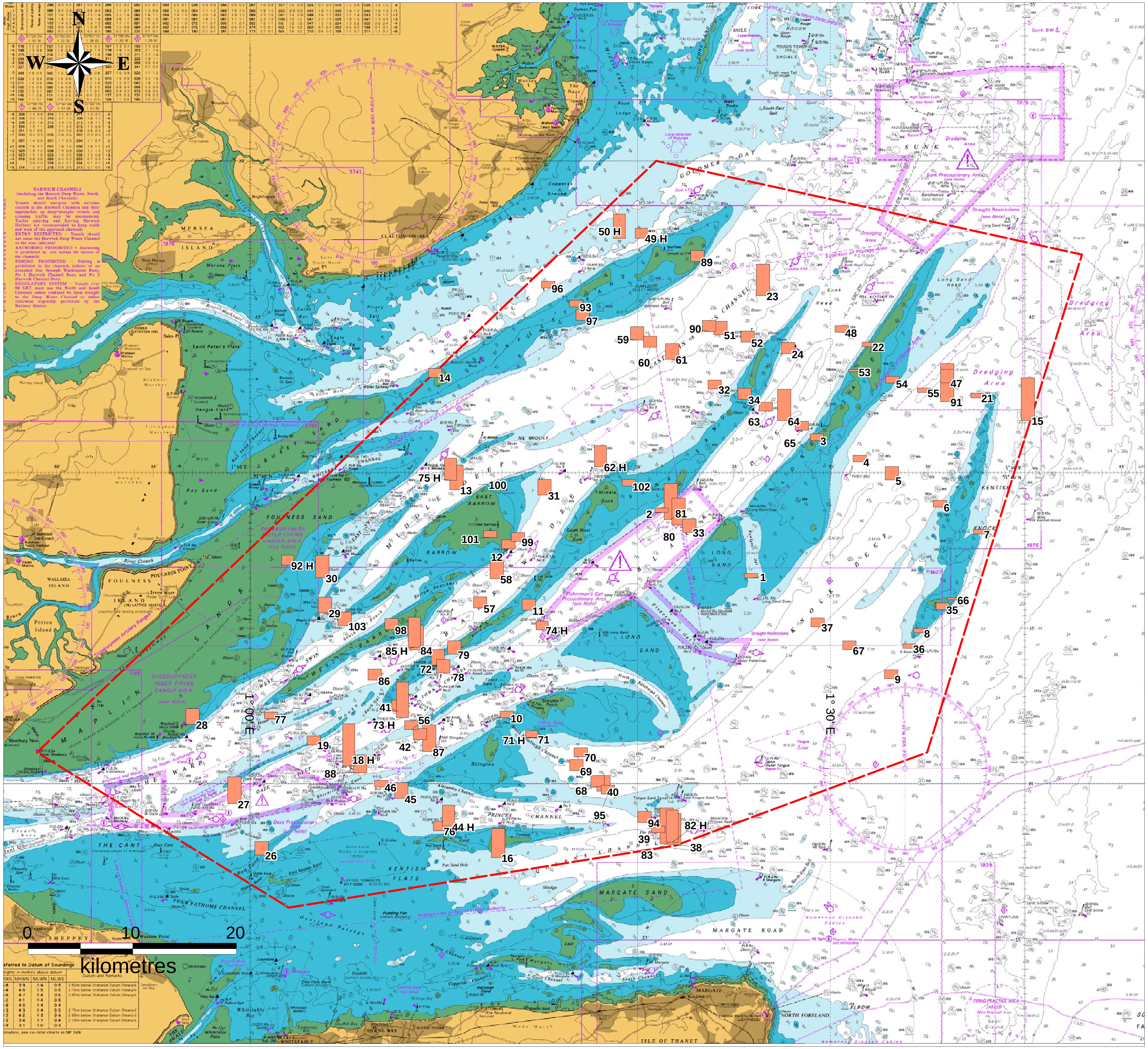

Legend

Survey Area

Species Richness at Grab Stations

9.3

Species Richness (d)

Figure 3.5

Coordinate System	Long/Lat WGS84

Notes

Drawn by	Approved by	Checked by
RLC	DKP	
Date drawn	Date issued	Sheet size
25/2/06		A3

Rev.	Date	Description	Initials

Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Species Richness (d) at All Grab Stations

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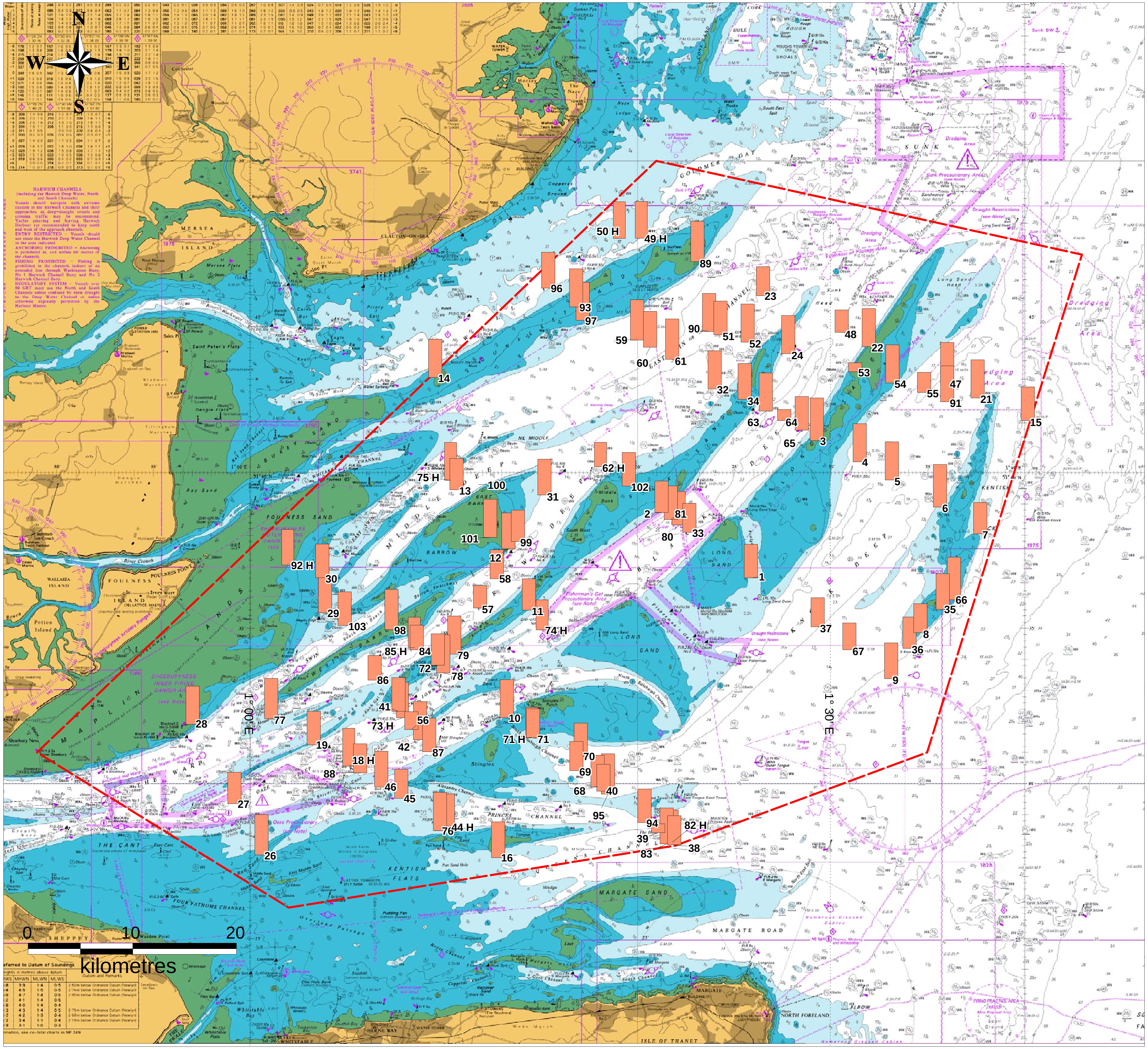

Legend

Survey Area

Species Evenness at Grab Stations

1

Species Evenness (J)

Figure 3.6

Coordinate System	Long/Lat WGS84
Notes	

Drawn by	Approved by	Checked by
RLC	DKP	
Date drawn	Date issued	Sheet size
25/2/06		A3

Rev.	Date	Description	Initials

Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Species Evenness (J')
at All Grab Stations

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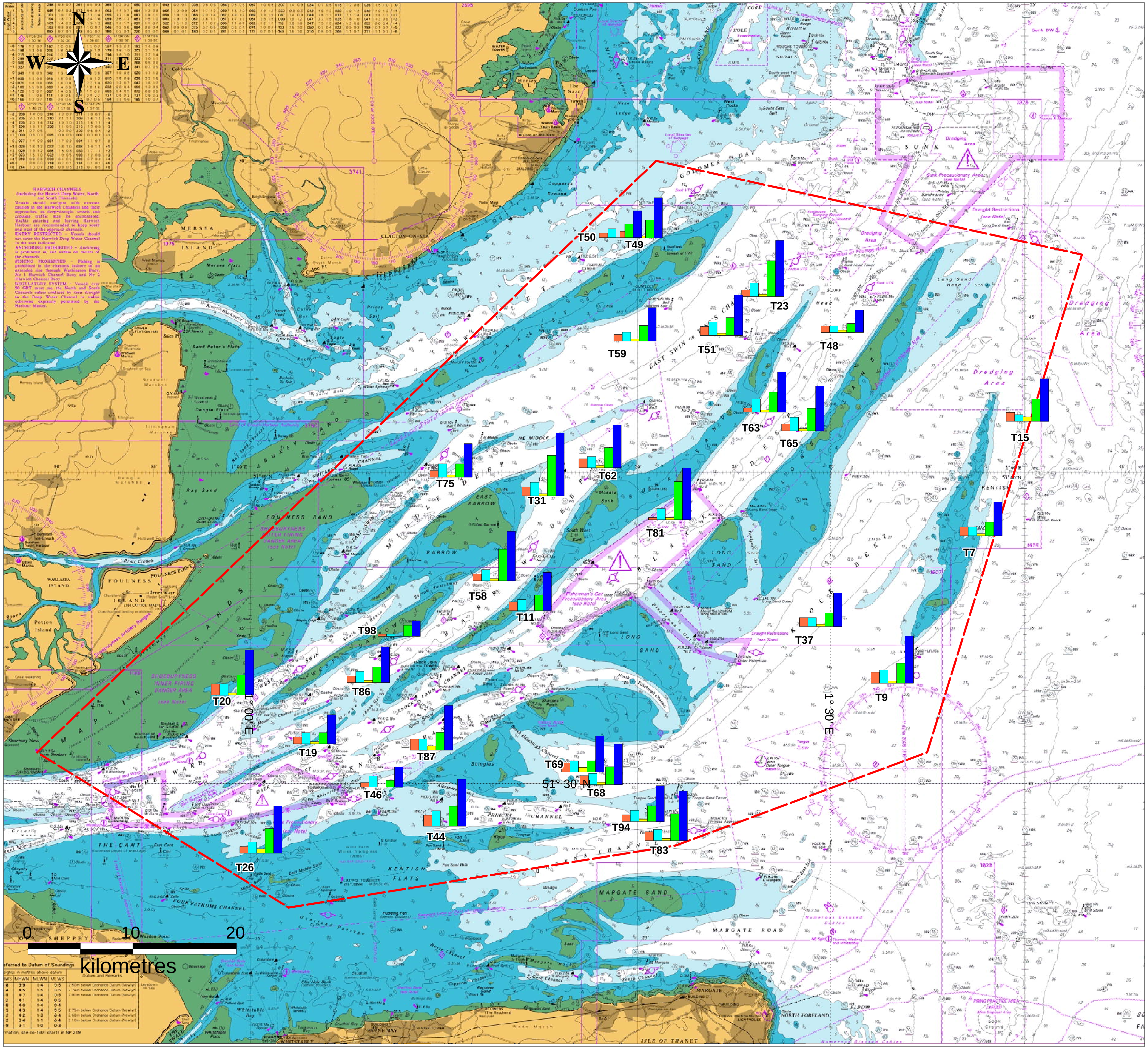

Legend

Survey Area

Number of Species at Trawl Sites

54

- Fish Species
- Colonial Sessile Epifaunal Species
- Non-colonial Sessile Epifaunal
- Infaunal Species
- Total Number of Species

Figure 3.7

Coordinate System	Long/Lat WGS84		
Notes			
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Date drawn 25/2/06	Date issued	Sheet size A3	
Rev.	Date	Description	Initials

Project Title

Benthic Survey of the Outer Thames Estuary Sandbank System

Drawing Title

Number of Species at Trawl Stations

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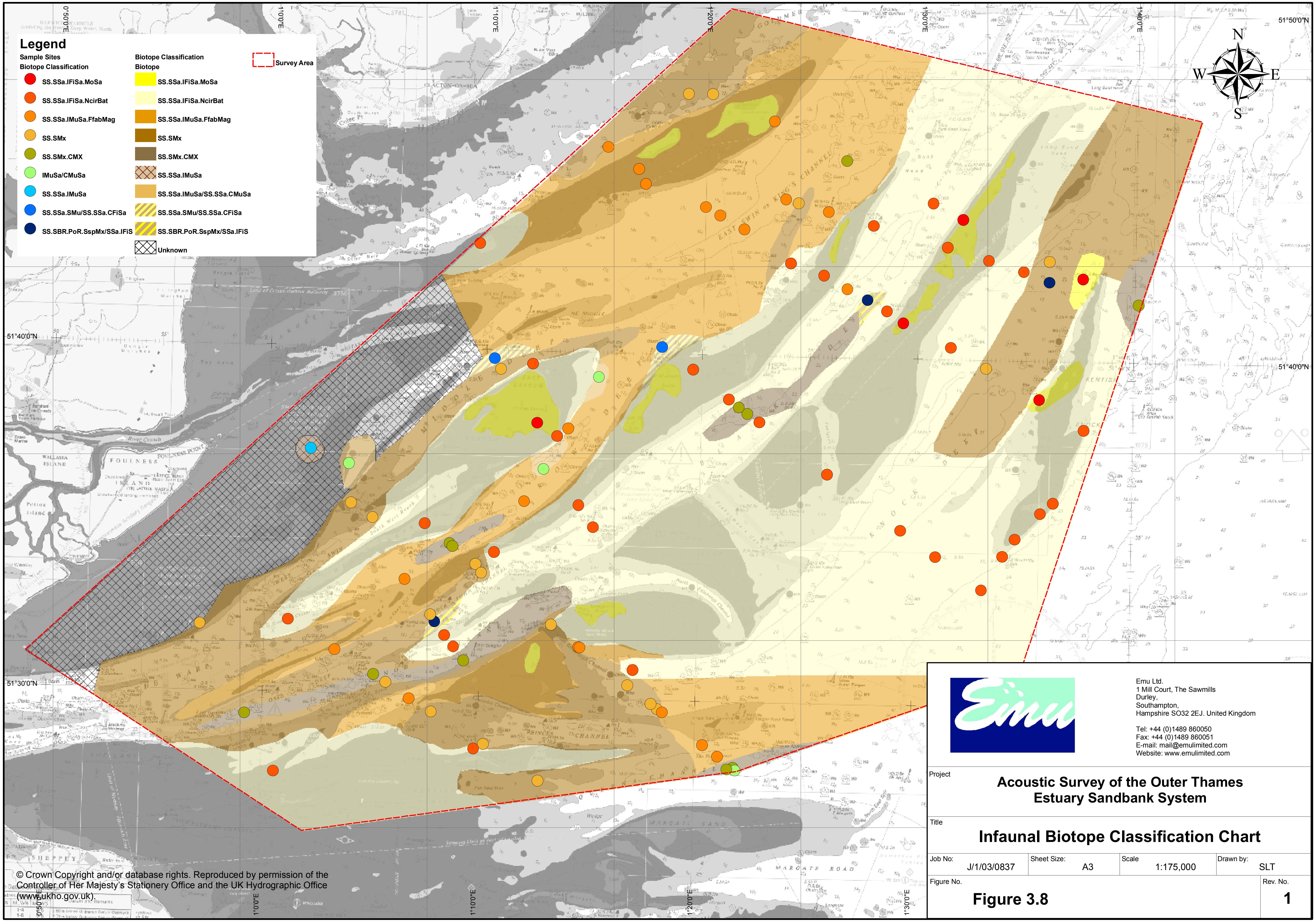

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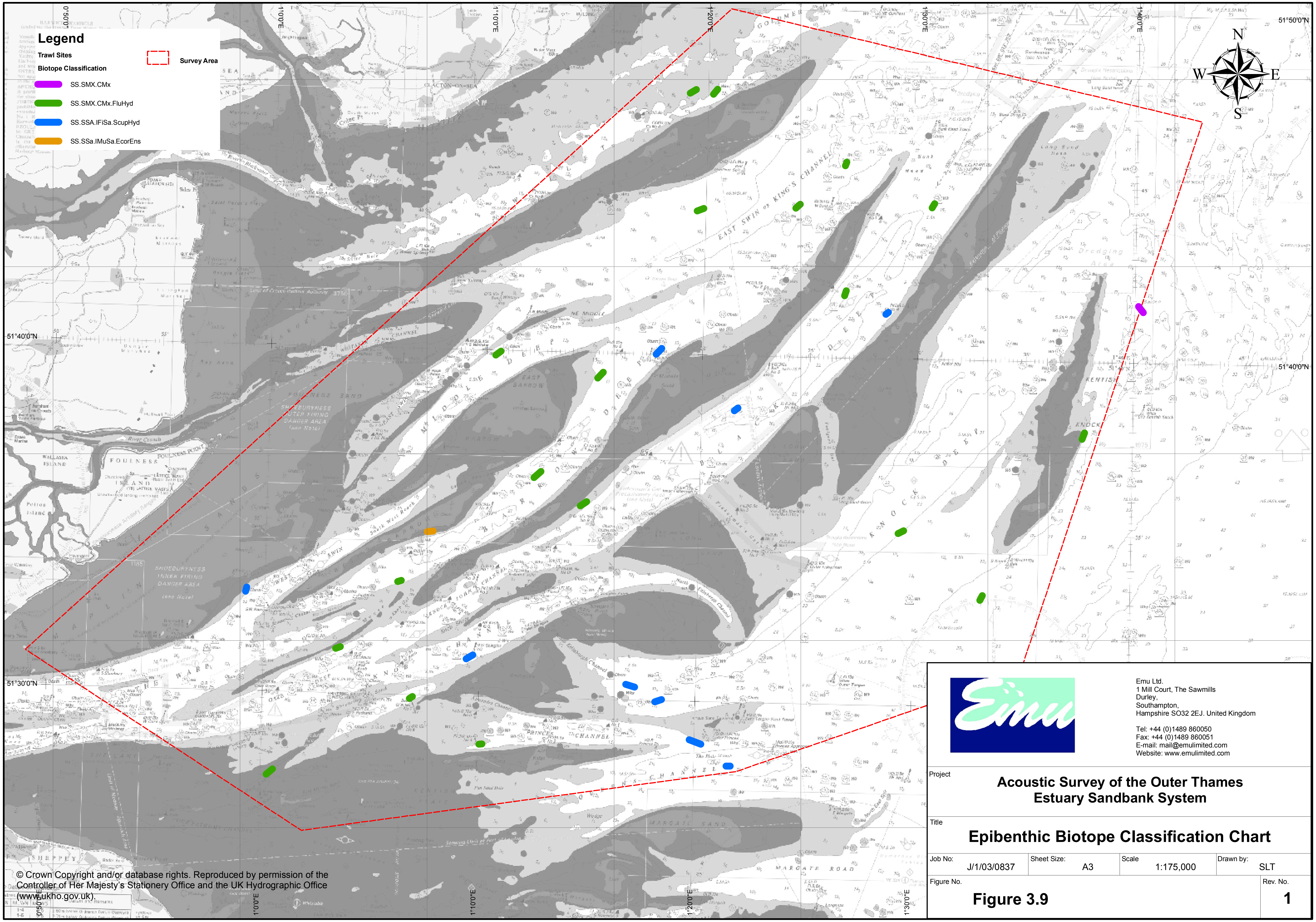
Project
Acoustic Survey of the Outer Thames Estuary Sandbank System

Title
Infaunal Biotope Classification Chart

Job No:	Sheet Size:	Scale	Drawn by:
J/1/03/0837	A3	1:175,000	SLT

Figure No.	Rev. No.
Figure 3.8	**1**



Legend
Trawl Sites
Biotope Classification
SS.SMX.CMx
SS.SMX.CMx.FluHyd
SS.SSA.IFiSa.ScupHyd
SS.SSa.IMuSa.EcorEns
Survey Area
N
S
E
W
350000
360000
370000
380000
390000
400000
410000
5740000
5730000
5720000
5710000
5700000
51°50'0"N
51°40'0"N
51°30'0"N
1°0'0"E
1°10'0"E
1°20'0"E
1°30'0"E
1°40'0"E
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Project
Acoustic Survey of the Outer Thames Estuary Sandbank System
Title
Epibenthic Biotope Classification Chart
Job No: J/1/03/0837
Sheet Size: A3
Scale 1:175,000
Drawn by: SLT
Figure No.
Figure 3.9
Rev. No. 1

Benthic Survey of the Outer Thames Estuary Sandbank System.

Volume II: Appendices.

Final Report

September 2006
Report No. 06/J/1/03/0837/0572

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English Nature
Northminster House
Peterborough
PE1 1AU

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APPENDIX I

Daily Logs

Daily Log

Emu Ltd.
1 Mill Court
The Sawmills
Durley
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SO32 2E
Tel: +44 (0) 1489 86005
Fax: +44 (0) 1489 86005

Surveyor	LXG / CGA	**Date**	Mon 15-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
10:00	Loading of kit into van	
13:00	Leave for Ramsgate	
17:30	Arrive in Ramsgate, Transport kit to EMU Surveyor, Set up kit, Make preliminary	
	system checks	
20:00	End of day	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Recorded Position			
HydroPro			
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **1** of 8

Daily Log

Emu Ltd.
1 Mill Court
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Surveyor	LXG / CGA	**Date**	Tue 16-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:00	Leave hotel for marina	F2-3
07:15	Set up sidescan towfish	
11:05	Depart marina for survey site	
11:07	Navigation check	
12:20	Arrive at survey site, Bar check, Deploy equipment	
14:40	Start survey	
17:55	End of survey	
19:50	Return to Ramsgate	
	Ops	
	Survey lines done : 28600m (~10%)	
	Total survey lines done : 28600m (~10%)	

Nav Check			
Known Point Description	**Easting/Latitude**	**Northing/Longitude**	**Time**
End of marina breakwater	390036.8	5687417.4	11:07
Recorded Position			
HydroPro	390045	5607453	11:07
CODA			

Signed ………………………………… ………………………………… **Sheet** **2** of 8
Emu Ltd. **Client Representative**

Daily Log

Emu Ltd.
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Tel: +44 (0) 1489 86005
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Surveyor	LXG / CGA	**Date**	Wed 17-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:40	On board vessel	F2-3
07:58	Navigation check in Ramsgate marina	
08:45	Bar check	Sea state slight
08:55	Deploy sidescan sonar, interference on port channel, investigated - found to be a broken	
	broken terminal on sidescan sonar, temporary fix in place, data ok	
09:45	Going to run on one engine	
09:50	Ready to start survey between P5 - P6	
10:00	Lost steering on vessel	
10:15	Steering on vessel fixed	
	Heave sensor not communicating	
10:27	Heave sensor fixed, ready to start recording using the pre-existing heave sensor	
16:40	End of survey, Start transit to Ramsgate	
19:40	Arrive to Ramsgate	
	Ops	
	Survey lines done : 44550m (~15%)	
	Total survey lines done : 73150m (~25%)	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Corner of last inner breakwater	390036.8	5687457.4	07:58
Recorded Position			
HydroPro	390044.5	5687453.2	07:58
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **3** of 8

Daily Log

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Tel: +44 (0) 1489 86005
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Surveyor	LXG / CGA	**Date**	Thu 18-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:40	Arrive on board vessel	F2
07:45	Refuel vessel	
08:09	Navigation check	
09:40	Deploy echosounder transducer	
09:45	Bar check	
09:50	Deploy sidescan sonar	
09:55	Start recording	Sea state calm F1
11:30	Changed towfish due to noise on starboard channel, discovered to be poor connection	
12:28	Completed P8 - P7 section over shallow banks	
16:50	End of survey, retrieve all equipment	
	Ops	
	Survey lines done : 43500m (~14%)	
	Total survey lines done : 116650m (~39%)	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Corner of last inner breakwater	390036.8	5687457	08:09
Recorded Position			
HydroPro (10m offset for towfish)	390046	5687455	08:09
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **4** of 8

Daily Log

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Surveyor	LXG / CGA	**Date**	Sun 21-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:20	Arrive on board vessel	F3-4
07:34	Navigation check	
10:00	Deploy equipment	
10:05	Start survey	
10:20	Survey abandoned due to no GPS on navigation chart	
12:30	Arrive to Ramsgate marina and refuel	
12:50	Arrive to berth	
14:40	End of repairs, Depart marina	
15:57	Start surveying P3 - P2	
18:10	End of survey	
19:55	Arrive to Ramsgate marina	
	Ops	
	Survey lines done : 22000m (~9%)	
	Total survey lines done : 138650m (~48%)	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Corner of last inner breakwater	390036.8	5687457	07:34
Recorded Position			
HydroPro	390046.5	5687453.3	07:34
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **5** of 8

Daily Log

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Surveyor	LXG / CGA	**Date**	Mon 22-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:50	Arrive on board vessel	F1 - calm
08:10	Navigation check	
10:30	Arrive on survey site, Bar check, SSS check	
10:37	Start survey	F4-5
16:55	End of survey	F4
19:00	Arrive to Ramsgate	
	Ops	
	Survey lines done : 59250m (~21%)	
	Total survey lines done : 197900m (~69%)	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Corner of last inner breakwater	390036.8	5687457	08:10
Recorded Position			
HydroPro	390046.1	5687458	08:10
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **6** of 8

Daily Log

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Surveyor	LXG / CGA	**Date**	Tue 23-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
07:45	Arrive on board vessel	
08:30	Refuel vessel	
08:55	Navigation check	
09:00	Leave marina for survey site	F4-5
11:10	Arrive on site, Deploy equipment, Bar check, SSS check, Start survey	
19:00	End of survey	F3-4
21:00	Arrive to Ramsgate	

Nav Check

Known Point Description	Easting/Latitude	Northing/Longitude	Time
Corner of last inner break water	390036.8	5687457	08:55
Recorded Position			
HydroPro	390047.3	5687454.3	08:55
CODA			

Signed ....
Emu Ltd. **Client Representative**

Sheet **7** of 8

OHG 8.A.1

Revision 1

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Daily Log

Surveyor	LXG / CGA	**Date**	Thu 25-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
09:00	Arrive on board vessel	
09:25	Refuel vessel	
09:40	Navigation check	
09:41	Leave marina for survey site	
11:20	Arrive on survey site, Deploy equipment	
15:30		F7
17:15	End of survey	
19:00	Arrive to Ramsgate, Demobilise	

Nav Check			
Known Point Description	**Easting/Latitude**	**Northing/Longitude**	**Time**
Corner of last inner breakwater	390036.8	5687457	09:38
Recorded Position			
HydroPro	390043.8	5687455.6	09:38
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **8** of 8

Daily Log

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Surveyor	LXG / CGA	**Date**	Mon 15-Aug-05
Client	English Nature	**Time zone**	GMT +1
Job	Outer Thames SSS Survey	**Site**	Outer Thames
Job No.	J/1/03/0837	**Vessel**	EMU Surveyor

Time	Activity	Weather/Sea state
10:00	Loading of kit into van	
13:00	Leave for Ramsgate	
17:30	Arrive in Ramsgate, Transport kit to EMU Surveyor, Set up kit, Make preliminary	
	system checks	
20:00	End of day	

Nav Check			
Known Point Description	**Easting/Latitude**	**Northing/Longitude**	**Time**
Recorded Position			
HydroPro			
CODA			

Signed ……………………………… ………………………………
Emu Ltd. **Client Representative**

Sheet **1** of 8

Actual Day Grab Locations and Sample Details
Job number: J/1/03/0837

			Position (WGS84)		Time	Depth (m)	Sample	Sediment Composition	Sediment Anoxia	Fauna/Flora details	Sample	
Site no.	**Grab no.**	**Date**	**E**	**N**	**(BST)**	**BSL**	**Size**					
											Fauna	PSA
4	1	27.08.05	398015	5725619	10:40	17	7 1/2	Discarded				
5	1	27.08.05	399921	5724513	11:09	22		Discarded				
5	2	27.08.05	399917	5724523	12:00	22	4	Med sand with <10% shell. Small lumps grey clay			A	A
4	1	27.08.05	398025	5725639	12:30	17	2	Fine/med sand			A	A
6	1	27.08.05	402755	5722852	13:02	10	3	Med sand with <10% shell.			A	A
55	1	27.08.05	401936	5729705	13:50	24		Discarded				
55	2	27.08.05	401941	5729691	13:55	24	2	Shelly (~30%) sand. Silt balls. Clay lumps			A	A
54	1	27.08.05	400068	5730291	14:08	6	5	Fine sand, <1% shell. Coal fragments. 1 x clay lump		*Nephtys* sp., *Liocarcinus* sp. Amphipoda	A	A
91	1	27.08.05	403303	5729117	14:26	18		Black silty clay, overlying layer brown silt. Dead Sabellaria reef.		Anemones (red striped), prawn (*Palaemon* ?)	A	A
47	1	27.08.05	403291	5730257	14:46	20		Discarded				
47	2	27.08.05	403280	5730235	14:49	20		Discarded				
47	3	27.08.05	403324	5730239	14:54	20	5	Shelly med/coarse sand. Small clumps dead Sabellaria			A	A
21	1	27.08.05	405120	5729306	15:09	22	6	Med/coarse sand, ~20% shell. Reddish colour. Clump dead Sabellaria			A	A
1	1	27.08.05	391382	5718873	16:18	9	1	Discarded (fine sand)				
1	2	27.08.05	391399	5718863	16:24	9	2	Fine sand		*Nephtys* sp.	A	A
1	3	27.08.05	391402	5718853	16:27	9	1	Discarded (fine sand)				
15	1	28.08.05	408083	5727909	11:33	22	2	Silt over sandy/muddy gravel over clay layer		*Lanice* sp., *Pectenaria* sp., *Ophiura albida* , *Owenia* sp.	A	A
7	1	28.08.05	405124	5721209	12:30	8	3	Fine sand. Coal fragments			A	A
66	1	28.08.05	403481	5717313	13:10	12	4	Fine/med sand <10% shell. Coal fragments			A	A
35	1	28.08.05	402801	5716743	13:20	6	2	Fine sand with tiny shell and coal fragments			A	A

			Position (WGS84)		Time	Depth (m)	Sample	Sediment Composition	Sediment Anoxia	Fauna/Flora details	Sample	
Site no.	Grab no.	Date	E	N	(BST)	BSL	Size					
8	1	28.08.05	401441	5715382	13:35	7	2	Fine sand with tiny shell and coal fragments		*Nephtys* sp.	A	A
9	1	28.08.05	399643	5712676	14:07	25	8	Sand and shell (50:50).	Lumps black anoxic clay.		A	A
36	1	28.08.05	400777	5714466	10:48	18	8	Fine sand and silt with tiny shell. Silty clay-like balls. Coal fragments			A	A
94	1	29.08.05	384721	5704394	10:35	17	10	Silty sand.	Grey streaks		A	A
39	1	29.08.05	385525	5703775	11:00	31	10	Thin silty sand layer over solid strongly anoxic clay.	Redox layer 1mm bs	*Pectenaria* tubes abundant	A	A
83	1	29.08.05	386019	5703099	11:19	31	6	Silty shelly sand. Grey near surface, not anoxic.		*Ophiura* sp., *Pectenaria* tubes, *Melinna* sp., *Hydrallmania falcata*	A	A
82	1	29.08.05	386397	5703097	11:43	28		Discarded - too coarse				
38	1	29.08.05	386466	5703031	11:50	27	4	Silty shelly fine sand, dead *Ensis*		*Aphrodite aculeatus, Ophiura albida, Lanice* tubes	A	A
67	1	29.08.05	397179	5714453	13:20	16		Discarded				
67	2	29.08.05	397180	5714454	13:23	16		Discarded - fine sand with silt				
67	3	29.08.05	397183	5714451	13:35	16	3	Fine silty sand with tiny shell. Dead *Ensis*	Patches anoxia		A	A
37	1	29.08.05	395318	5715862	13:52	24	2	Fine silty sand with tiny shell.			A	A
10	1	29.08.05	376637	5710853	15:17	6	4	Shelly sand. Dead cockles and *Ensis*			A	A
71	1	29.08.05	378170	5709616	15:55	11		Discarded				
71	2	29.08.05	378171	5709616	16:00	11						
70	1	29.08.05	381000	5708420	16:15	17	9	Silty shelly sand with dead *Crassostrea*			A	A
69	1	29.08.05	380721	5707597	16:26	17	9	Silty shelly sand. Dead eroded *Sabellaria* reef, dead piddock.	Lumps black anoxic clay. Redox layer 6cm bs light grey layer		A	A
68	1	29.08.05	381962	5706608	16:50	16	3	Silty sand with shell			A	A
40	1	29.08.05	382320	5706320	16:58	16		Discarded				
40	2	29.08.05	382308	5706329	17:03	16	10	Silty sandy shell			A	A
95	1	29.08.05	382571	5706145	17:20	16	4	Slightly silty shelly sand.		Small piece dead *Sabellaria*	A	A
16	1	29.08.05	375914	5702509	17:53	12		Discarded				
16	3	29.08.05	375915	5702508	17:53	12	1	Sand, slightly silty, big shells. Poor sample		*Sertularia* sp.	A	A
16	2	29.08.05	375915	5702510	17:55	12		Discarded				

Site no.	Grab no.	Date	Position (WGS84) E	N	Time (BST)	Depth (m) BSL	Sample Size	Sediment Composition	Sediment Anoxia	Fauna/Flora details	Sample	
76	1	29.08.05	372473	5704217	18:25	12	4	Fine sand with silt balls. Coal fragments		*Nephtys* sp.	A	A
44	1	29.08.05	372901	5704457	18:30	14	2	Discarded - Sandy, large shells, stoney below				
17	1	29.08.05	374062	5703700	18:45			Discarded - Too hard				
11	1	30.08.05	378116	5717251	10:43	10		Discarded - Fine sand				
11	2	30.08.05	378107	5717241	10:45	10	3	Fine sand with silt balls. <5% shell. Coal fragments		*Nephtys* sp., *Abra* sp.	A	A
74	1	30.08.05	378877	5716062	11:08	22		Discarded - 2 small cobbles with fine sand		*Pomatoceros* sp.		
2	1	30.08.05	386152	5722882	11:47	15	4	Fine sand with silt balls		*Nephtys* sp.	A	A
81	1	30.08.05	386698	5722447	11:56	25		Silty shelly sand		*Ophiura* sp., *Pectenaria* tubes	A	A
80	1	30.08.05	387157	5722108	12:14	20	3	Silty shelly sand with large dead shells			A	A
33	1	30.08.05	387777	5721647	12:22	23	2 1/2	Discarded				
33	2	30.08.05	387785	5721655	12:28	23	5	Fine sand with large lumps of coal			A	A
3	1	30.08.05	395457	5726974	13:03	2	5	Discarded				
3	2	30.08.05	395498	5726957	13:06	2	4	Fine sand			A	A
65	1	30.08.05	394614	5727598	13:16	18	6	Fine sand with very small silt balls			A	A
64	1	30.08.05	393580	5728187	13:30	20	<2	*Sabellaria* reef on silty sand		*Sabellaria* reef, *Alcyonidium diaphanum*, Anemones	A	A
63	1	30.08.05	392496	5728779	13:39	27	4	Silty sand (small silt balls) with some shell		*Abra* sp.	A	A
63	2	30.08.05	392512	5728776	13:44	27	2	Discarded				
34	1	30.08.05	391242	5729499	14:00	5	2 1/2	Discarded				
34	2	30.08.05	391259	5729502	14:02	5	4	Fine sand			A	A
24	1	30.08.05	393903	5732163	14:24	19		Silty fine sand			A	A
53	1	30.08.05	397861	5731009	14:42	4		Not fired				
53	2	30.08.05	397863	5731006	14:45	4	4	Fine sand with silt balls			A	A
22	1	30.08.05	398701	5732481	14:56	2	4	Fine sand			A	A
48	1	30.08.05	397108	5733364	15:06	21	7	Shelly medium sand with small amount silt	Anoxia associated with silt		A	A
23	1	30.08.05	392483	5735637	15:41	28	6	Silty shelly sand		Encrusting thick Sabellaria (not reef)	A	A
89	1	30.08.05	388624	5737749	16:15	3	5	Fine sand with <5% shell and some silt			A	A

			Position (WGS84)		Time	Depth (m)	Sample	Sediment Composition	Sediment Anoxia	Fauna/Flora details	Sample	
Site no.	Grab no.	Date	E	N	(BST)	BSL	Size					
49	1	30.08.05	385292	5739219	16:53		2	Discarded - Silty sandy gravel and shell with flint cobbles				
50	1	30.08.05	384028	5739217	17:03	11		Discarded - sand and gravel				
50	2	30.08.05	384025	5739222	17:06	11	3	Discarded - Silty sandy gravel				
96	1	30.08.05	379717	5736380	17:32	6	10	Silt (relatively compact) with sand	Whole sample grey	*Nucula* sp., *Abra* sp.	A	A
93	1	30.08.05	381351	5735220	17:46	3	10	Sandy silt	Whole sample grey		A	A
97	1	30.08.05	381724	5734406	17:59	2	5	Discarded - Fine sand with underlying			A	A
97	2	30.08.05	381725	5734416	18:05	2		Fine sand			A	A
14	1	30.08.05	372867	5731241	18:47	3	6	Fine sand			A	A
92	1	30.08.05	363885	5720276	19:44	3	3	Discarded - fine sand with dead cockles.				
92	2	30.08.05	363889	5720282	19:48	3	3	Discarded - fine sand with dead cockles.				
86	1	31.08.05	368798	5713295	11:18	17	4	Silty fine sand, coal fragments			A	A
98	1	31.08.05	369880	5716280	11:44	4	2	Fine sand			A	A
85	1	31.08.05	371167	5715230	12:00	29	1	Discarded - large pebbles over silty sand		*Asterias rubens, Sabellaria*		
84	1	31.08.05	371360	5715041	12:05	29		Shelly silty sand. Coal fragments	Patches of anoxic grey sediment	*Pectenaria, Lanice* sp.?	A	A
57	1	31.08.05	375202	5717441	12:35	24	6	Silty sand. Surface silty layer		*Ophiura ophiura*	A	A
58	1	31.08.05	376242	5719159	12:54	23	3	Silty sand.	Patches of anoxic clay		A	A
43	1	31.08.05	376733	5719733	13:10	25		Discarded - sand and coarse gravel				
101	1	31.08.05	375900	5721637	13:26	3	4	Fine sand <10% shell	Patches of anoxic clay	*Donax* sp.	A	A
12	1	31.08.05	376974	5720932	13:39	21	5	Fine sand			A	A
99	1	31.08.05	377555	5721347	13:50	19	4	Silty sand		*Abra* sp.	A	A
31	1	31.08.05	379203	5724082	14:10	16	10	Anoxic clay with thin silty covering	Redox layer 1mm bs		A	A
62	1	31.08.05	382577	5725635	14:37	20		Discarded - cobbles				
102	1	31.08.05	384243	5724491	14:59	3	4	Fine sand			A	A
32	1	31.08.05	389484	5730157	15:31	10	4	Silty sand with silt balls and coal fragments		*Abra* sp.	A	A
52	1	31.08.05	391507	5732901	15:50	24	5	Fine sand			A	A
51	1	31.08.05	389901	5733369	16:02	25		Discarded				
51	2	31.08.05	389898	5733377	16:07	25	3	Sandy shelly silt. Whole dead shells			A	A
90	1	31.08.05	389228	5733579	16:23	24	7	Fine sand with silt covering surface	Patches of anoxic clay		A	A
61	1	31.08.05	386992	5731979	16:39	24	3	Silty sand	Patches of anoxic clay		A	A
60	1	31.08.05	385695	5732726	16:58	20	8	Sitly sand overlying grey anoxic silty soft clay	Anoxic silt. Redox layer 3cm bs		A	A
59	1	31.08.05	384935	5733166	17:05	15	10	Silty sand overlying soft black clay	Anoxic clay. Redox layer 8cm bs	*Nucula* sp.	A	A
100	1	31.08.05	375678	5724792	18:06	11	4	Fine sand			A	A

			Position (WGS84		Time	Depth (m)	Sample	Sediment Composition	Sediment Anoxia	Fauna/Flora details	Sample	
13	1	31.08.05	373968	5724522	18:17	16	2	Sandy shell. Large dead Ostrea valves			A	A
75	1	31.08.05	373647	5725120	18:24	16	2	Discarded - silty sandy shell		*Hydrallmania falcata*		
Site no.	**Grab no.**	**Date**	**E**	**N**	**(BST)**	**BSL**	**Size**					
30	1	31.08.05	365835	5719490	19:08		6	Silty clay (grey)		*Echinocardium* sp., *Abra* sp.	A	A
29	1	31.08.05	365946	5717388	19:20	10	8	Silt (5cm) over grey clay			A	A
103	1	31.08.05	367096	5716604	19:32	12	6	Silty sand. Coal fragments			A	A
28	1	01.09.05	357856	5710955	11:39	6	6	Fine sand with dead cockles			A	A
20	1	01.09.05	360303	5712578	11:54	12		Discarded - Muddy sand, whole Ostrea shells		*Psammechinus miliaris*		
20	2	01.09.05	360306	5712595	11:56	12	2	Discarded - Muddy sand, whole Ostrea shells				
77	1	01.09.05	362560	5711152	12:22	12	4	Fine sand			A	A
27	1	01.09.05	360178	5706155	12:47	23		Discarded - mud with pebble				
27	2	01.09.05	360223	5706143	12:54	23	3	Silty shelly sand	Redox layer 3cm bs		A	A
26	1	01.09.05	361759	5703032	13:14	6	5	Shelly sand.			A	A
25	1	01.09.05	363078	5700304	13:33	7	2	Discarded - sand with whole shells				
45	1	01.09.05	370206	5706195	14:13	11	5	Sandy shell			A	A
88	1	01.09.05	367791	5707776	14:30	15	2	Discarded - sandy shell				
88	2	01.09.05	367786	5707785	14:32	15	5	Shelly sand with some silt				
46	1	01.09.05	369030	5706902	14:42	17	6	Brown sandy silt over grey sandy clay	Redox layer 4cm bs (smells H2S)		A	A
18	1	01.09.05	367202	5708189	15:07	16		Discarded - Sandy with whole shells				
87	1	01.09.05	371950	5708940	15:29	16	6	Sandy silty shell		*Pectenaria* tubes	A	A
42	1	01.09.05	371417	5709670	15:50	20	6	Silty sand	Patches anoxia		A	A
56	1	01.09.05	370915	5710288	16:01		6	Shelly sand			A	A
73	1	01.09.05	370485	5713035	16:08	15	2	Discarded - Sandy silty shells with dead *Sabellaria* reef				
41	1	01.09.05	370174	5711410	16:18	16		Discarded - shelly sand				
41	2	01.09.05	370174	5711402	16:20	16	5	Shelly sand			A	A
78	1	01.09.05	372910	5713622	16:40	17	2	Fine sand. Dead cockles			A	A
72	1	01.09.05	372592	5714093	16:46	7	3	Fine sand with dead cockles over sandy black clay	Redox layer 2cm bs		A	A
79	1	01.09.05	373590	5714724	17:04	8	5	Fine sand with coal fragments			A	A
19	1	01.09.05	365058	5709527	17:59	12	10	Silty sand over slopy grey silt with lumps soft clay, smell H2S	Redox layer 2cm bs	*Pectenaria* tubes	A	A

Emu Ltd
Benthic Survey of the Outer Thames Estuary
Actual Mini-Hamon Grab Locations and Sample Details
Job number: J/1/03/0837

		Date	Position (WGS84)		Time	Depth (m)	Sample	Sediment Composition	Sediment anoxia	Sample	
Site no.	**Grab no.**		**Latitude**	**Longitude**	**(BST)**	**BSL**	**Size**	**(AA = As Above)**	bs-below surface	**Fauna**	**PSA**
75	1	01.09.05	51o39.755N	001o10.371E	10:01	10	14	Medium fine sand with shell debris		A	A
62	1	01.09.05	51o40.175N	001o18.167E	11:28	10	1	Discarded - Surface scraping			
62	2	01.09.05	51o40.191N	001o18.122E	11:30		10	Thick mud/clay		A	A
50	1	02.09.05	51o47.499N	001o19.100E	11:10	12		Discarded - Surface scraping			
50	2	02.09.05	51o47.491N	001o19.075E	11:11	12		Discarded - Surface scraping			
50	3	02.09.05	51o47.513N	001o19.095E	11:18	12	7	Silty sandy shell		A	A
49	1	02.09.05	51o47.520N	001o20.229E	11:26	13	3	Sand and gravel		A	A
74	1	02.09.05	51o34.945N	001o15.086E	17:50	16		Discarded - Surface scraping, fine sand			
74	2	02.09.05	51o34.945N	001o15.106E	17:53	16	12	Fine sand with small amount shell		A	A
92	1	03.09.05	51o37.040N	001o02.032E	09:48	3		Discarded - Surface scraping			
92	2	03.09.05	51o37.038N	001o02.003E	09:48	3		Discarded - Surface scraping			
92	3	03.09.05	51o37.033N	001o01.958E	09:51	3	1	Silty fine sand with dead cockles	Streaks	A	A
82	1	03.09.05	51o28.089N	001o21.859E	12:23	26		Misfired			
82	2	03.09.05	51o28.105N	001o21.831E	12:25	26	12	Muddy sandy shells (1cm layer) over sandy clay		A	A
71	1	03.09.05	51o31.473N	001o14.591E	13:47	11		Discarded - Surface scraping			
71	2	03.09.05	51o31.488N	001o14.569E	13:50	11	8	Fine sand with small lumps anoxic clay	Clay patches	A	A
85	1	03.09.05	51o34.390N	001o08.465E	14:31	26		Discarded - Surface scraping			
85	2	03.09.05	51o34.389N	001o08.501E	14:33	26	5	Silty sand over black anoxic clay	Redox layer 2cm bs	A	A
73	1	04.09.05	51o32.117N	001o07.887E	11:18	15	8	Silty (slightly) sand shell gravel		A	A
44	1	04.09.05	51o28.624N	001o10.264E	12:17	13	5	Silty shelly sand		A	A
18	1	04.09.05	51o30.560N	001o05.112E	12:54	16	6	Sandy silty shells		A	A

Actual Anchor Dredge Locations and Sample Details
Job number: J/1/03/0837

Site no.	Dredge no.	Date	Position (WGS84)		Time	Depth (m)	Sediment Composition	Sediment Anoxia	Fauna/Flora	Faunal
			E	N	(BST)	BSL	(AA = As Above)	bs-below surface		sample
15	1	28.08.05	408082	5727902	11:45	22	None taken			
15	2	28.08.05	408097	5727879	11:53	22	Clay with muddy sandy gravel. Couple cobbles.		*Psammechinus milaris, Pectenaria* sp., *Asterias rubens* , *Pagurus bernhardus* , *Lanice conchilega* , *Buccinum undatum* , *Sertularia cupressina* ?	
7	1	28.08.05	405125	5721197	12:37	8	None taken			
7	2	28.08.05	405128	5721201	12:45	8	Fine sand. Coal fragments	Streaks		
94	1	29.08.05	384728	5704394	10:40	16	Silty sand.	Streaks		
83	1	29.08.05	386028	5703403	11:25	32	Silty sand with shell		*Alcyonidum diaphanum, Ophiura albida, Aphrodita aculeata, Asterias rubens, Psammechinus milliaris, Pectenaria* sp., *Conopeum reticulum.*	
9	1	29.08.05	399644	5712662	13:00	26	Sandy shell over black anoxic clay			A
37	1	29.08.05	395306	5715852	13:57	26	Fine silty sand with shell and dead *Ensis*		*Nephtys* sp., *Spisula solida* ?, *Abra alba* ?	A
10	1	29.08.05	376640	5710862	15:35	6	Shelly sand with dead cockles and *Ensis*			A
69	1	29.08.05	380724	5707592	16:32	17	Silty shelly sand. Lumps black anoxic clay. Dead eroded *Sabellaria* reef	Very anoxic.Redox layer 6cm bs		
40	1	29.08.05	382341	5706314	17:09	16	Silty sandy shell			A
44	1	29.08.05	372899	5704458	18:35	14	Muddy sand shells	Streaks	*Alcyonidium diaphanum*	A
11	1	30.08.05	378108	5717242	10:49	10	Discarded - Fine sand.			
11	2	30.08.05	378095	5717245	10:55	10	Fine sand.			A
81	1	30.08.05	386705	5722445	12:00	25	Silty shelly sand. Lumps silty anoxic clay	Patches	*Pectenaria* tubes, *Psammechinus miliaris* , *Nucula* sp., *Crepidula fornicata* (1), *Buccinum undatum* (3), *Atelecyclus rotundatus*	A

65	1	30.08.05	394601	5727585	13:19	18	Fine sand with thin layer coarse sand and shell	Streaks		A
Site no.	**Dredge no.**	**Date**	**Position (WGS84)**		**Time**	**Depth (m)**	**Sediment Composition**	**Sediment Anoxia**	**Fauna/Flora**	**Faunal**
			E	**N**	**(BST)**	**BSL**	**(AA = As Above)**	**bs-below surface**		**sample**
63	1	30.08.05	392487	5728781	13:48	27	Silty sand and black anoxic sandy clay	Black sandy clay smells like H2S	*Pagurus bernhardus, Aphrodite aculeata*	A
48	1	30.08.05	397141	5733339	15:10	21	Shelly sand with small amount silt			A
23	1	30.08.05	392479	5735641	15:44	28	Empty			
23	2	30.08.05	392470	5735636	15:51	28	Silty shelly sand			A
50	1	30.08.05	384020	5739234	17:08	11	Silty sandy shell and gravel (coarse/med)		*Psammechinus miliaris*	A
93	1	30.08.05	381349	5735225	17:50	3	Sandy silt	Grey sediment		A
86	1	31.08.05	368808	5713289	11:20	17	Silty fine sand, coal fragments			?
98	1	31.08.05	369887	5716278	11:50	4	Fine sand		*Echinocardium* sp., *Mactra* sp.?	A
58	1	31.08.05	376221	5719131	13:00	23	Silty sand		Dover sole, *Hinia* sp.	A
31	1	31.08.05	379185	5724072	14:13	16	Anoxic clay with silt surface	Redox layer 1mm bs	*Echinocardium* sp.	A
62	1	31.08.05	382567	5725633	14:41	20	Sandy gravel with large shell. Few cobbles and lumps anoxic clay, coal fragments	Lumps anoxic clay	*Alcyonidium diaphanum, Pagurus bernhardus* , Nereids,	A
51	1	31.08.05	389993	5733392	16:15	25	Sandy shelly silt. Dead shells			A
59	1	31.08.05	384903	5733146	17:10	15	Silty sand overlying soft black clay			A
75	1	31.08.05	373640	5725120	18:29	16	Silty sandy shell			A
103	1	31.08.05	367111	5716617	19:36	12	Silty sand. Coal fragments			A
20	1	01.09.05	360306	5712563	12:00	12	Empty			
20	2	01.09.05	360314	5712588	12:05	12	Silty sandy shells		*Asterias rubens* x3, *Buccinum undatum* x 2, *Crepidula fornicata* x 9, *Ophiura ophiura* x2, *Psammechinus milaris* x9, *Pagurus bernhardus,* x4, *Mytilus edulis* x1, *Liocarcinus holstatus* x1 - all thrown	A
26	1	01.09.05	361750	5703042	13:16	7	Shelly sand		*Ophiura ophiura* x 3 - thrown	A
46	1	01.09.05	368993	5706894	14:47	17	Empty			
46	2	01.09.05	368981	5706897	14:52	17	Sandy silt and grey sandy clay	Patches		A
87	1	01.09.05	371946	5708920	15:31	16	Sandy silty shell		*Pectenaria* tubes	A
79	1	01.09.05	373551	5714727	17:07	8	Fine sand with some silt & shell (<4%)	Streaks		A
19	1	01.09.05	365049	5709527	18:02	12	Sandy silt with silty sandy clay, smell H2S	Patches	*Pectenaria* tubes	A

Emu Ltd
Benthic Survey of the Outer Thames Estuary
Actual Locations and Sample Details
Job number: J/1/03/0837
2m Beam Trawl with chains
Actual Trawl Locations and Sample Details

		Start of Tow Location WGS84		End of Tow Location WGS84		Time on	Time left	Time taken	Speed	Depth at end	Direction flow	Wire length	Sample for ID
Trawl No.	Date	Latitude	Longitude	Latitude	Longitude	Seabed (mins)	Seabed (mins)	Mins	Knots	BSL		metres	Litres
75	01.09.05	51o39.855N	001o10.404E	51o39.967N	001o10.653E	10.05	10:10	5	2.2	16	Into current	60	N
31	01.09.05	51o39.257N	001o15.159E	51o39.434N	001o15.415E	10:43	10:48	5	2.2	17	Slack	60	N
62	01.09.05	51o40.161N	001o18.104E	51o39.985N	001o17.846E	11:15	11:20	5	2.2	20	Slack	75	N
81	01.09.05	51o38.491N	001o21.699E	51o38.405N	001o21.529E	12:06	12:11	5	2.4	23	Into current	80	N
65	01.09.05	51o41.345N	001o28.580E	51o41.285N	001o28.464E	12:53	12:58	5	2.2	15	Into current	70	8
63	01.09.05	51o41.940N	001o26.611E	51o41.799N	001o26.527E	13:17	13:23	6	2	22	Into current	80	6
48	01.09.05	51o44.500N	001o30.624E	51o44.384N	001o30.513E	13:54	14:00	6	1.6	18	Into current	80	6
23	01.09.05	51o45.652N	001o26.509E	51o45.544N	001o26.445E	14:30	14:36	6	1.4	26	Into current,	80	Y
51	01.09.05	51o44.404N	001o24.378E	51o44.287N	001o24.174E	14:59	15:06	7	1.7	21	Into current	80	8
59	01.09.05	51o44.221N	001o19.909E	51o44.144N	001o19.598E	15:37	15:44	7	2.2	13	Into current	70	N
50	02.09.05	51o47.540N	001o19.157E	51o47.649N	001o19.431E	10:59	11:04	5	2.2	12	Slack	45	Y
49	02.09.05	51o47.525N	001o20.230E	51o47.666N	001o20.419E	11:30	11:35	5	2.2	12	lack	50	Y
15	02.09.05	51o41.651N	001o40.189E	51o41.479N	001o40.409E	13:40	13:45	5	2.5	20	Across current	80	Y
7	02.09.05	51o37.976N	001o37.792E	51o37.789N	001o37.679E	14:31	14:36	5	2.6	12	Into current,	55	Y
9	02.09.05	51o33.227N	001o33.205E	51o33.091N	001o33.091E	15:33	15:38	5	2	23	Into current	90	N
37	02.09.05	51o35.055N	001o29.502E	51o34.972N	001o29.242E	16:11	16:16	5	2	18	Into current	80	Y
11	02.09.05	51o35.567N	001o14.495E	51o35.684N	001o14.790E	18:04	18:09	5	2.1	9	With current	35	Y
58	02.09.05	51o36.530N	001o12.638E	51o36.345N	001o12.322E	19:01	19:06	5	3.6	17	With current	65	Y
83	03.09.05	51o28.158N	001o21.520E	51o28.158N	001o21.709E	12:32	12.37	5	2	27	Into current	100	Y
94	03.09.05	51o28.775N	001o20.327E	51o28.889N	001o19.782E	12:50	12:55	5	2.7	13	With current	75	Y
68	03.09.05	51o29.967N	001o18.166E	51o30.034N	001o18.462E	13:10	13:15	5	2.3	17	Into current	75	Y
98	03.09.05	51o34.735N	001o07.720E	51o34.708N	001o07.447E	14:41	14:46	5	2.3	2.4	Into current	25	Y
20	04.09.05	51o32.853N	000o59.105E	51o32.975N	000o59.152E	09:59	10:04	5	1.4	7.1	Into current	35	Y
86	04.09.05	51o33.252N	001o06.127E	51o33.288N	001o06.302E	10:56	11:01	5	1.5	13	Into current	45	Y
87	04.09.05	51o31.070N	001o09.390E	51o31.187N	001o09.689E	11:35	11:41	6	2.4	15	Into current	50	Y
44	04.09.05	51o28.617N	001o10.075E	51o28.625N	001o10.214E	12:09	12:14	5	1.6	12	Into current	45	Y
46	04.09.05	51o29.884N	001o06.817E	51o29.943N	001o06.952E	12:37	12:42	5	2.3	16	Into current	60	Y
19	04.09.05	51o31.280N	001o03.348E	51o31.328N	001o03.558E	13:09	13:14	5	1.9	14	Into current	50	Y
69	04.09.05	51o30.373N	001o17.209E	51o30.447N	001o16.799E	13:23	13:28	5	3.2	16	With current	65	Y
26	04.09.05	51o27.751N	001o00.576E	51o27.596N	001o00.284E	13:48	13:53	5	3	7	With slack	35	Y

Trawl No.	Comments
75	
31	
62	Large aluminium tube in net
81	
65	Lesser weaver fish
63	Fish Id'd and thrown
48	
23	Medium size chunks Sabellaria tubes on shells, sample for ID
51	Shell debris
59	
50	
49	
15	
7	photo labelled as 17
9	
37	
11	
58	
83	
94	photo labelled as 92
68	
98	
20	
86	
87	
44	
46	
19	
69	
26	

APPENDIX II

PSA results

Outer Thames Estuary (J/1/03/0837)
Site 1 (WL017040)

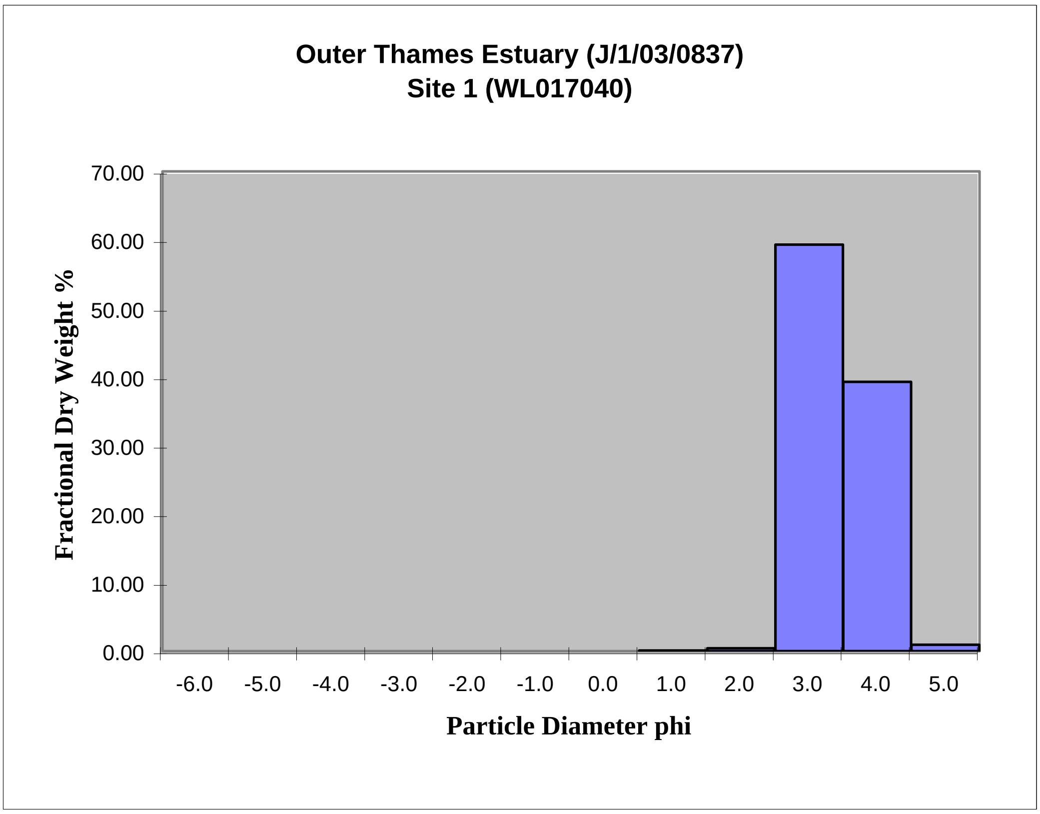
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.014	0.01	0.01
	1	0.0	0.000	0.00	0.01
Medium Sand	0.5	1.0	0.054	0.02	0.03
	0.25	2.0	0.953	0.43	0.46
Fine Sand	0.125	3.0	130.265	59.32	59.79
	0.063	4.0	86.239	39.27	99.06
Silt/Clay	<0.063	5.0	2.067	0.94	100.00
		Total Weight	219.592	100.00	

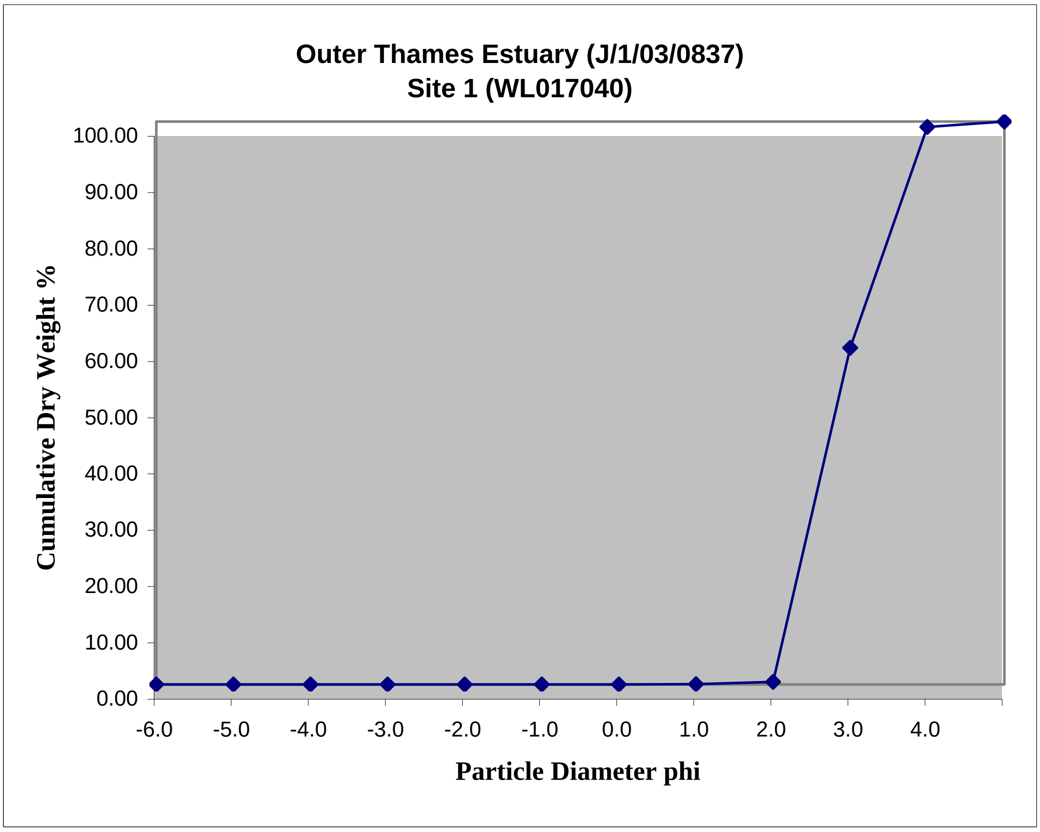
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.14
Mean phi	2.56
Md phi	2.84
Sorting	0.13
Skq	-2.99
Kurtosis	0.41

%Gravel	0.00
% Sand	99.06
% Fines	0.94
% Org C	0.773

Sand


Outer Thames Estuary (J/1/03/0837)
Site 1 (WL017040)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 1 (WL017040)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 2 (WL017041)

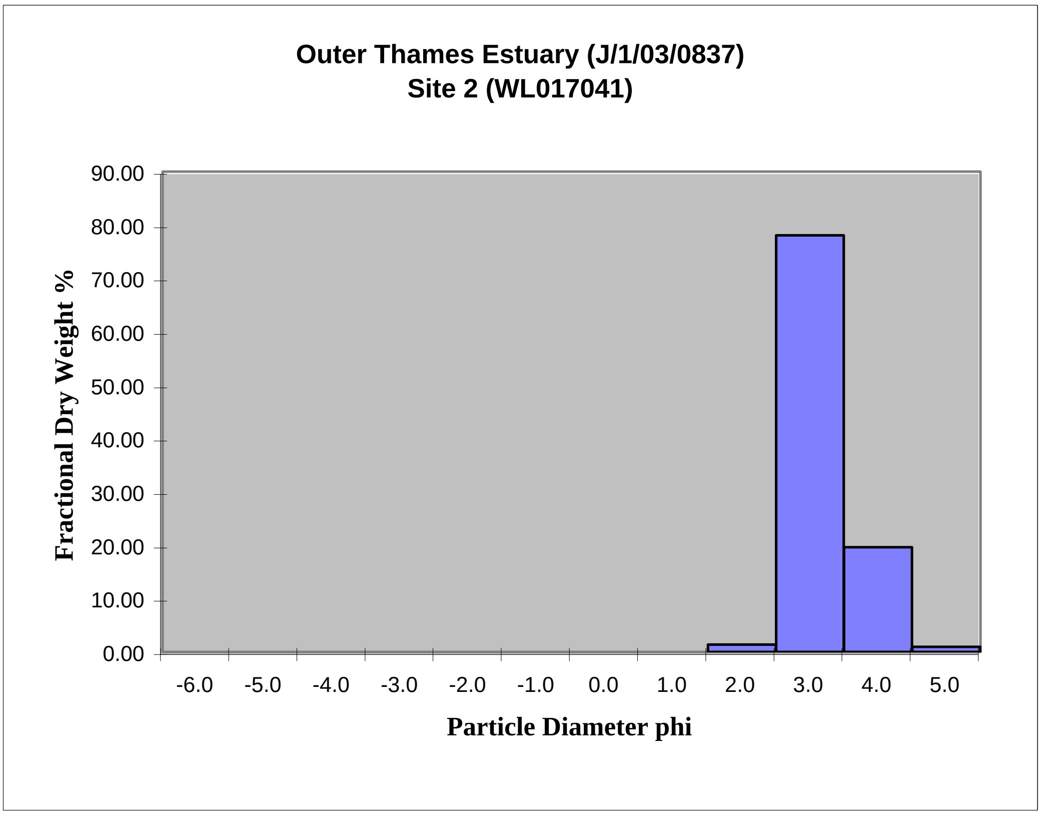
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.007	0.00	0.00
Medium Sand	0.5	1.0	0.052	0.02	0.02
	0.25	2.0	4.305	1.36	1.38
Fine Sand	0.125	3.0	247.556	78.05	79.42
	0.063	4.0	62.278	19.63	99.06
Silt/Clay	<0.063	5.0	2.990	0.94	100.00
		Total Weight	317.188	100.00	

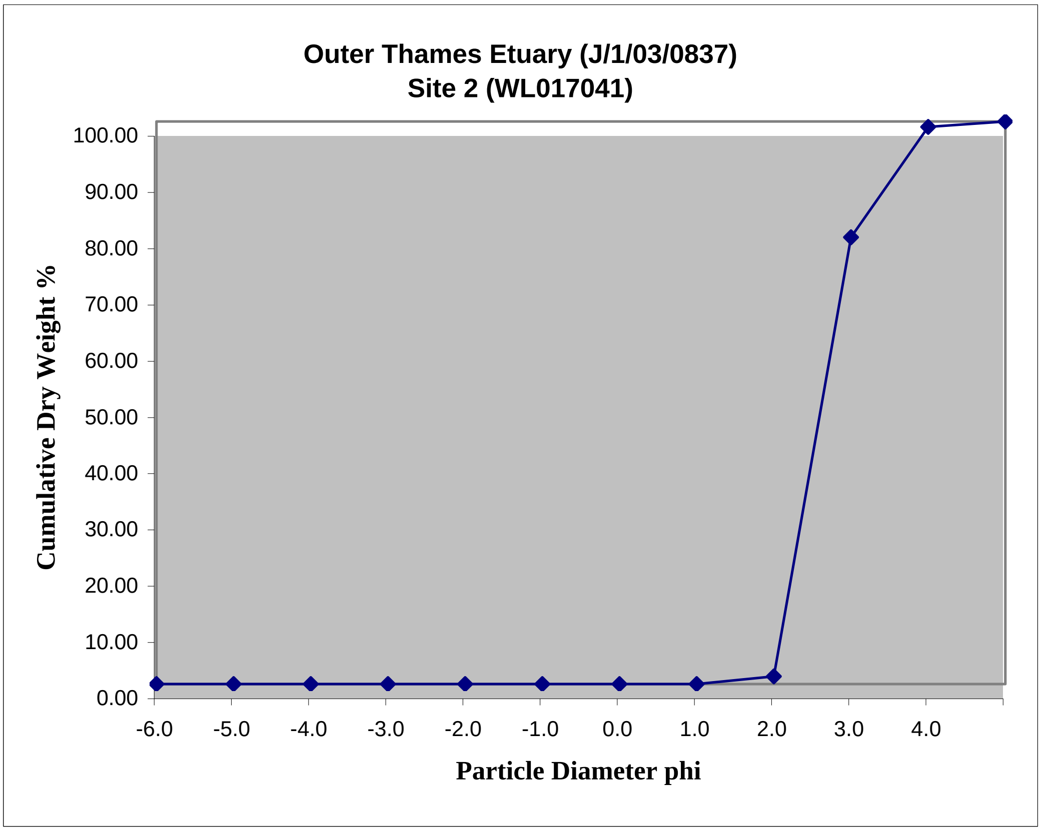
Mean mm	0.17
Md mm	0.16
Mean phi	2.58
Md phi	2.62
Sorting	0.30
Skq	-0.34
Kurtosis	0.48

%Gravel	0.00
% Sand	99.06
% Fines	0.94
% Org C	0.514

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 2 (WL017041)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Etuary (J/1/03/0837)
Site 2 (WL017041)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 3 (WL017042)

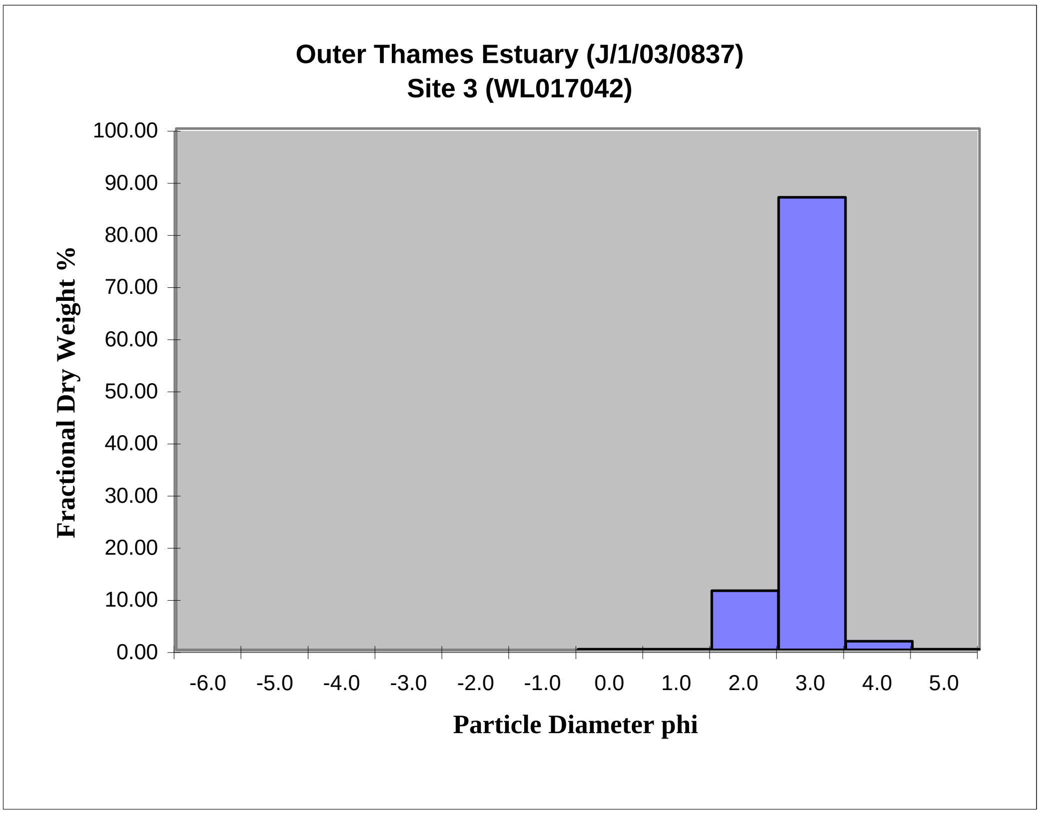
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.025	0.01	0.01
	1	0.0	0.082	0.03	0.04
Medium Sand	0.5	1.0	0.230	0.09	0.13
	0.25	2.0	29.830	11.33	11.46
Fine Sand	0.125	3.0	228.600	86.83	98.28
	0.063	4.0	4.339	1.65	99.93
Silt/Clay	<0.063	5.0	0.182	0.07	100.00
		Total Weight	263.288	100.00	

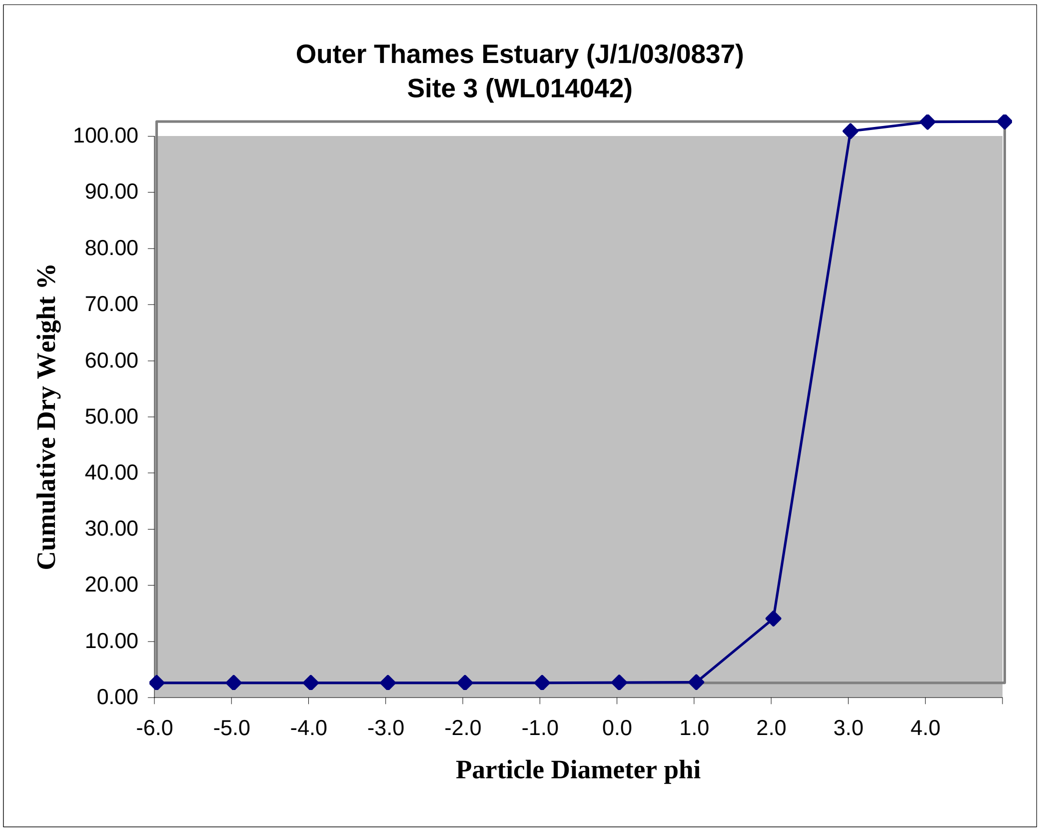
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.18
Md mm	0.18
Mean phi	2.44
Md phi	2.44
Sorting	0.43
Skq	-0.16
Kurtosis	1.09

%Gravel	0.00
% Sand	99.93
% Fines	0.07
% Org C	0.751

Sand


Outer Thames Estuary (J/1/03/0837)
Site 3 (WL017042)
Fractional Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 3 (WL014042)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 4 (WL017043)

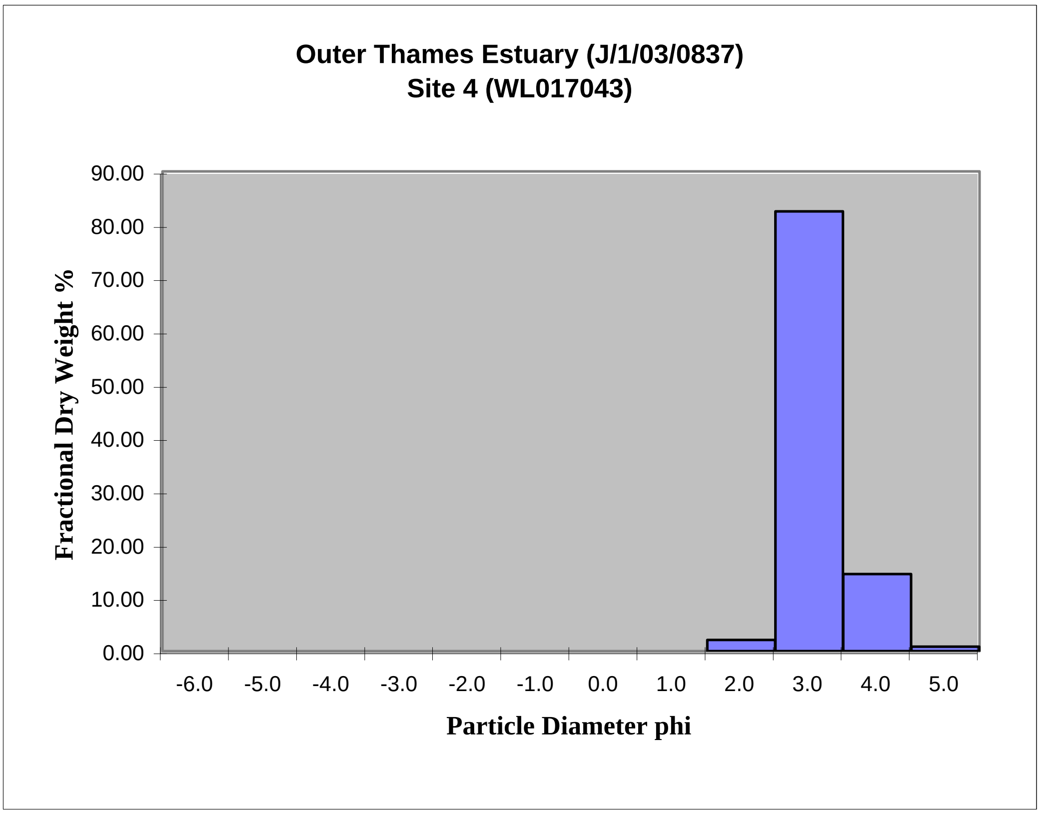
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.077	0.03	0.03
	0.25	2.0	5.627	2.11	2.14
Fine Sand	0.125	3.0	219.639	82.52	84.67
	0.063	4.0	38.540	14.48	99.15
Silt/Clay	<0.063	5.0	2.271	0.85	100.00
		Total Weight	266.154	100.00	

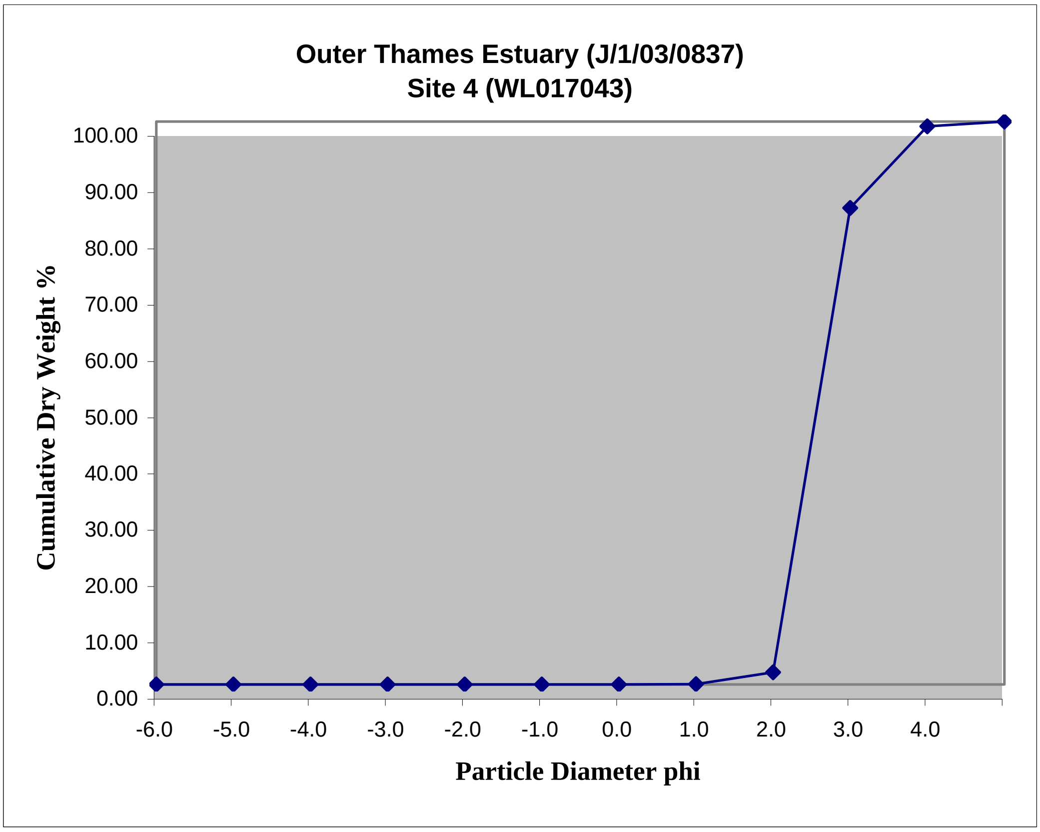
* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.17
Mean phi	2.58
Md phi	2.58
Sorting	0.33
Skq	-0.15
Kurtosis	0.57

%Gravel	0.00
% Sand	99.15
% Fines	0.85
% Org C	0.475

Sand


Outer Thames Estuary (J/1/03/0837)
Site 4 (WL017043)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 4 (WL017043)
Cumulative Dry Weight %
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90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 5 (WL017044)

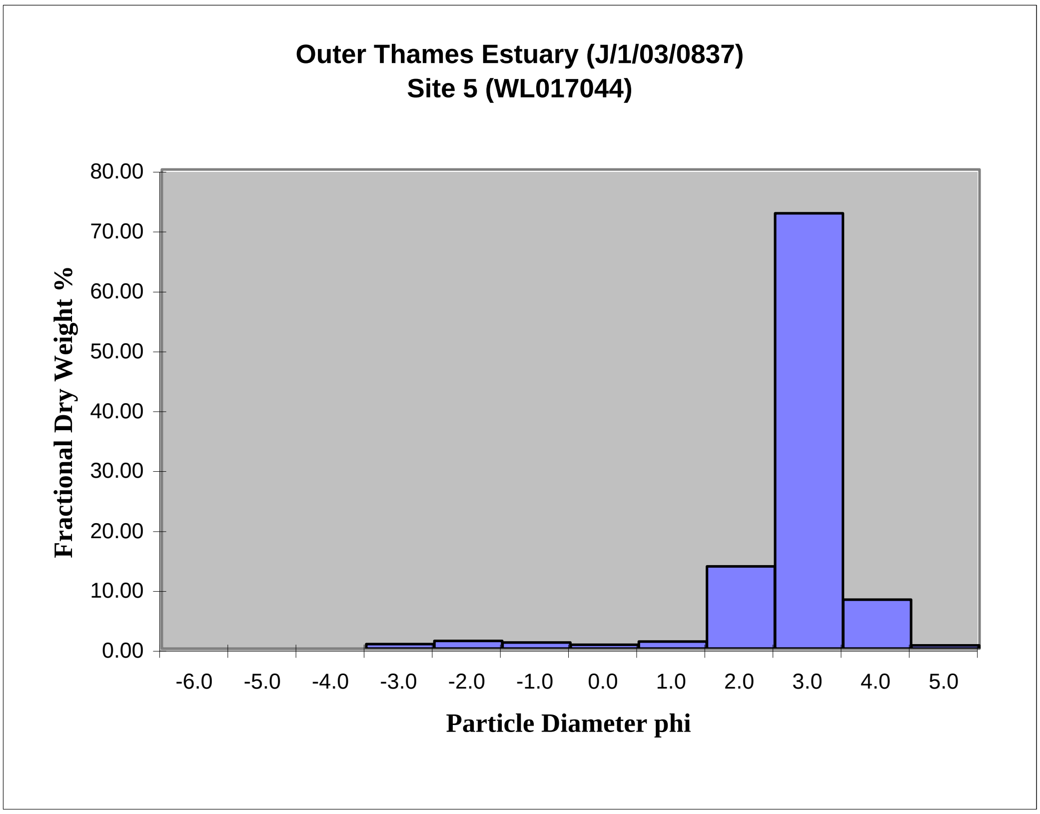
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	2.014	0.77	0.77
	4	-2.0	3.369	1.29	2.06
Coarse Sand	2	-1.0	2.684	1.03	3.09
	1	0.0	1.683	0.64	3.73
Medium Sand	0.5	1.0	3.122	1.19	4.93
	0.25	2.0	35.835	13.71	18.64
Fine Sand	0.125	3.0	189.916	72.67	91.30
	0.063	4.0	21.304	8.15	99.46
Silt/Clay	<0.063	5.0	1.422	0.54	100.00
		Total Weight	261.349	100.00	

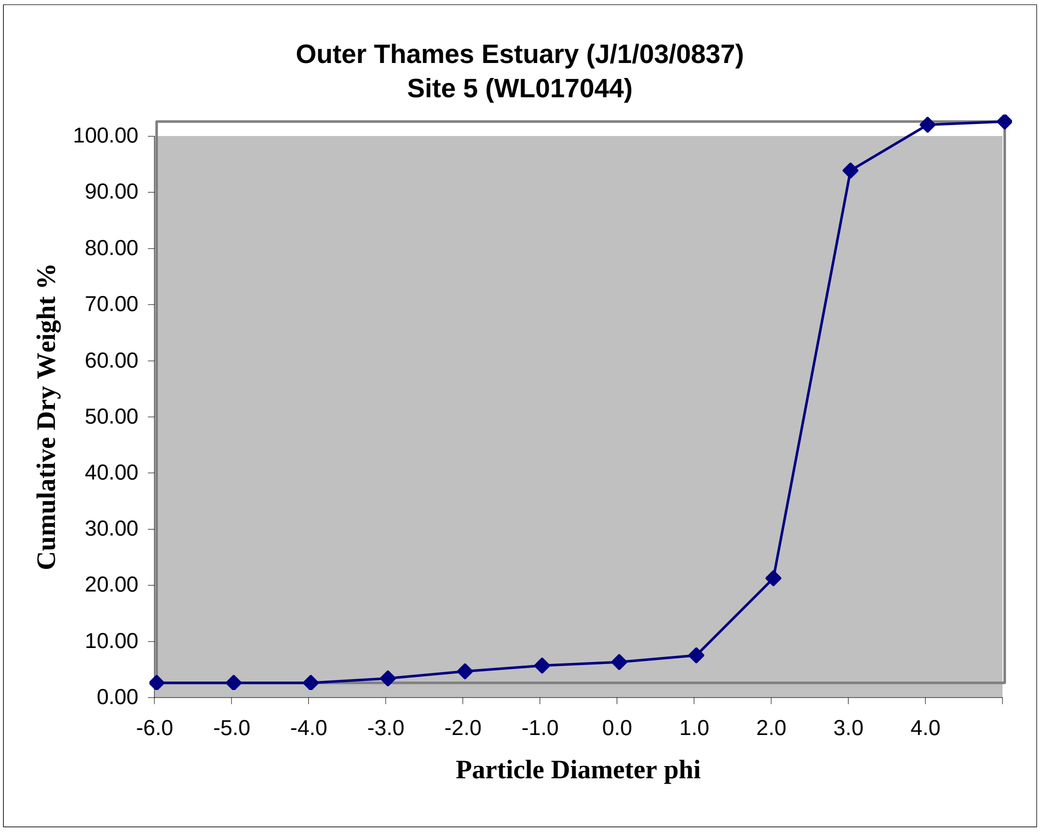
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.19
Md mm	0.19
Mean phi	2.38
Md phi	2.43
Sorting	0.57
Skq	-0.30
Kurtosis	1.16

%Gravel	2.06
% Sand	97.40
% Fines	0.54
% Org C	0.648

Sand


Outer Thames Estuary (J/1/03/0837)
Site 5 (WL017044)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 5 (WL017044)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 6 (WL017045)

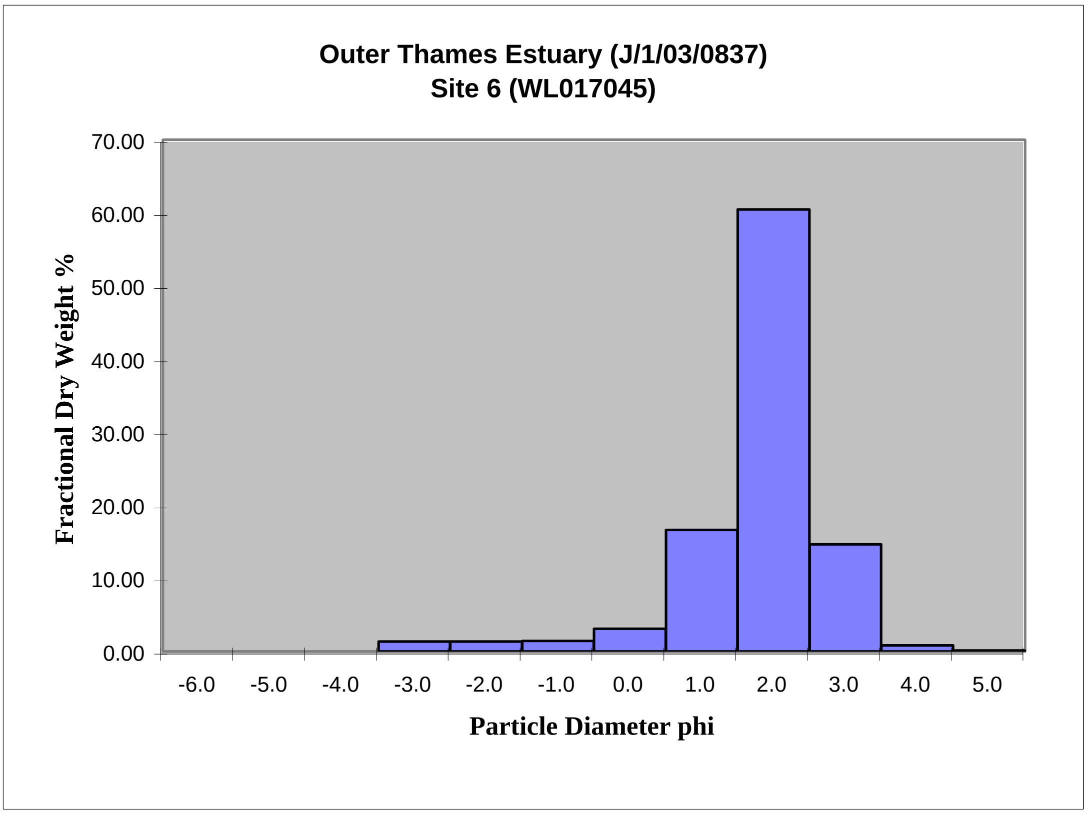
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	3.836	1.35	1.35
	4	-2.0	3.847	1.36	2.71
Coarse Sand	2	-1.0	4.127	1.45	4.16
	1	0.0	8.804	3.10	7.26
Medium Sand	0.5	1.0	47.204	16.63	23.89
	0.25	2.0	171.669	60.47	84.36
Fine Sand	0.125	3.0	41.657	14.67	99.03
	0.063	4.0	2.394	0.84	99.87
Silt/Clay	<0.063	5.0	0.360	0.13	100.00
		Total Weight	283.898	100.00	

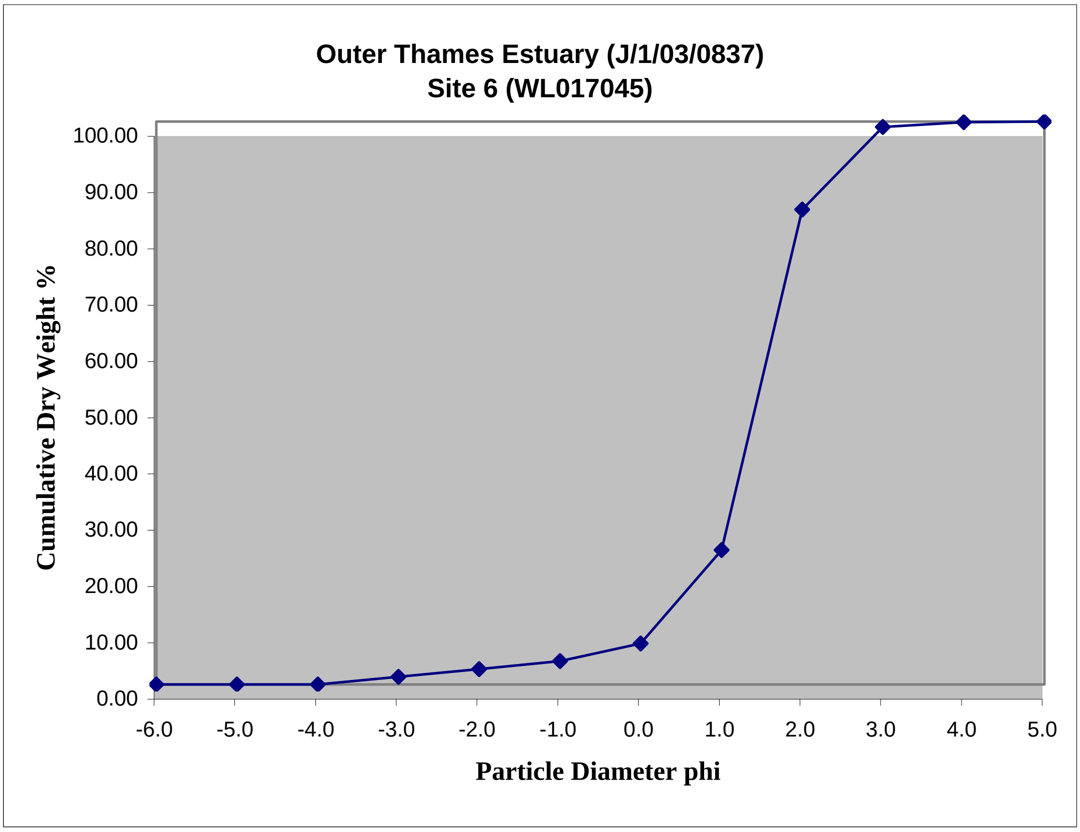
Mean mm	0.40
Md mm	0.37
Mean phi	1.32
Md phi	1.43
Sorting	0.89
Skq	-0.24
Kurtosis	1.71

%Gravel	2.71
% Sand	97.17
% Fines	0.13
% Org C	2.457

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 6 (WL017045)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 6 (WL017045)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 7 (WL017046)

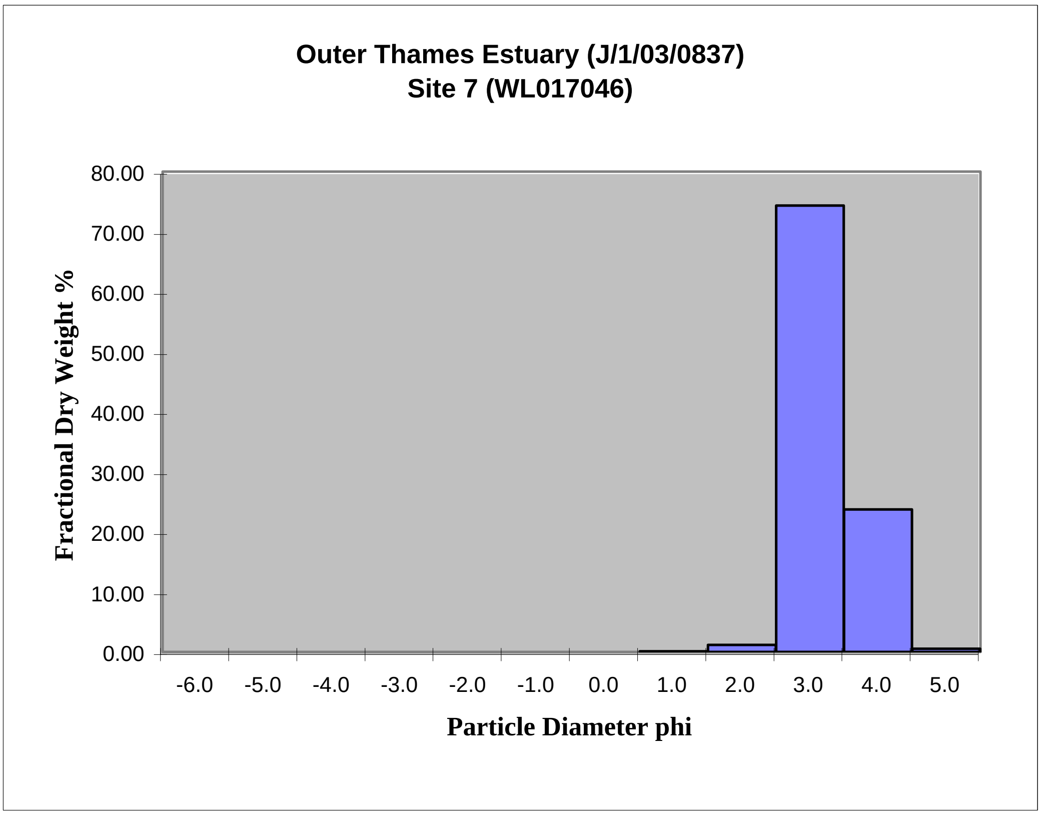
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.055	0.02	0.02
	1	0.0	0.065	0.02	0.04
Medium Sand	0.5	1.0	0.357	0.13	0.17
	0.25	2.0	3.260	1.19	1.37
Fine Sand	0.125	3.0	202.868	74.36	75.73
	0.063	4.0	64.779	23.75	99.48
Silt/Clay	<0.063	5.0	1.424	0.52	100.00
		Total Weight	272.808	100.00	

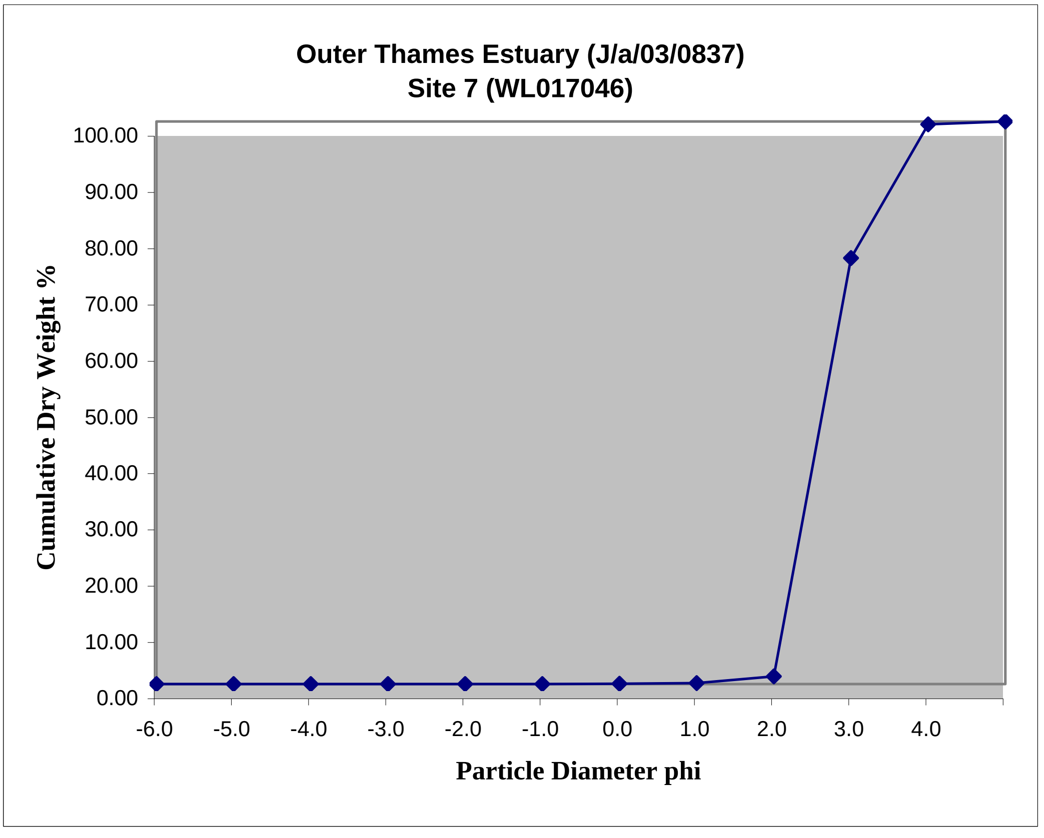
Mean mm	0.17
Md mm	0.16
Mean phi	2.58
Md phi	2.65
Sorting	0.28
Skq	-0.53
Kurtosis	0.42

%Gravel	0.00
% Sand	99.48
% Fines	0.52
% Org C	0.670

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 7 (WL017046)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/a/03/0837)
Site 7 (WL017046)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 8 (WL017047)

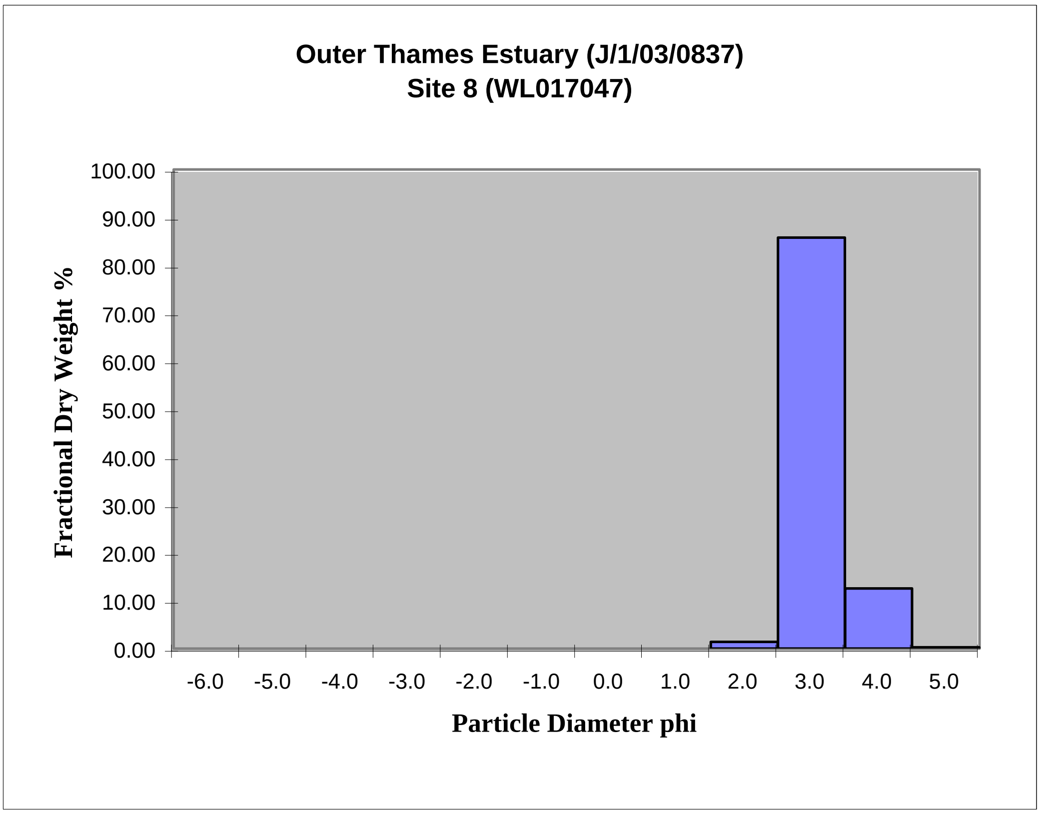
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.044	0.02	0.02
	0.25	2.0	3.420	1.39	1.40
Fine Sand	0.125	3.0	211.688	85.76	87.17
	0.063	4.0	31.031	12.57	99.74
Silt/Clay	<0.063	5.0	0.642	0.26	100.00
		Total Weight	246.825	100.00	

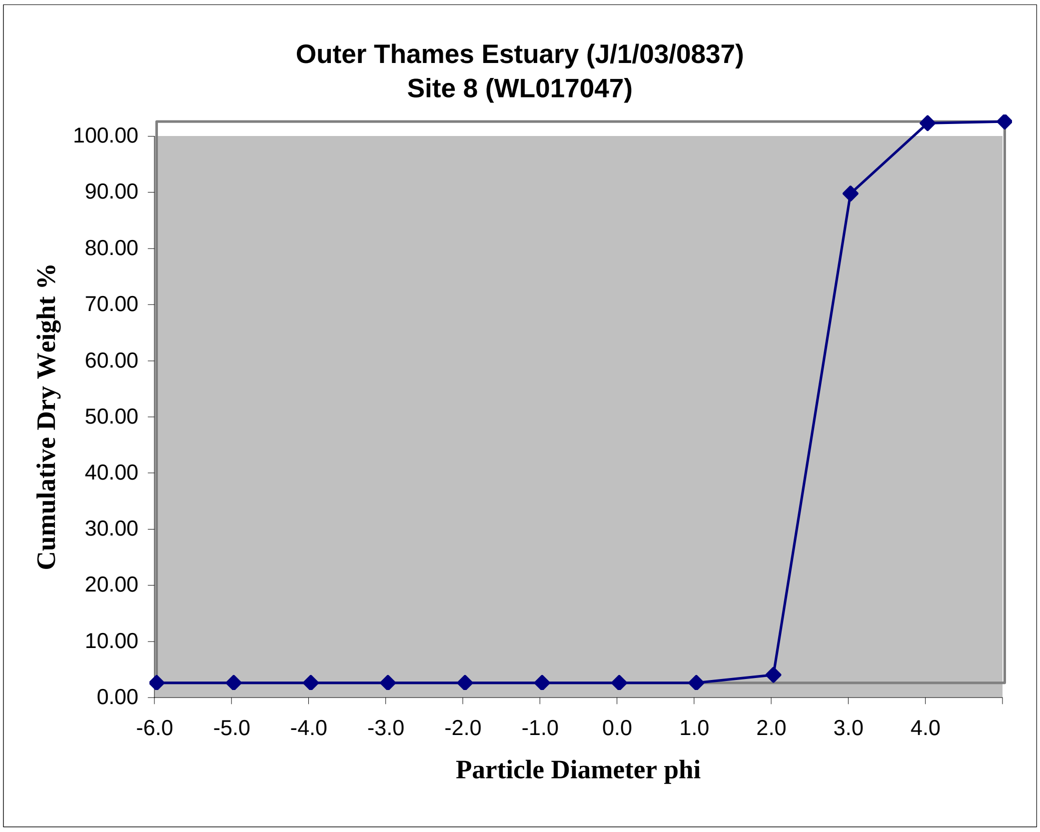
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.17
Mean phi	2.57
Md phi	2.57
Sorting	0.33
Skq	-0.10
Kurtosis	0.61

%Gravel	0.00
% Sand	99.74
% Fines	0.26
% Org C	0.629

Sand


Outer Thames Estuary (J/1/03/0837)
Site 8 (WL017047)
Fractional Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 8 (WL017047)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 9 (WL017048)

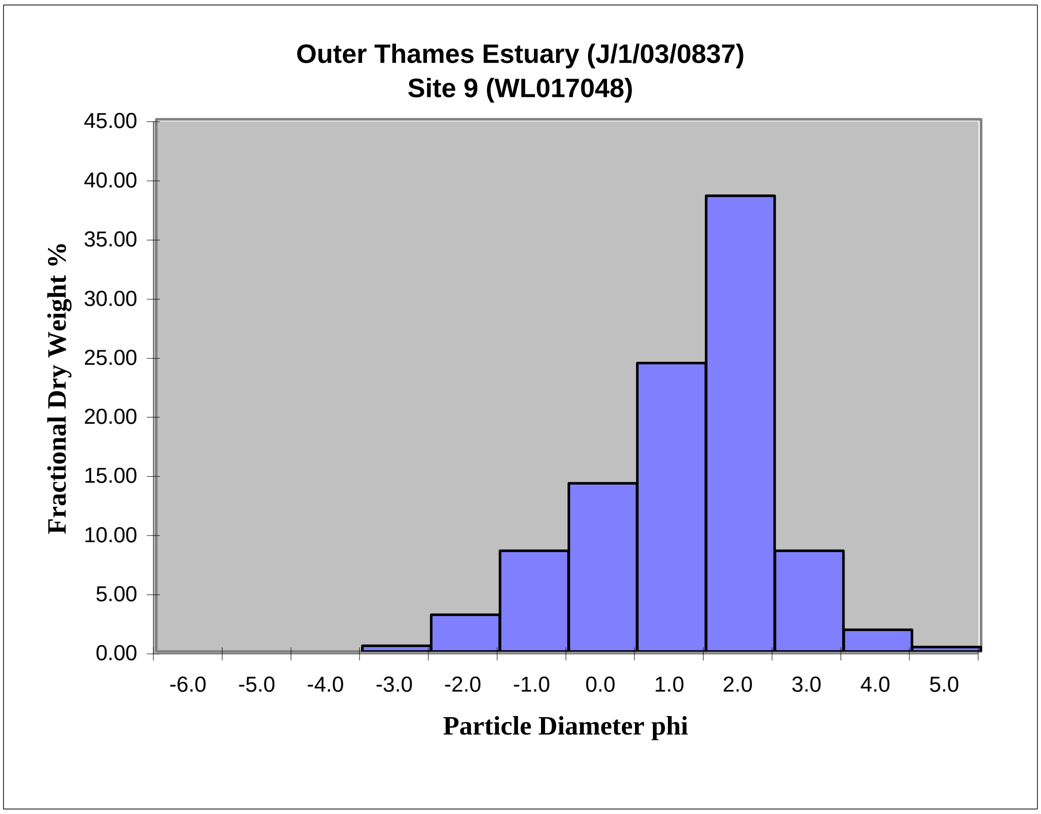
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	1.528	0.50	0.50
	4	-2.0	9.603	3.12	3.62
Coarse Sand	2	-1.0	26.221	8.53	12.15
	1	0.0	43.704	14.21	26.36
Medium Sand	0.5	1.0	74.987	24.38	50.74
	0.25	2.0	118.488	38.53	89.27
Fine Sand	0.125	3.0	26.163	8.51	97.78
	0.063	4.0	5.647	1.84	99.62
Silt/Clay	<0.063	5.0	1.177	0.38	100.00
		Total Weight	307.518	100.00	

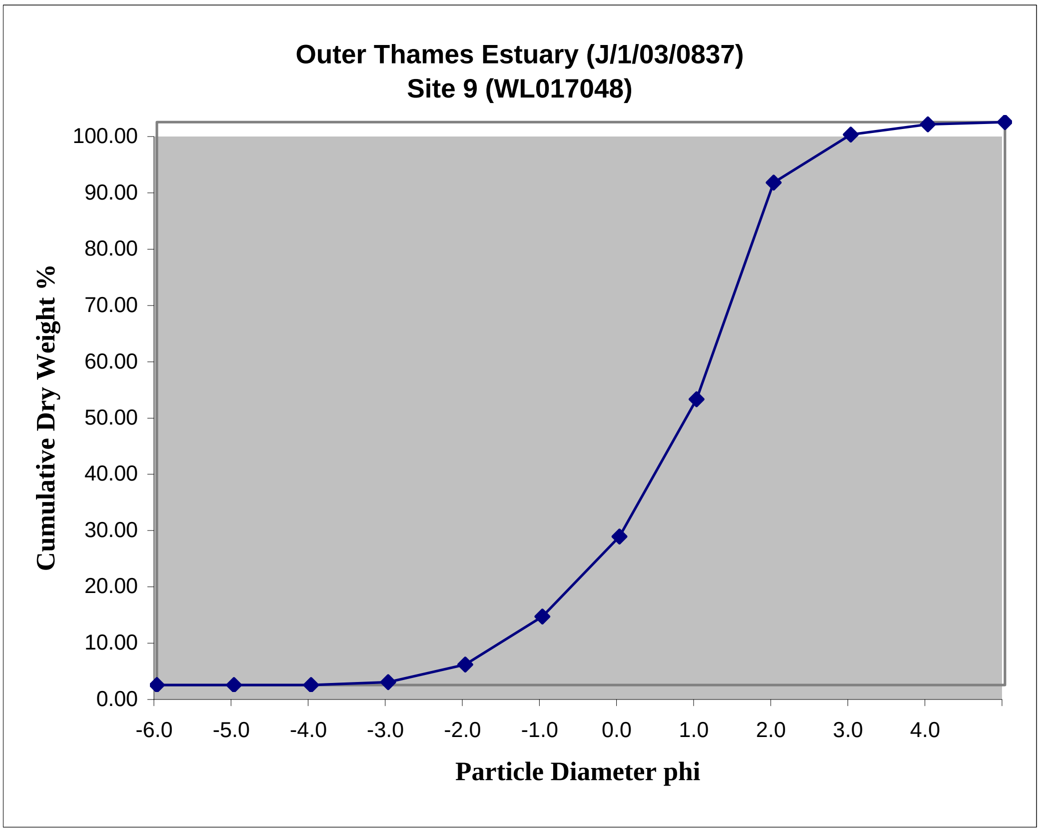
Mean mm	0.62
Md mm	0.51
Mean phi	0.70
Md phi	0.97
Sorting	1.33
Skq	-0.28
Kurtosis	1.07

%Gravel	3.62
% Sand	96.00
% Fines	0.38
% Org C	0.710

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 9 (WL017048)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 9 (WL017048)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 10 (WL017049)

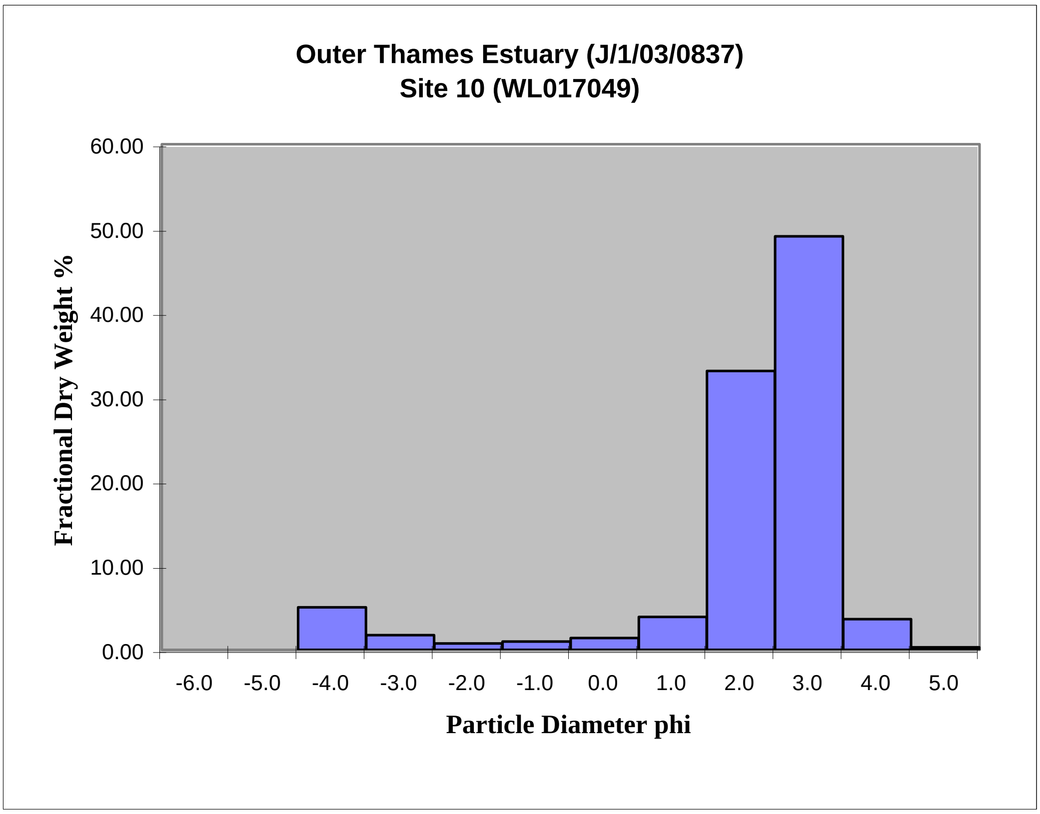
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	14.615	5.06	5.06
Gravel	8	-3.0	4.993	1.73	6.79
	4	-2.0	2.221	0.77	7.56
Coarse Sand	2	-1.0	2.903	1.01	8.57
	1	0.0	4.084	1.41	9.98
Medium Sand	0.5	1.0	11.320	3.92	13.90
	0.25	2.0	95.520	33.08	46.98
Fine Sand	0.125	3.0	141.685	49.07	96.05
	0.063	4.0	10.537	3.65	99.70
Silt/Clay	<0.063	5.0	0.855	0.30	100.00
		Total Weight	288.733	100.00	

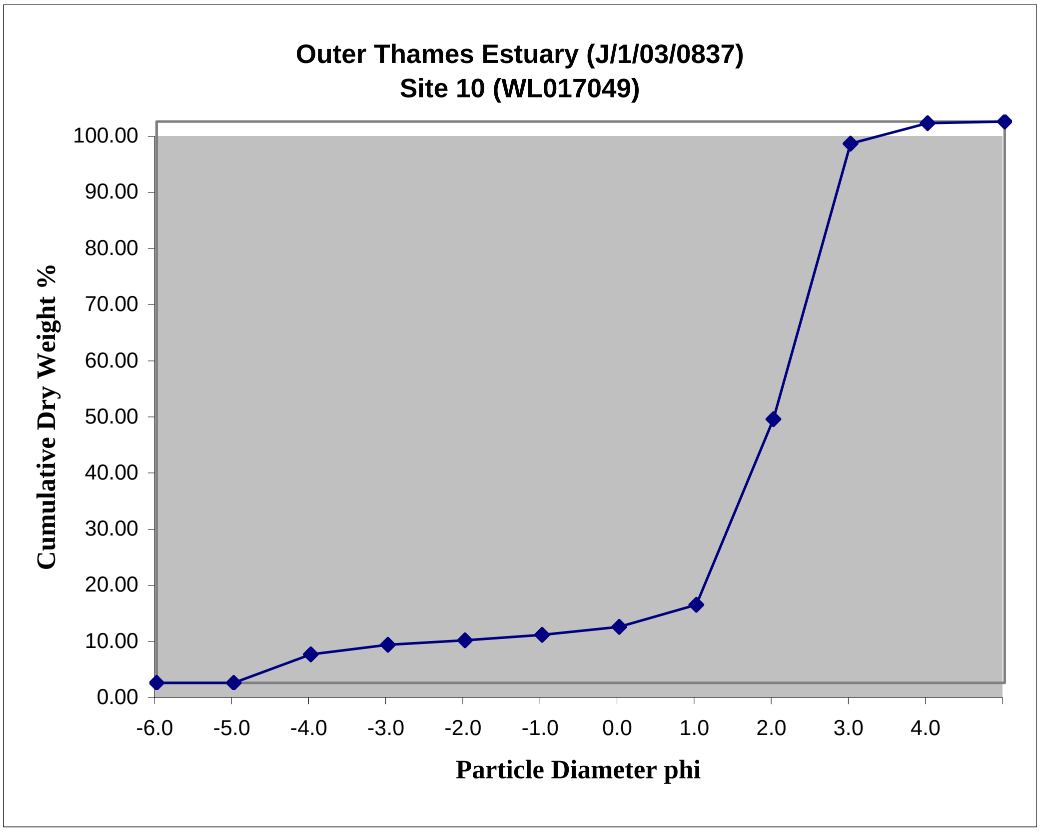
Mean mm	0.26
Md mm	0.24
Mean phi	1.96
Md phi	2.06
Sorting	1.48
Skq	-0.46
Kurtosis	2.32

%Gravel	7.56
% Sand	92.14
% Fines	0.30
% Org C	0.984

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 10 (WL017049)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 10 (WL017049)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 11 (WL017050)

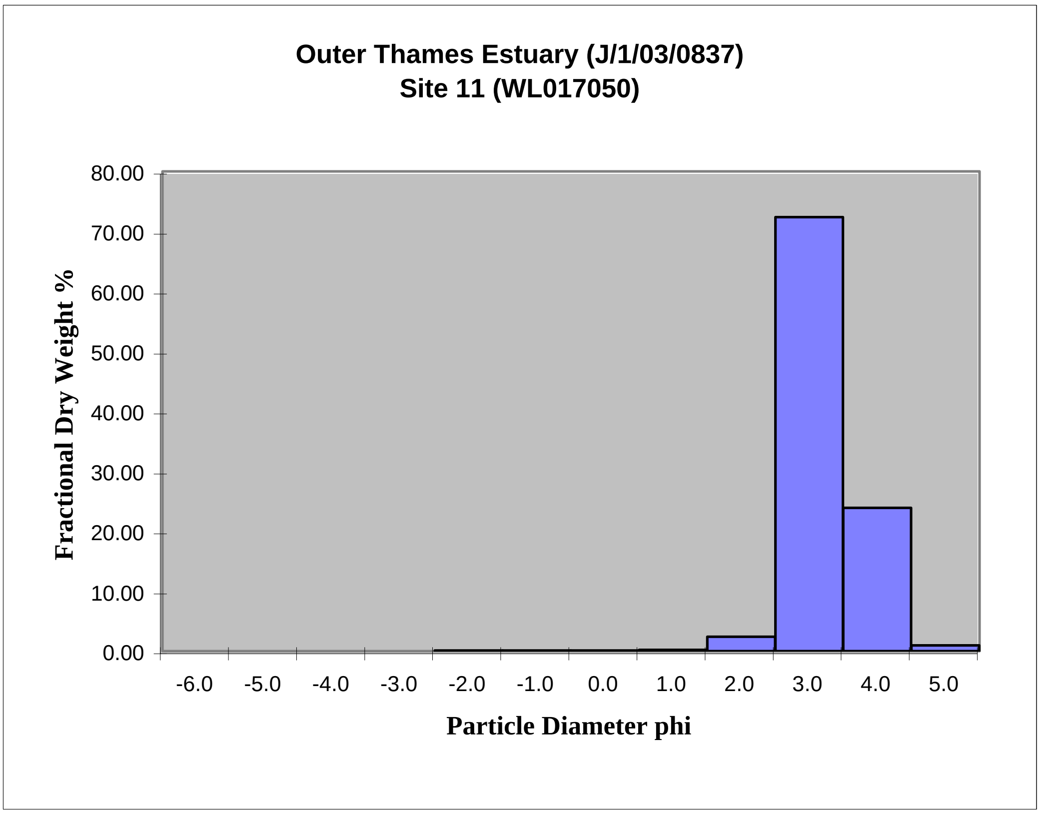
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.075	0.03	0.03
Coarse Sand	2	-1.0	0.157	0.06	0.09
	1	0.0	0.251	0.10	0.19
Medium Sand	0.5	1.0	0.473	0.19	0.38
	0.25	2.0	6.051	2.43	2.81
Fine Sand	0.125	3.0	180.511	72.38	75.19
	0.063	4.0	59.538	23.87	99.06
Silt/Clay	<0.063	5.0	2.347	0.94	100.00
		Total Weight	249.403	100.00	

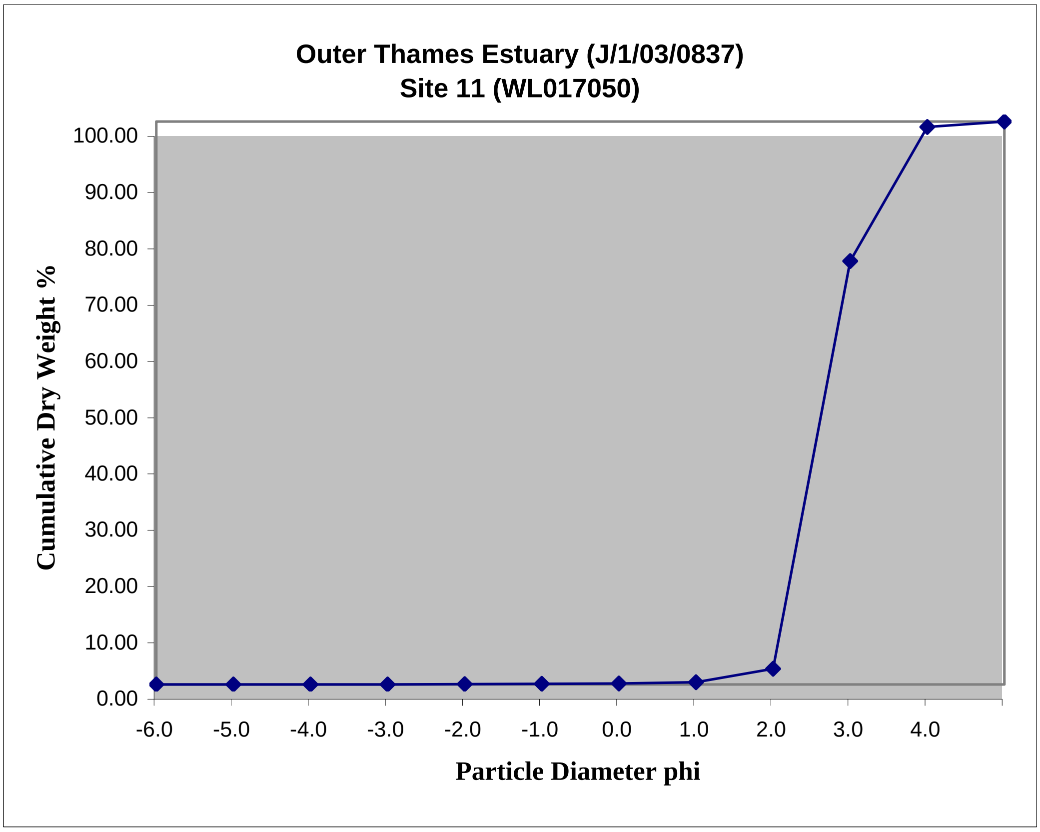
Mean mm	0.17
Md mm	0.16
Mean phi	2.57
Md phi	2.65
Sorting	0.28
Skq	-0.55
Kurtosis	0.42

%Gravel	0.03
% Sand	99.03
% Fines	0.94
% Org C	0.579

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 11 (WL017050)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 11 (WL017050)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 12 (WL017051)

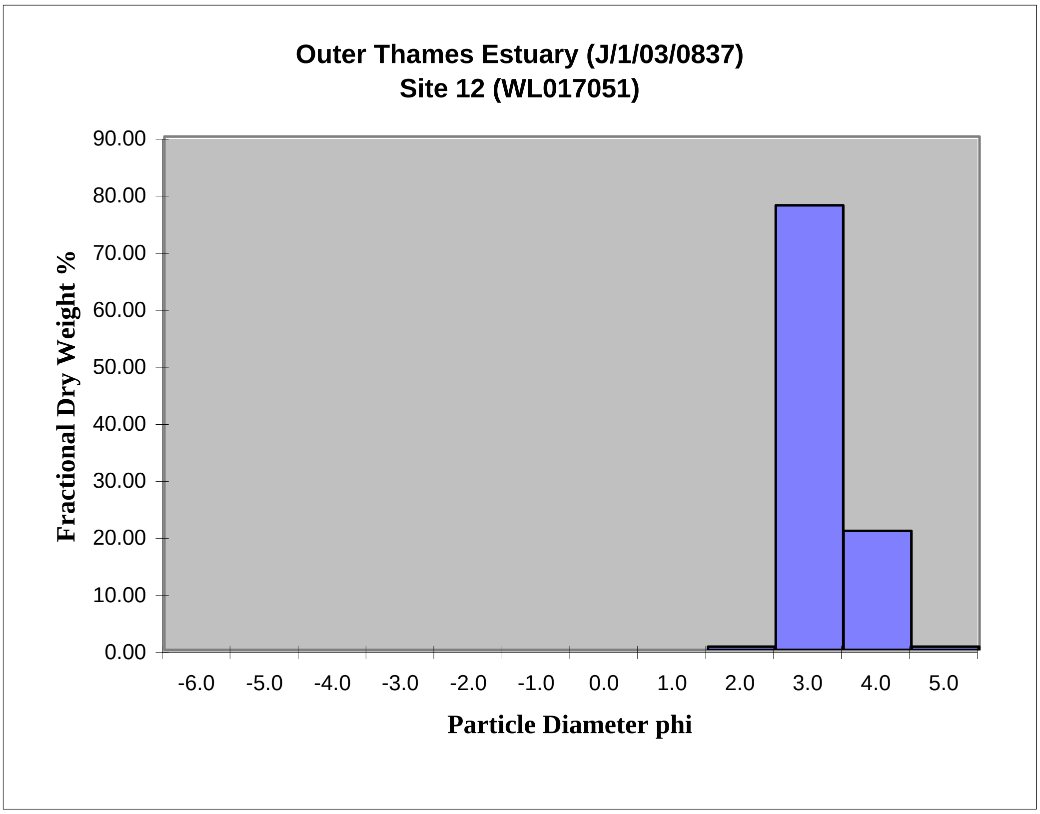
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.026	0.01	0.01
	1	0.0	0.011	0.00	0.01
Medium Sand	0.5	1.0	0.043	0.02	0.03
	0.25	2.0	1.527	0.56	0.59
Fine Sand	0.125	3.0	214.048	77.95	78.53
	0.063	4.0	57.352	20.89	99.42
Silt/Clay	<0.063	5.0	1.595	0.58	100.00
		Total Weight	274.602	100.00	

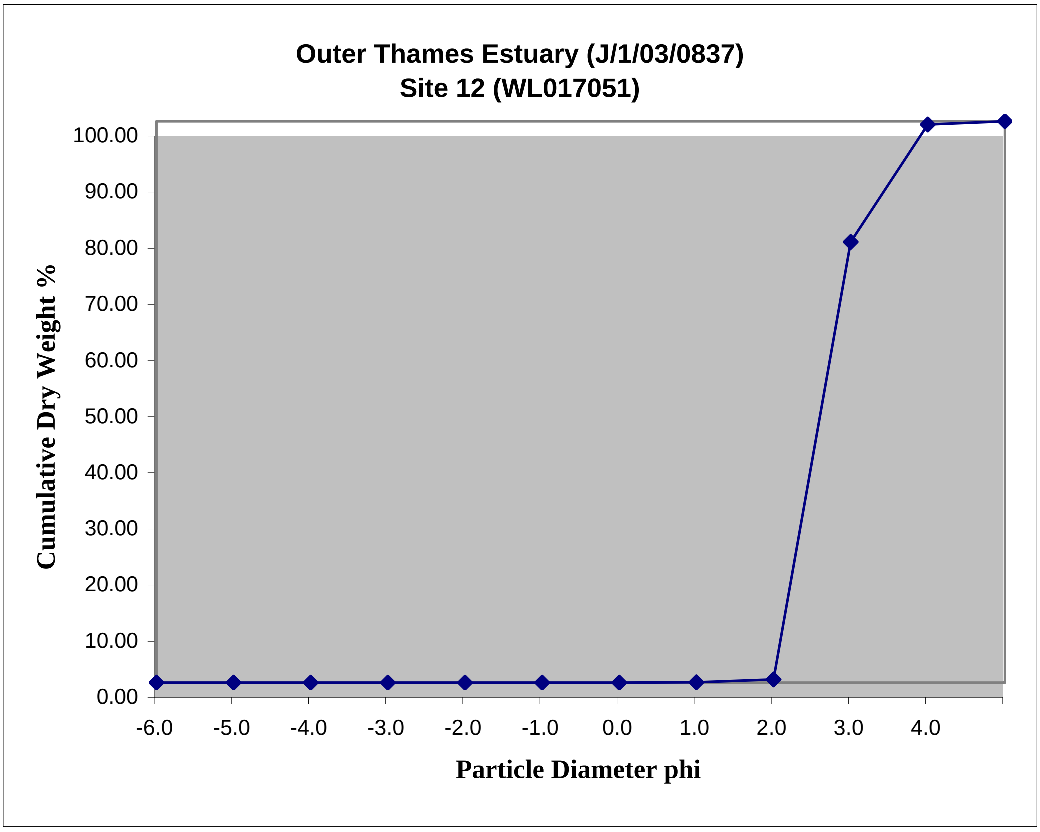
Mean mm	0.17
Md mm	0.16
Mean phi	2.59
Md phi	2.63
Sorting	0.29
Skq	-0.38
Kurtosis	0.47

%Gravel	0.00
% Sand	99.42
% Fines	0.58
% Org C	0.487

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 12 (WL017051)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 12 (WL017051)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 13 (WL017052)

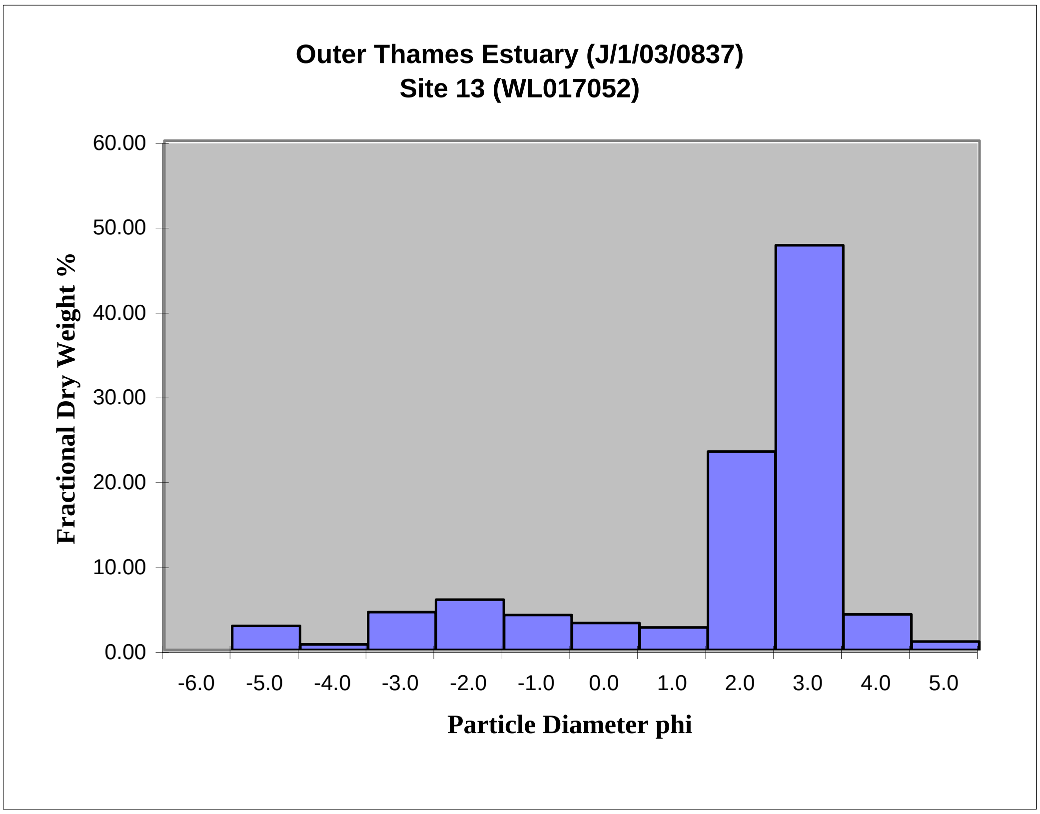
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	7.661	2.84	2.84
	16	-4.0	1.743	0.65	3.49
Gravel	8	-3.0	12.045	4.47	7.95
	4	-2.0	15.935	5.91	13.86
Coarse Sand	2	-1.0	11.052	4.10	17.96
	1	0.0	8.525	3.16	21.12
Medium Sand	0.5	1.0	7.119	2.64	23.76
	0.25	2.0	63.068	23.38	47.14
Fine Sand	0.125	3.0	128.626	47.69	94.82
	0.063	4.0	11.303	4.19	99.01
Silt/Clay	<0.063	5.0	2.663	0.99	100.00
		Total Weight	269.74	100.00	

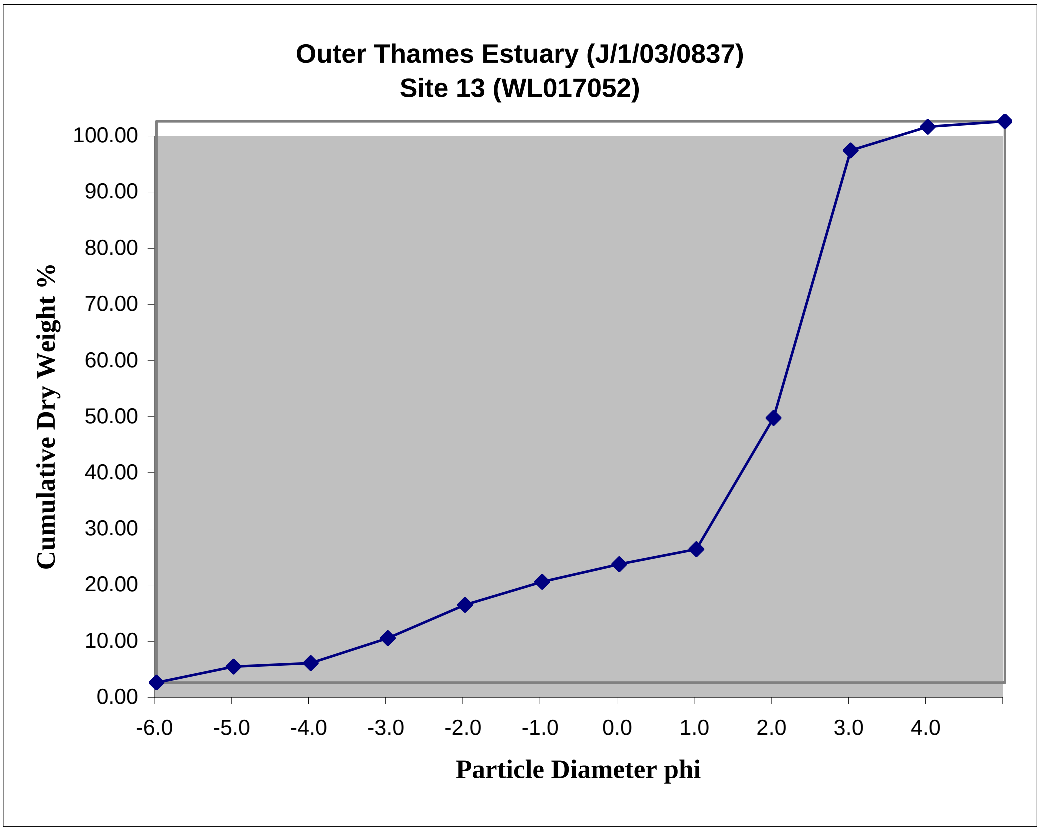
Mean mm	0.46
Md mm	0.24
Mean phi	1.12
Md phi	2.06
Sorting	2.07
Skq	-0.69
Kurtosis	1.78

%Gravel	13.86
% Sand	85.15
% Fines	0.99
% Org C	1.503

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 13 (WL017052)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 13 (WL017052)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 14 (WL017053)

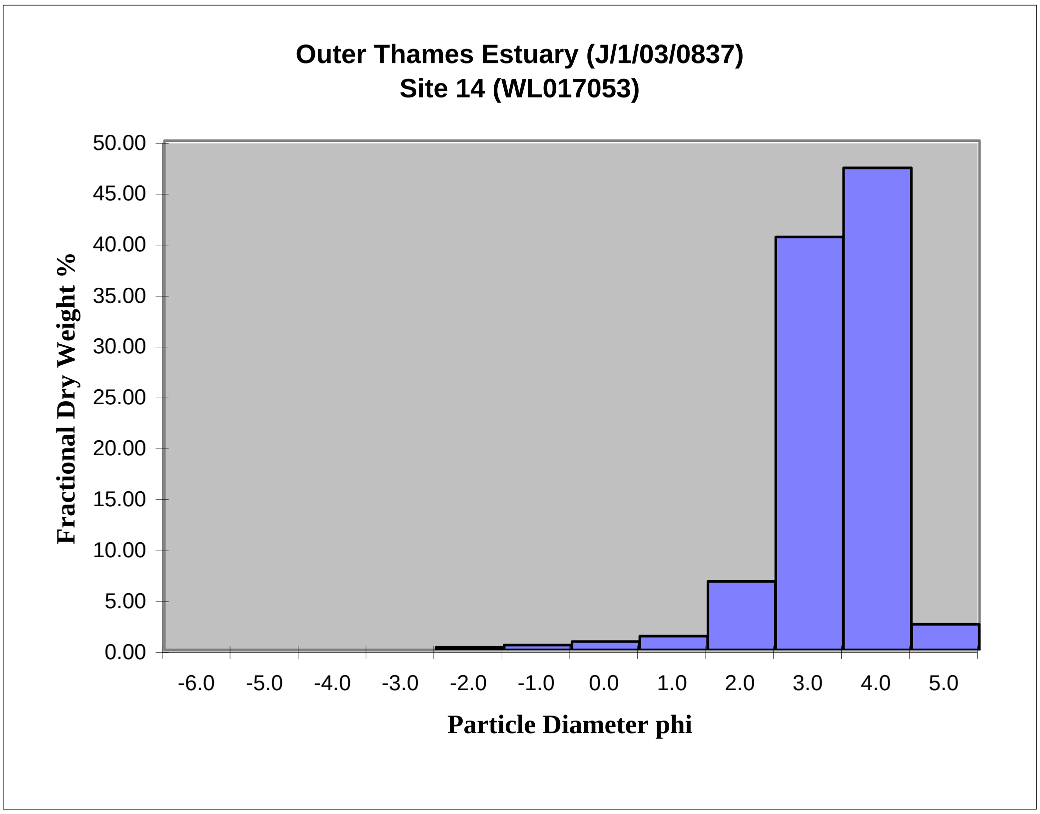
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.663	0.26	0.26
Coarse Sand	2	-1.0	1.180	0.47	0.73
	1	0.0	2.039	0.81	1.54
Medium Sand	0.5	1.0	3.383	1.34	2.89
	0.25	2.0	16.895	6.71	9.60
Fine Sand	0.125	3.0	102.094	40.55	50.15
	0.063	4.0	119.206	47.35	97.49
Silt/Clay	<0.063	5.0	6.317	2.51	100.00
		Total Weight	251.777	100.00	

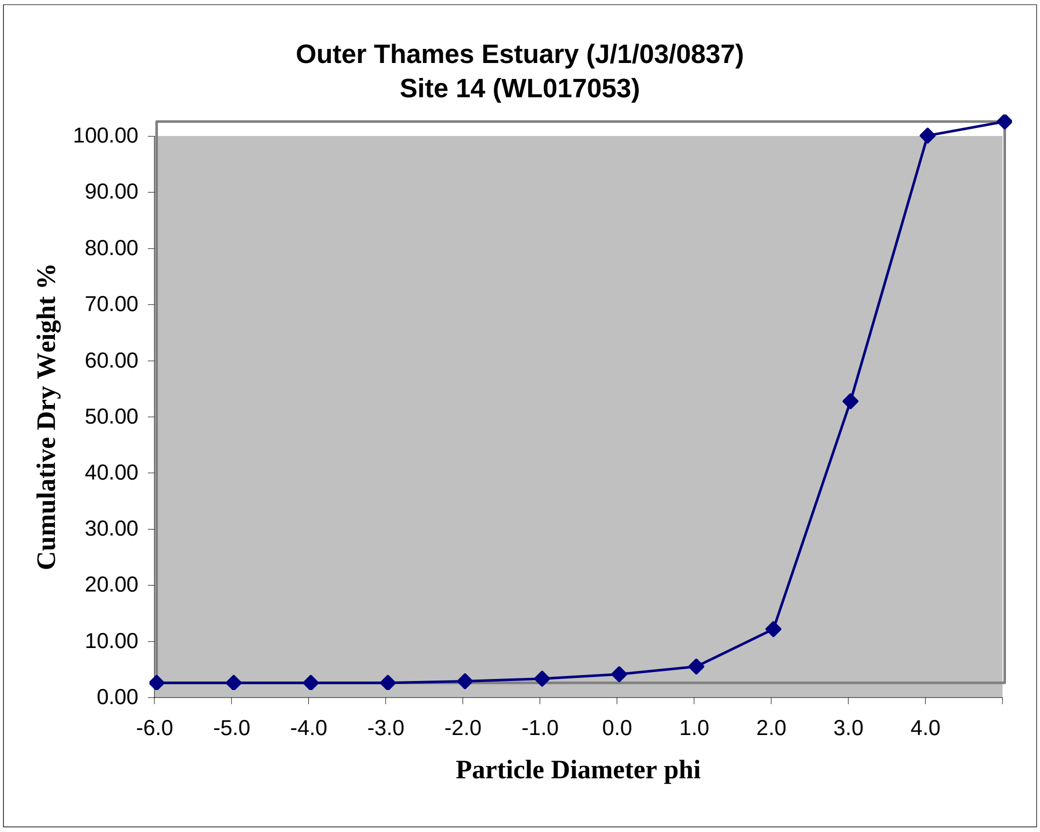
Mean mm	0.18
Md mm	0.13
Mean phi	2.49
Md phi	3.00
Sorting	0.16
Skq	-6.15
Kurtosis	2.60

%Gravel	0.26
% Sand	97.23
% Fines	2.51
% Org C	0.762

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 14 (WL017053)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 14 (WL017053)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 15 (WL017054)

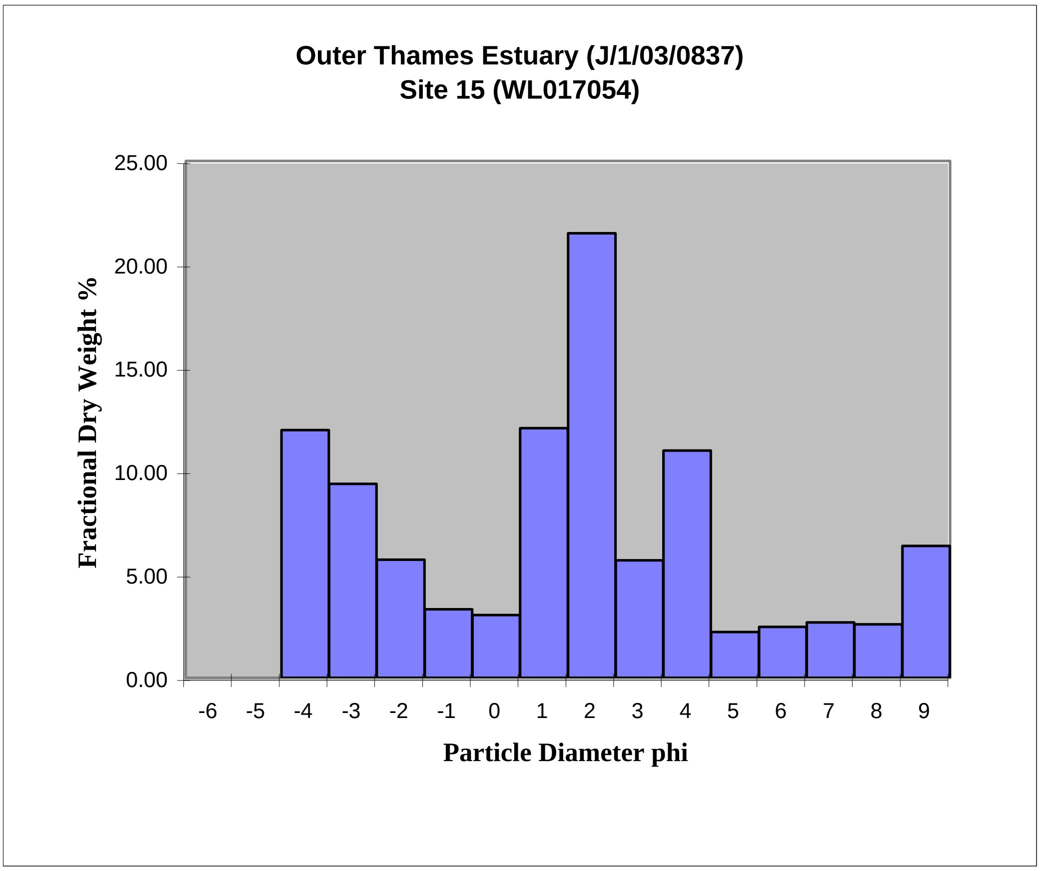
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	36.643	11.99	11.99
Gravel	8	-3.0	28.655	9.37	21.36
	4	-2.0	17.444	5.71	27.07
Coarse Sand	2	-1.0	10.120	3.31	30.38
	1	0.0	9.294	3.04	33.42
Medium Sand	0.5	1.0	36.924	12.08	45.50
	0.25	2.0	65.731	21.50	67.00
Fine Sand	0.125	3.0	17.383	5.69	72.69
	0.063	4.0	33.579	10.98	83.67
Silt	0.032	5.0	6.776	2.22	85.89
	0.0156	6.0	7.535	2.47	88.35
	0.0078	7.0	8.185	2.68	91.03
	0.0039	8.0	7.902	2.59	93.62
Clay	<0.0039	9.0	19.512	6.38	100.00
		Total Weight	306	100	

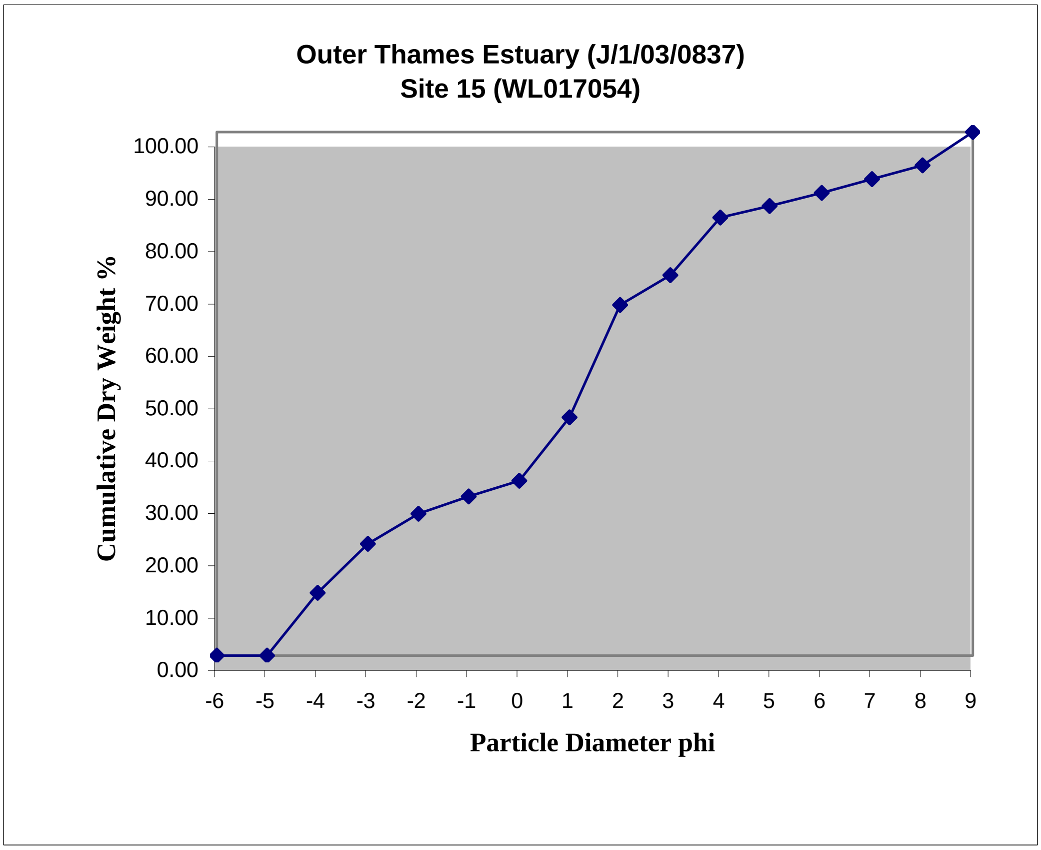
Mean mm	0.66
Md mm	0.43
Mean phi	0.59
Md phi	1.21
Sorting	3.83
Skq	-0.08
Kurtosis	0.92

%Gravel	27.07
% Sand	56.60
% Fines	16.33
% Org C	1.380

Silty gravelly sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 15 (WL017054)
Fractional Dry Weight %
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 15 (WL017054)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 16 (WL017055)

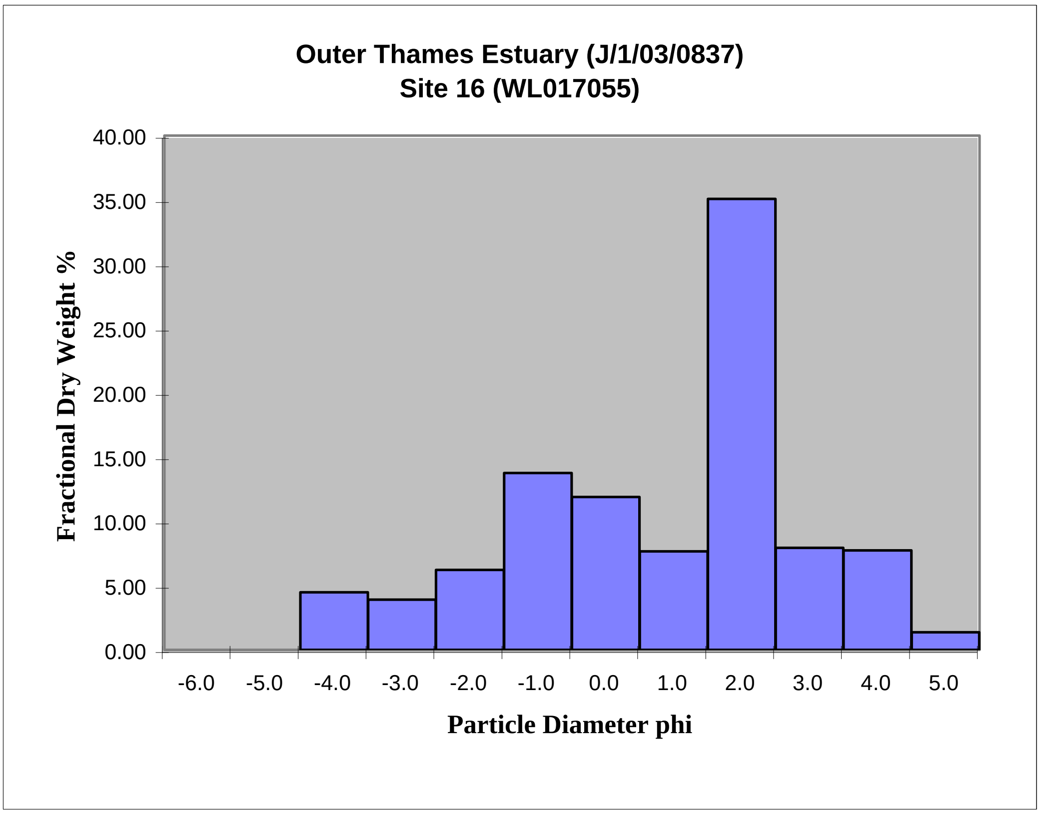
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	17.424	4.48	4.48
Gravel	8	-3.0	15.156	3.90	8.37
	4	-2.0	24.236	6.23	14.60
Coarse Sand	2	-1.0	53.492	13.75	28.35
	1	0.0	46.269	11.89	40.24
Medium Sand	0.5	1.0	29.786	7.66	47.90
	0.25	2.0	136.458	35.07	82.97
Fine Sand	0.125	3.0	30.857	7.93	90.90
	0.063	4.0	30.082	7.73	98.63
Silt/Clay	<0.063	5.0	5.312	1.37	100.00
		Total Weight	389.072	100.00	

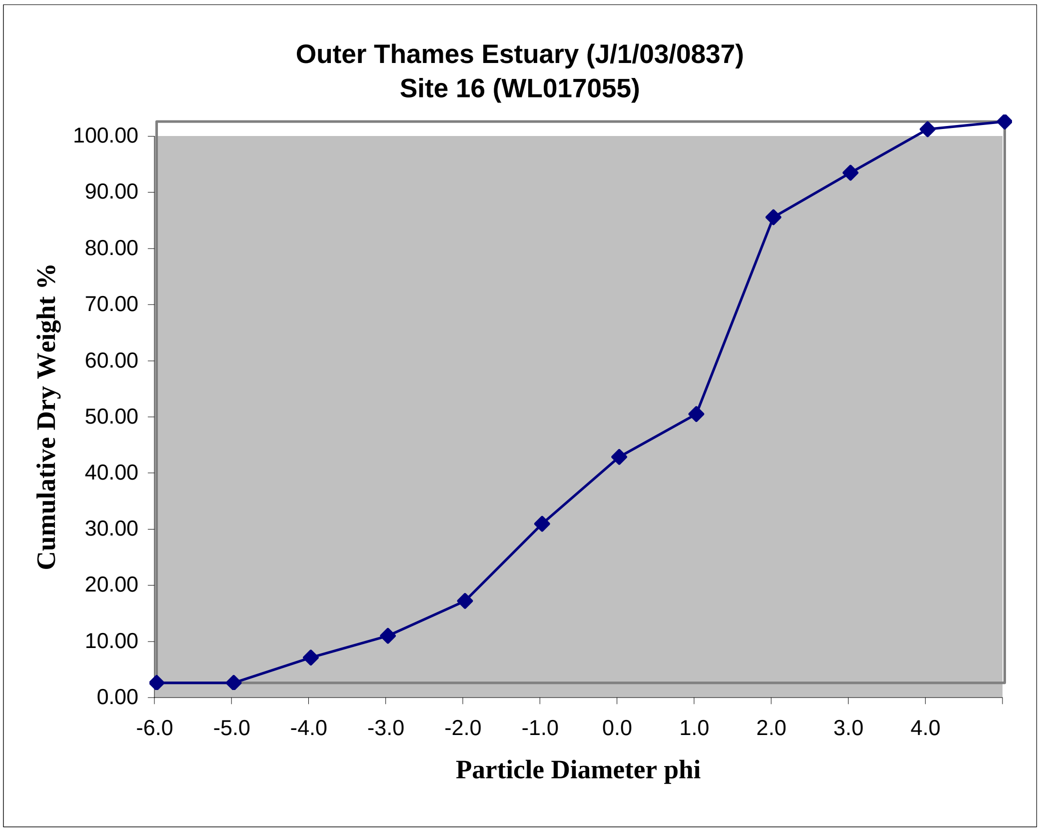
Mean mm	0.74
Md mm	0.48
Mean phi	0.43
Md phi	1.06
Sorting	2.04
Skq	-0.46
Kurtosis	0.93

%Gravel	14.60
% Sand	84.03
% Fines	1.37
% Org C	1.142

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 16 (WL017055)
Fractional Dry Weight %
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 16 (WL017055)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 18 H (WL017057)

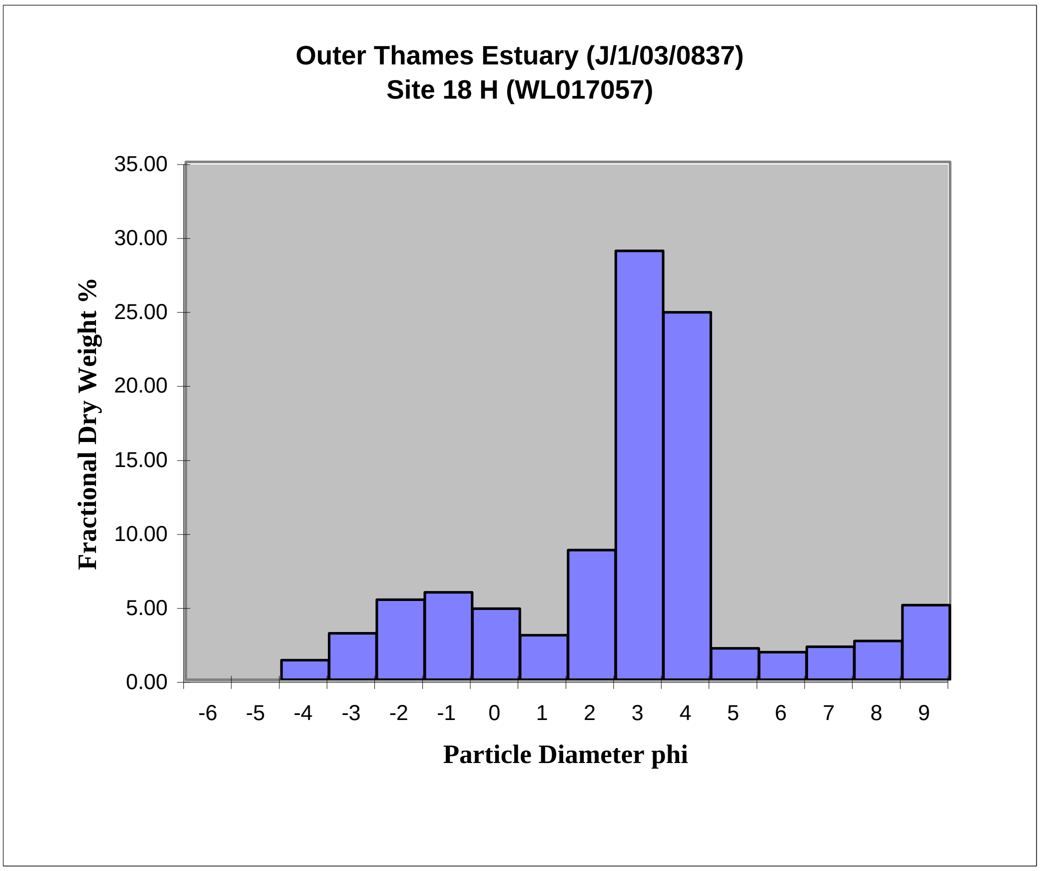
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	3.370	1.32	1.32
Gravel	8	-3.0	8.047	3.14	4.46
	4	-2.0	13.820	5.40	9.86
Coarse Sand	2	-1.0	15.096	5.90	15.76
	1	0.0	12.310	4.81	20.57
Medium Sand	0.5	1.0	7.671	3.00	23.57
	0.25	2.0	22.419	8.76	32.33
Fine Sand	0.125	3.0	74.195	28.99	61.32
	0.063	4.0	63.558	24.84	86.16
Silt	0.032	5.0	5.420	2.12	88.27
	0.0156	6.0	4.767	1.86	90.14
	0.0078	7.0	5.686	2.22	92.36
	0.0039	8.0	6.673	2.61	94.97
Clay	<0.0039	9.0	12.880	5.03	100.00
		Total Weight	256	100	

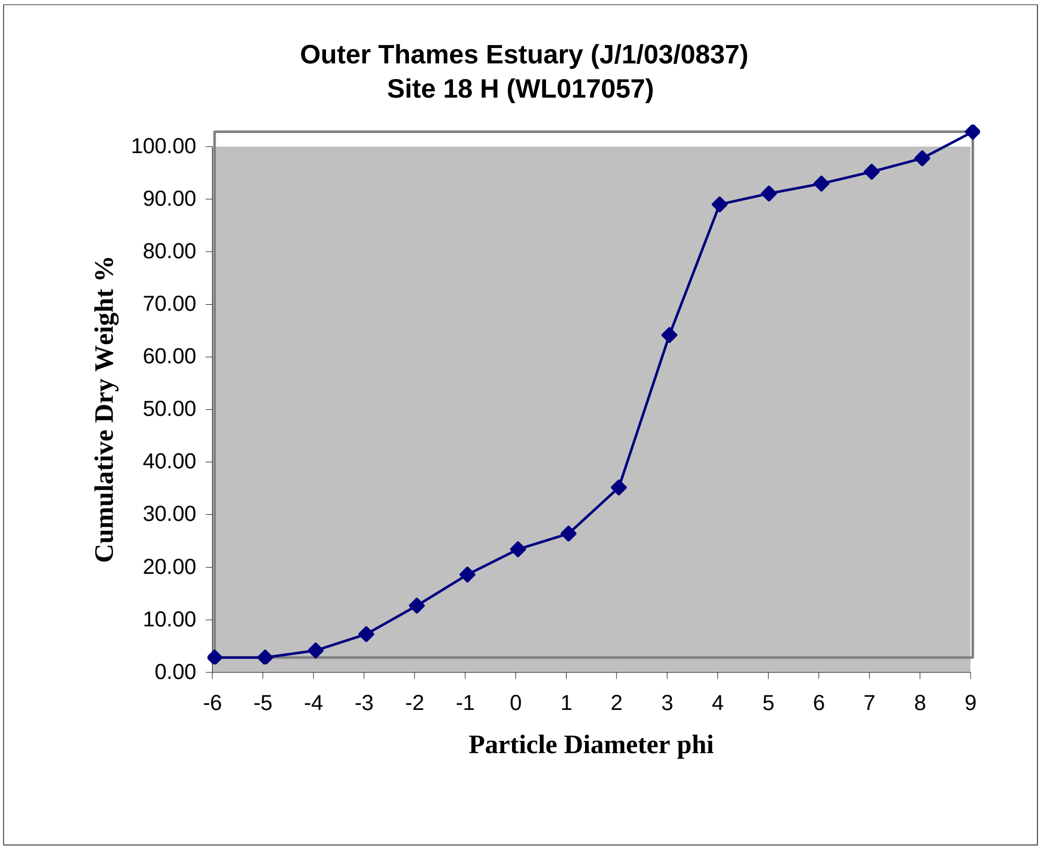
Mean mm	0.28
Md mm	0.16
Mean phi	1.85
Md phi	2.61
Sorting	2.87
Skq	-0.24
Kurtosis	1.88

%Gravel	9.86
% Sand	76.30
% Fines	13.84
% Org C	1.379

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 18 H (WL017057)
Fractional Dry Weight %
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 18 H (WL017057)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 19 (WL017058)

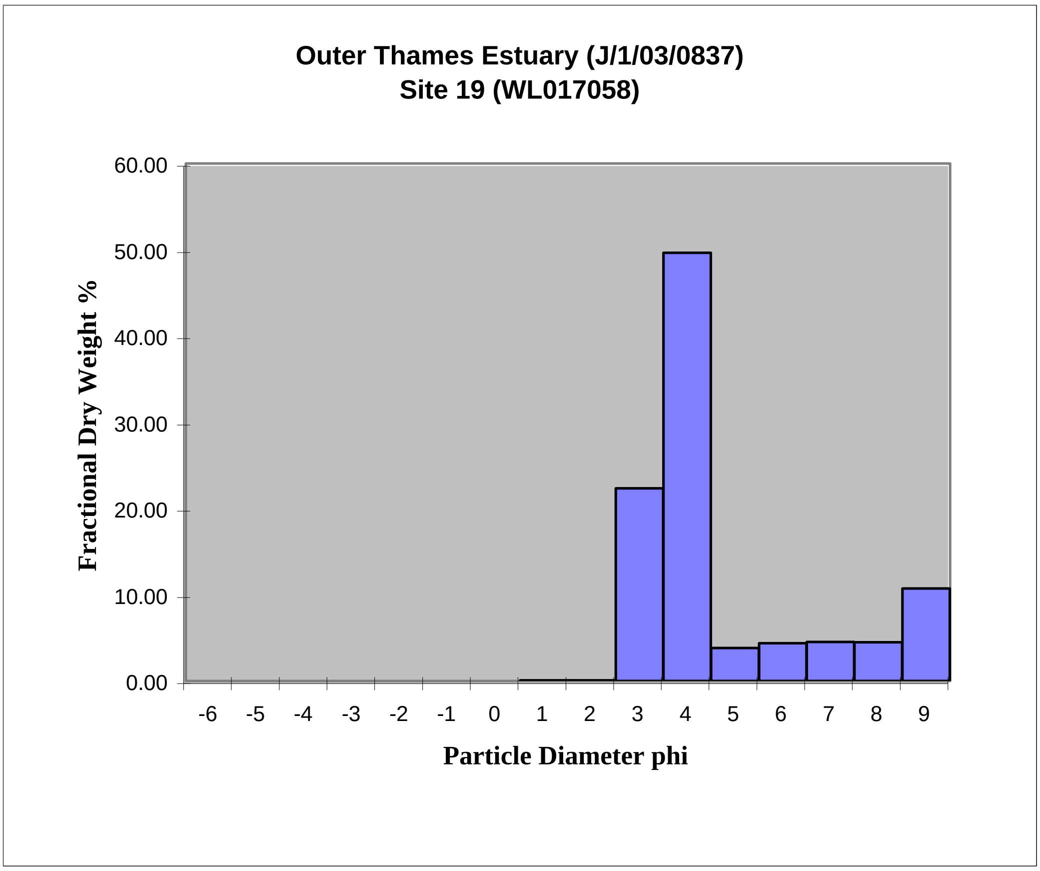
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.005	0.00	0.00
	1	0.0	0.001	0.00	0.01
Medium Sand	0.5	1.0	0.022	0.02	0.02
	0.25	2.0	0.084	0.07	0.10
Fine Sand	0.125	3.0	25.927	22.35	22.45
	0.063	4.0	57.613	49.66	72.11
Silt	0.032	5.0	4.416	3.81	75.91
	0.0156	6.0	5.076	4.38	80.29
	0.0078	7.0	5.232	4.51	84.80
	0.0039	8.0	5.205	4.49	89.29
Clay	<0.0039	9.0	12.428	10.71	100.00
		Total Weight	116	100	

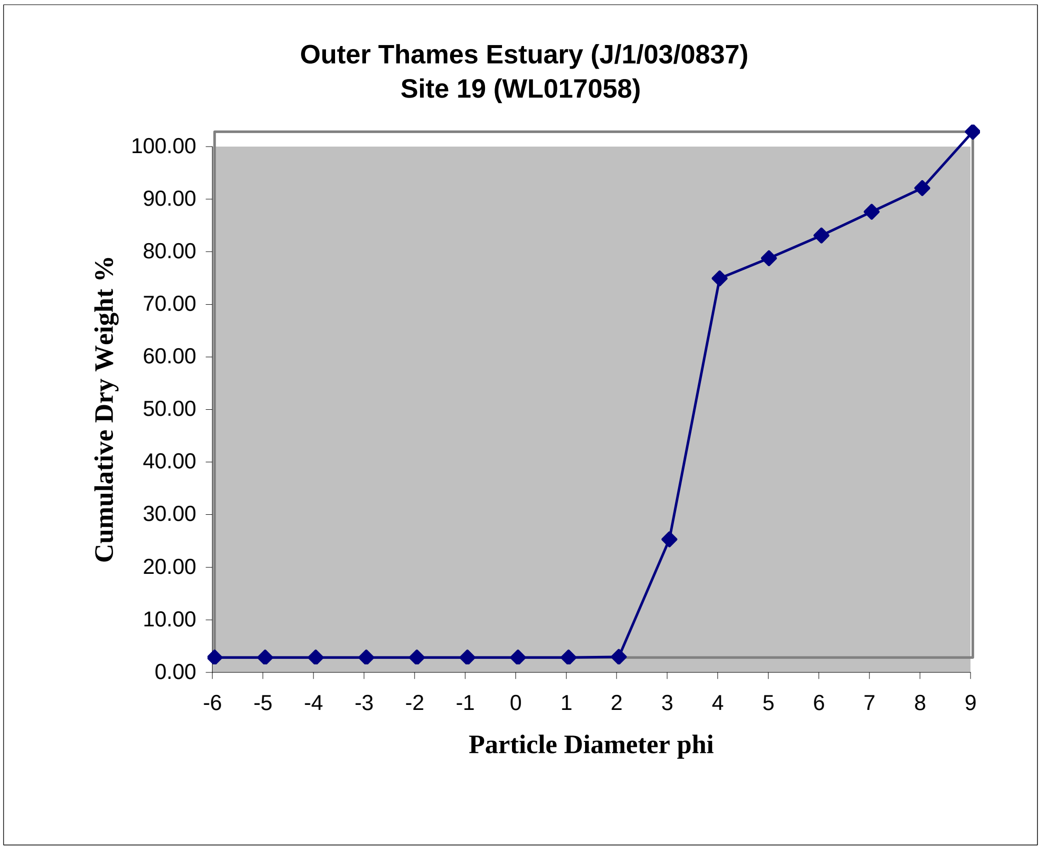
Mean mm	0.05
Md mm	0.09
Mean phi	4.36
Md phi	3.55
Sorting	1.89
Skq	0.56
Kurtosis	1.40

%Gravel	0.00
% Sand	72.11
% Fines	27.89
% Org C	1.670

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 19 (WL017058)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 19 (WL017058)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 21 (WL017060)

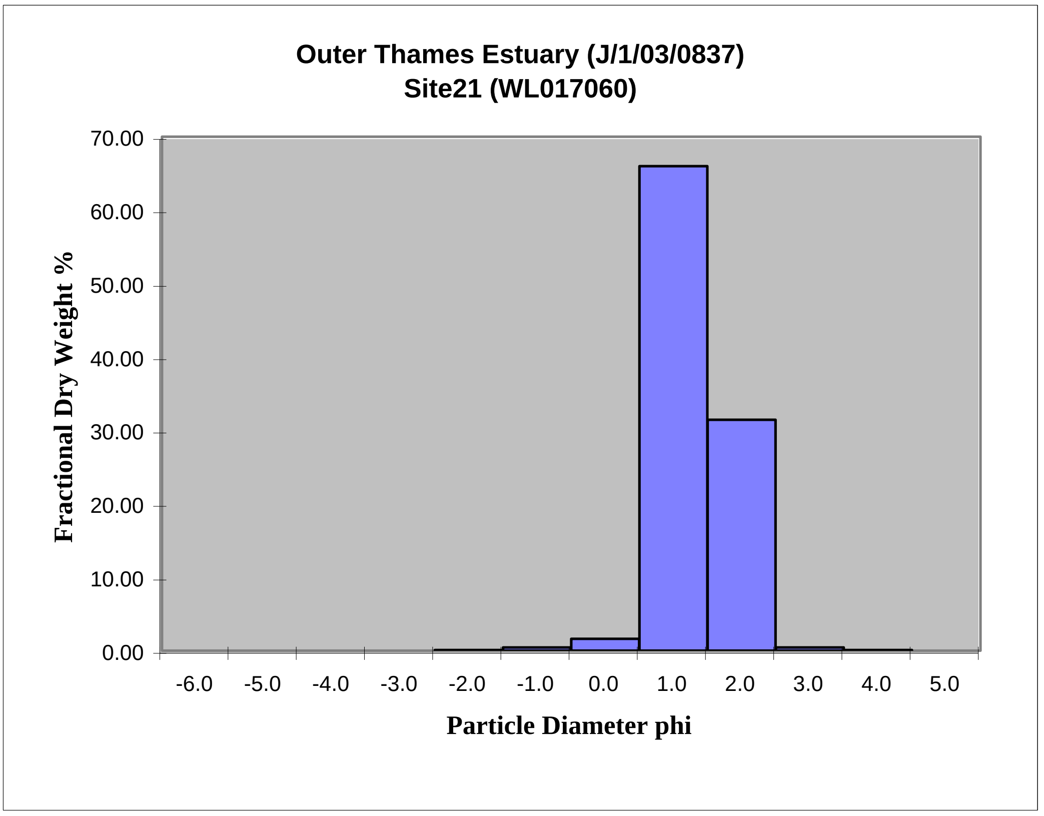
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.245	0.09	0.09
Coarse Sand	2	-1.0	1.235	0.43	0.52
	1	0.0	4.554	1.60	2.12
Medium Sand	0.5	1.0	188.205	66.01	68.12
	0.25	2.0	89.620	31.43	99.55
Fine Sand	0.125	3.0	1.201	0.42	99.97
	0.063	4.0	0.074	0.03	100.00
Silt/Clay	<0.063	5.0	0.000	0.00	100.00
		Total Weight	285.134	100.00	

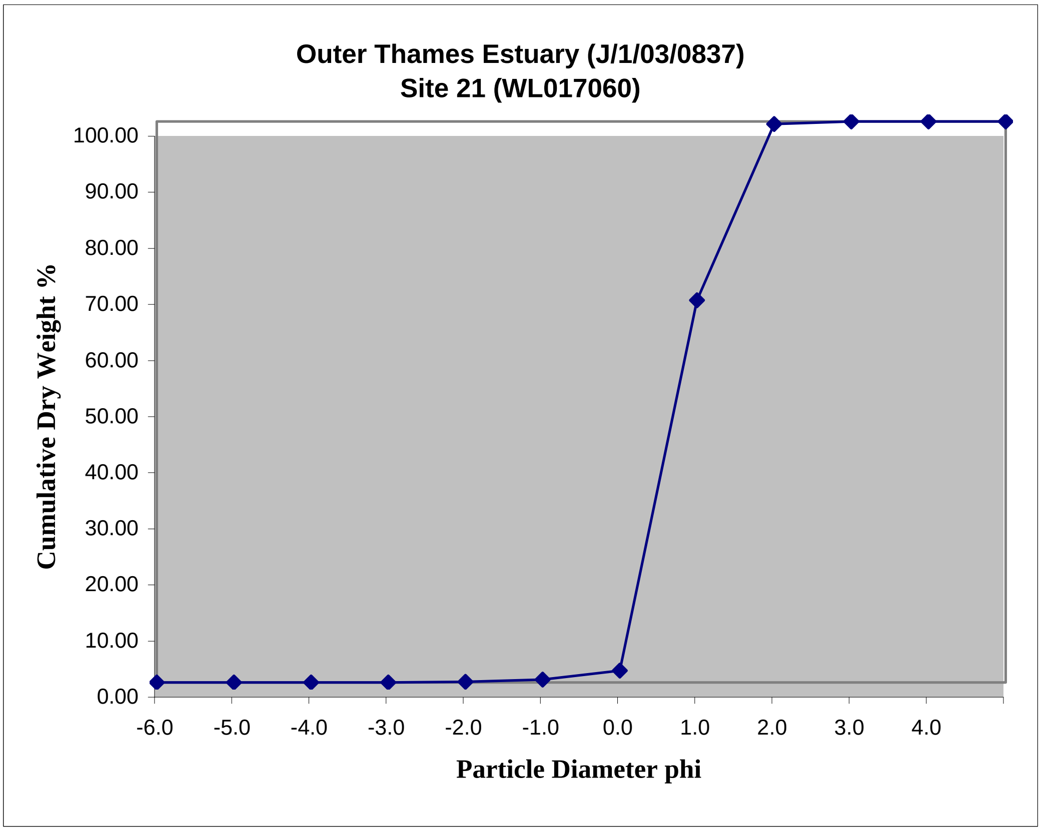
Mean mm	0.57
Md mm	0.60
Mean phi	0.81
Md phi	0.73
Sorting	0.60
Skq	0.23
Kurtosis	0.85

%Gravel	0.09
% Sand	99.91
% Fines	0.00
% Org C	0.521

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site21 (WL017060)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 21 (WL017060)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 22 (WL017061)

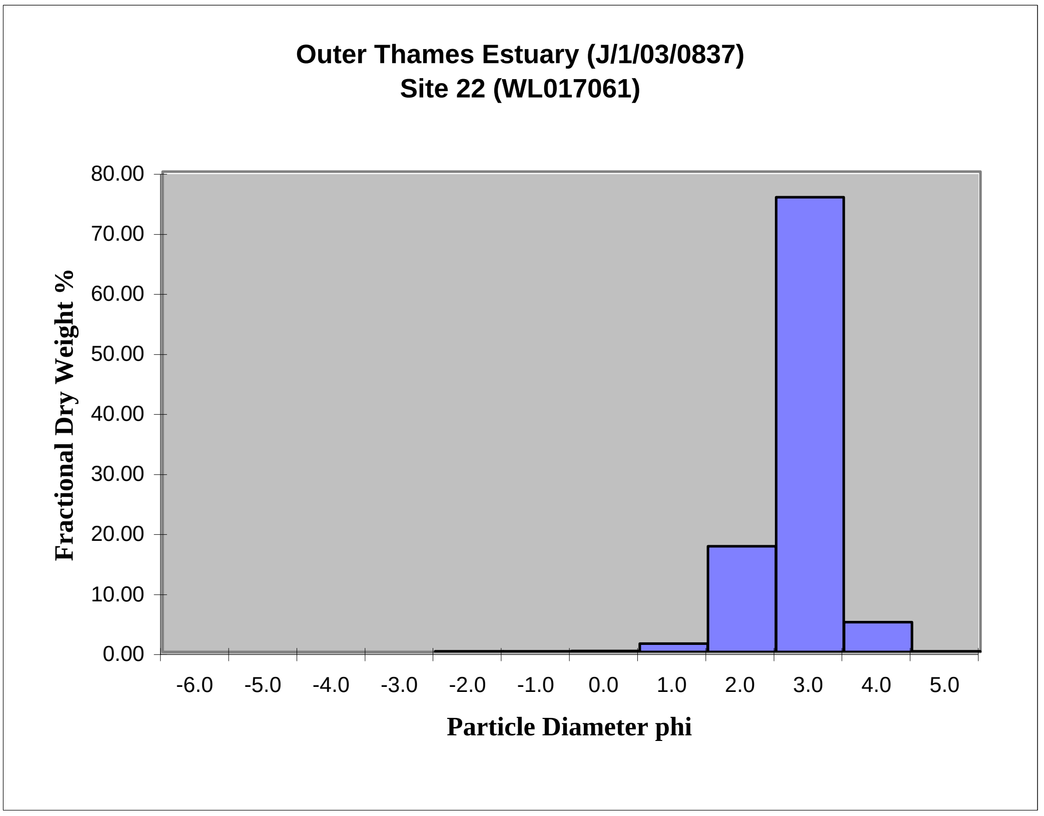
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.111	0.04	0.04
Coarse Sand	2	-1.0	0.184	0.07	0.11
	1	0.0	0.419	0.16	0.27
Medium Sand	0.5	1.0	3.655	1.38	1.65
	0.25	2.0	46.624	17.58	19.23
Fine Sand	0.125	3.0	200.867	75.73	94.96
	0.063	4.0	13.120	4.95	99.90
Silt/Clay	<0.063	5.0	0.255	0.10	100.00
		Total Weight	265.235	100.00	

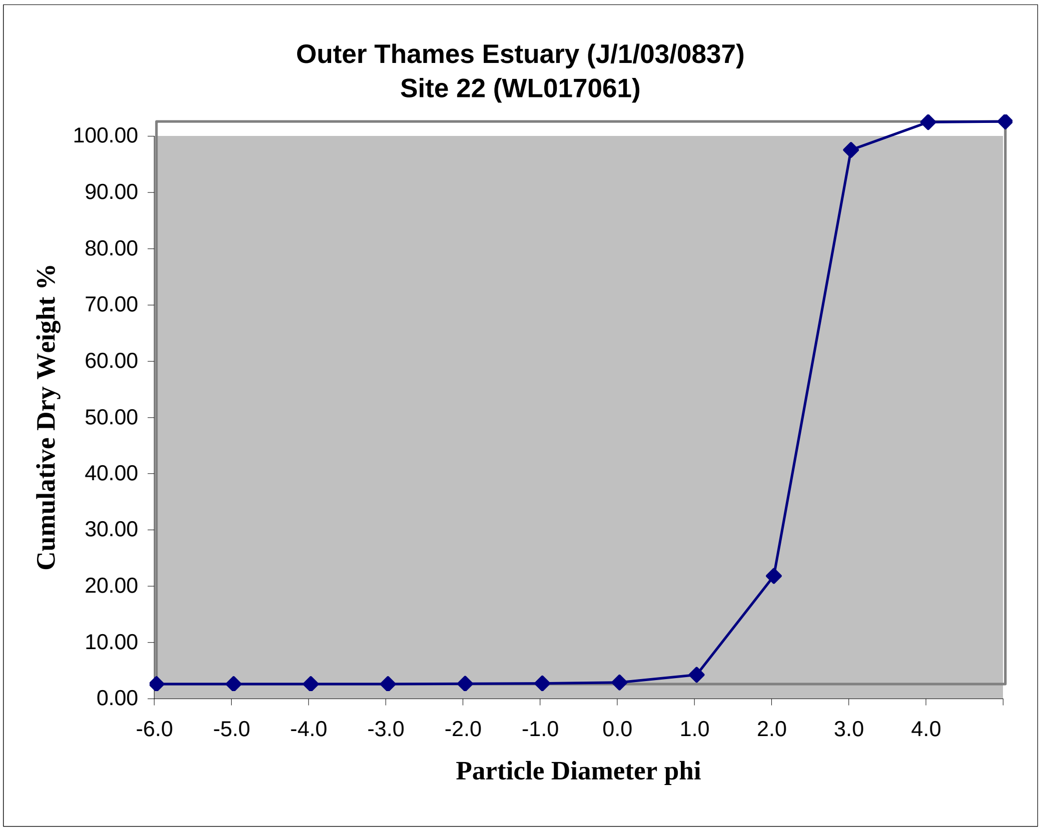
Mean mm	0.19
Md mm	0.19
Mean phi	2.36
Md phi	2.41
Sorting	0.53
Skq	-0.24
Kurtosis	1.12

%Gravel	0.04
% Sand	99.86
% Fines	0.10
% Org C	0.526

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 22 (WL017061)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 22 (WL017061)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 23 (WL017062)

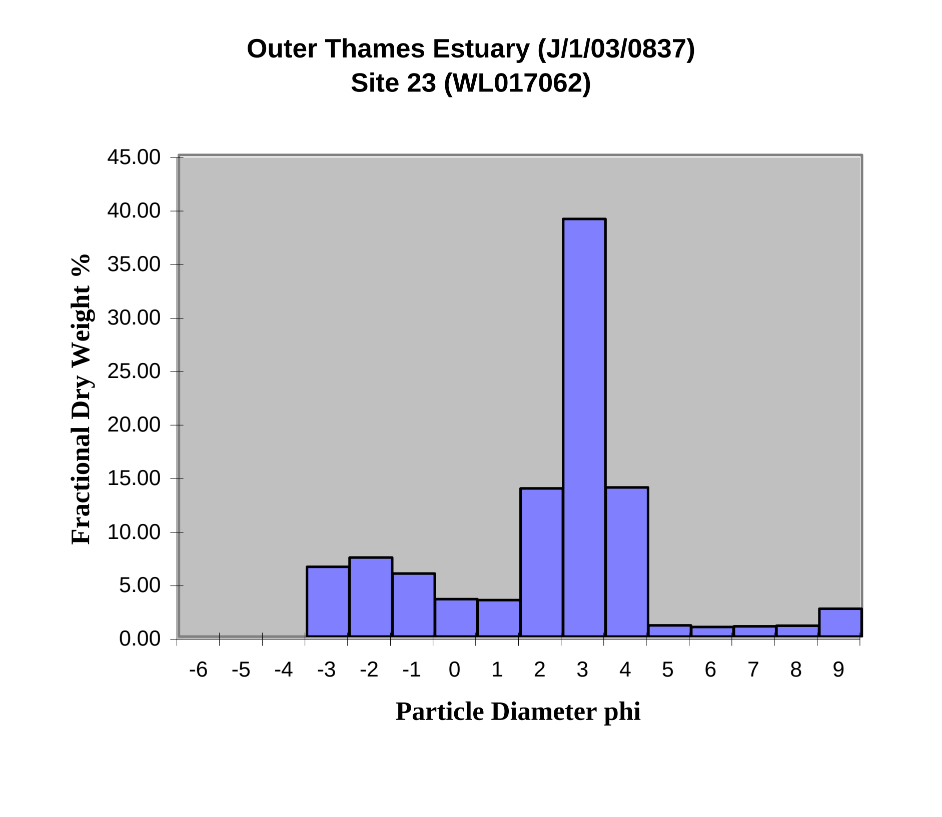
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	16.057	6.52	6.52
	4	-2.0	18.201	7.40	13.92
Coarse Sand	2	-1.0	14.491	5.89	19.81
	1	0.0	8.646	3.51	23.32
Medium Sand	0.5	1.0	8.367	3.40	26.72
	0.25	2.0	34.047	13.83	40.56
Fine Sand	0.125	3.0	96.039	39.02	79.58
	0.063	4.0	34.292	13.93	93.51
Silt	0.032	5.0	2.564	1.04	94.56
	0.0156	6.0	2.175	0.88	95.44
	0.0078	7.0	2.338	0.95	96.39
	0.0039	8.0	2.502	1.02	97.41
Clay	<0.0039	9.0	6.385	2.59	100.00
		Total Weigh	246	100	

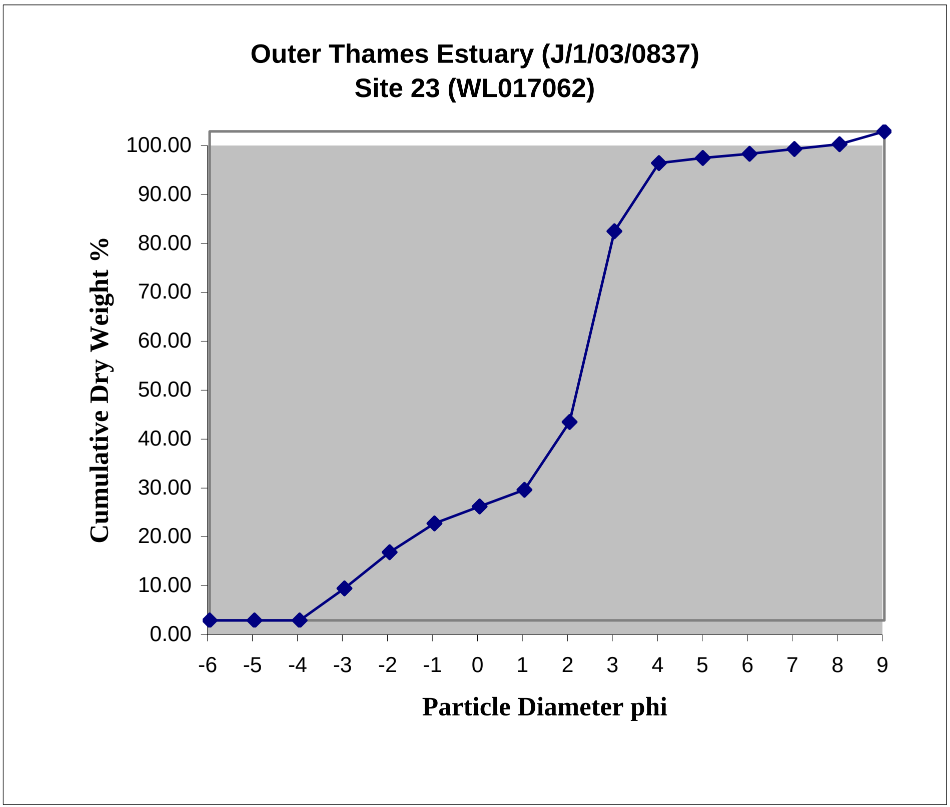
Mean mm	0.41
Md mm	0.21
Mean phi	1.30
Md phi	2.24
Sorting	2.56
Skq	-0.41
Kurtosis	1.50

%Gravel	13.92
% Sand	79.59
% Fines	6.49
% Org C	1.234

Gravelly Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 23 (WL017062)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 23 (WL017062)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 24 (WL017063)

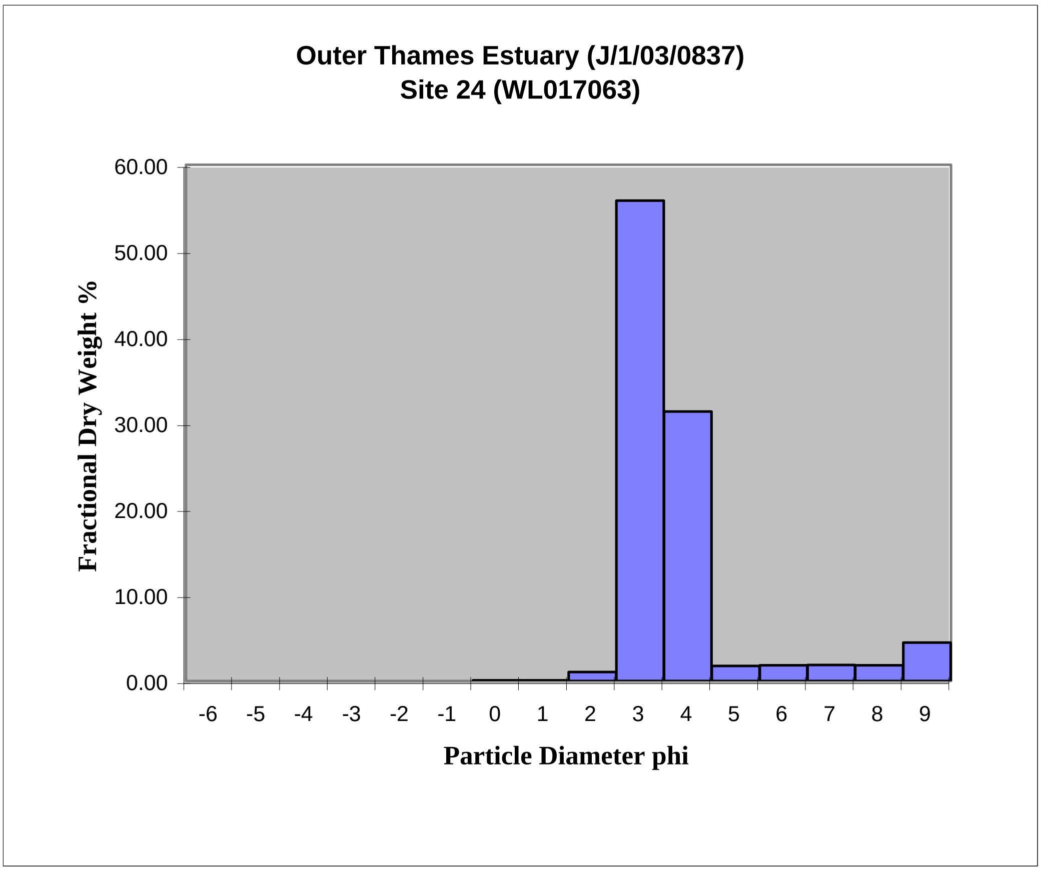
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.015	0.01	0.01
	1	0.0	0.067	0.03	0.03
Medium Sand	0.5	1.0	0.213	0.09	0.12
	0.25	2.0	2.570	1.04	1.16
Fine Sand	0.125	3.0	138.237	55.83	56.99
	0.063	4.0	77.544	31.32	88.30
Silt	0.032	5.0	4.317	1.74	90.05
	0.0156	6.0	4.513	1.82	91.87
	0.0078	7.0	4.617	1.86	93.73
	0.0039	8.0	4.495	1.82	95.55
Clay	<0.0039	9.0	11.024	4.45	100.00
		Total Weight	248	100	

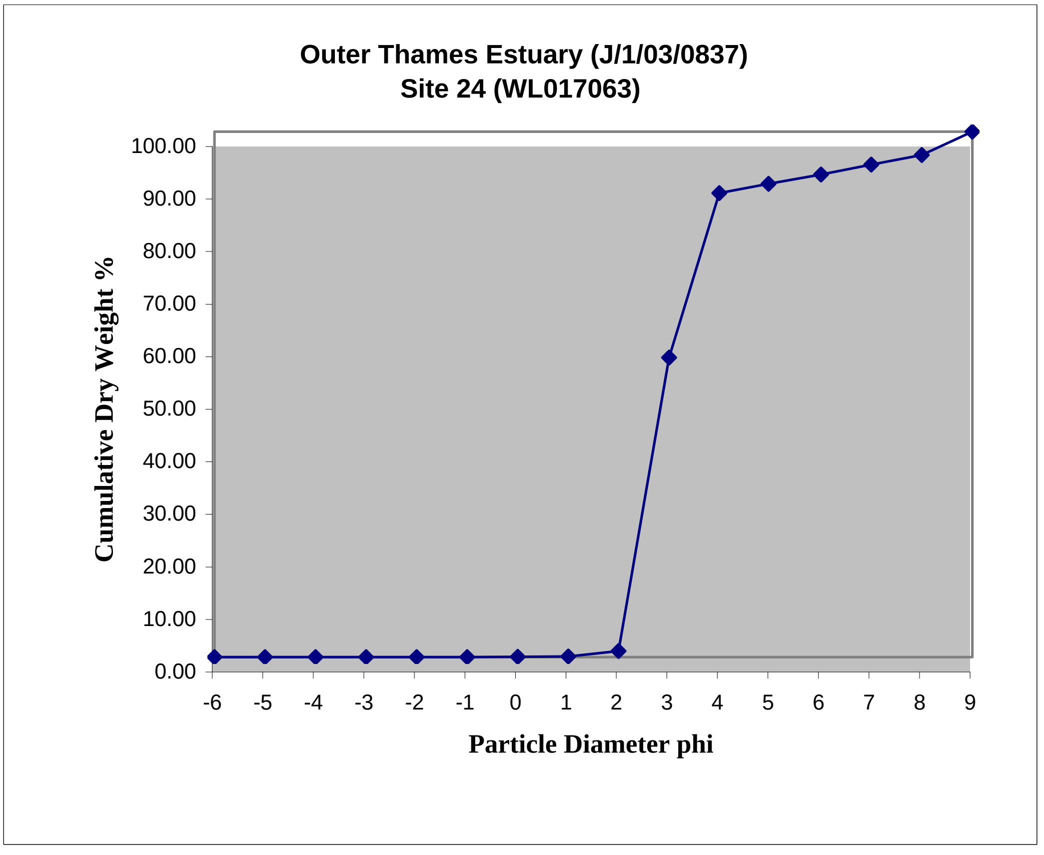
Mean mm	0.13
Md mm	0.14
Mean phi	3.00
Md phi	2.87
Sorting	1.25
Skq	0.47
Kurtosis	2.02

%Gravel	0.00
% Sand	88.30
% Fines	11.70
% Org C	0.957

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 24 (WL017063)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 24 (WL017063)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 26 (WL017065)

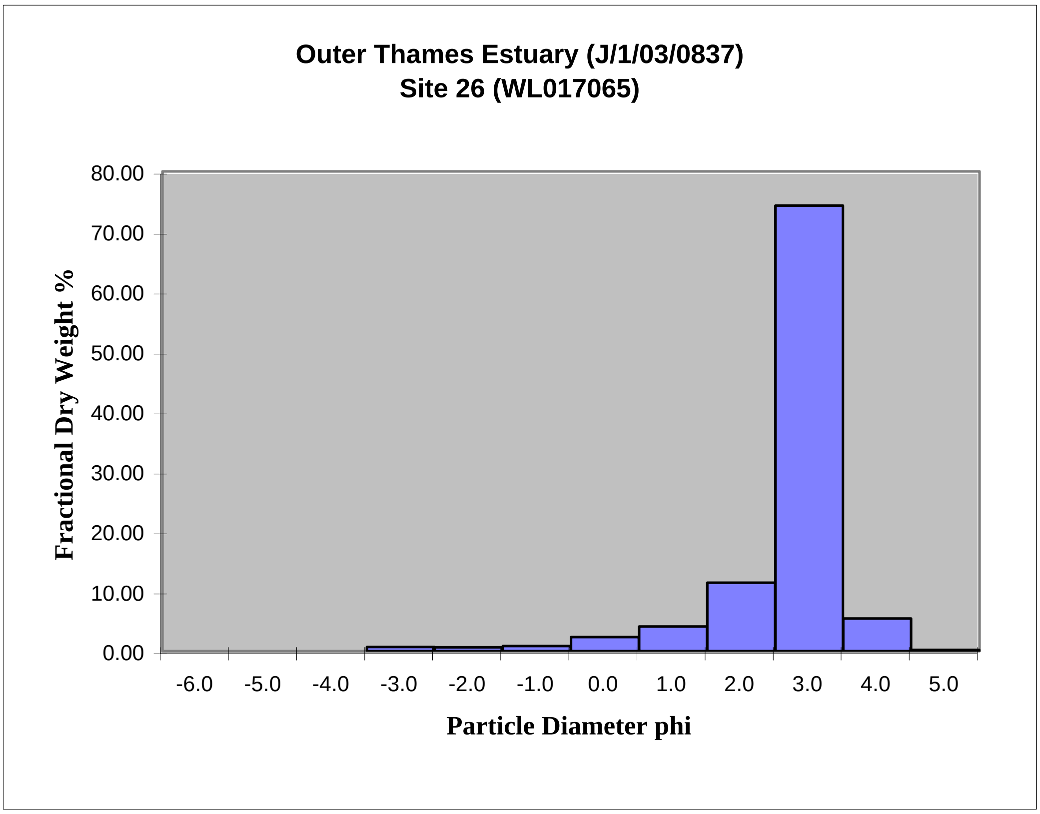
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	2.163	0.72	0.72
	4	-2.0	1.946	0.64	1.36
Coarse Sand	2	-1.0	2.542	0.84	2.20
	1	0.0	7.028	2.32	4.52
Medium Sand	0.5	1.0	12.366	4.09	8.61
	0.25	2.0	34.595	11.44	20.05
Fine Sand	0.125	3.0	224.696	74.29	94.33
	0.063	4.0	16.474	5.45	99.78
Silt/Clay	<0.063	5.0	0.662	0.22	100.00
		Total Weight	302.472	100.00	

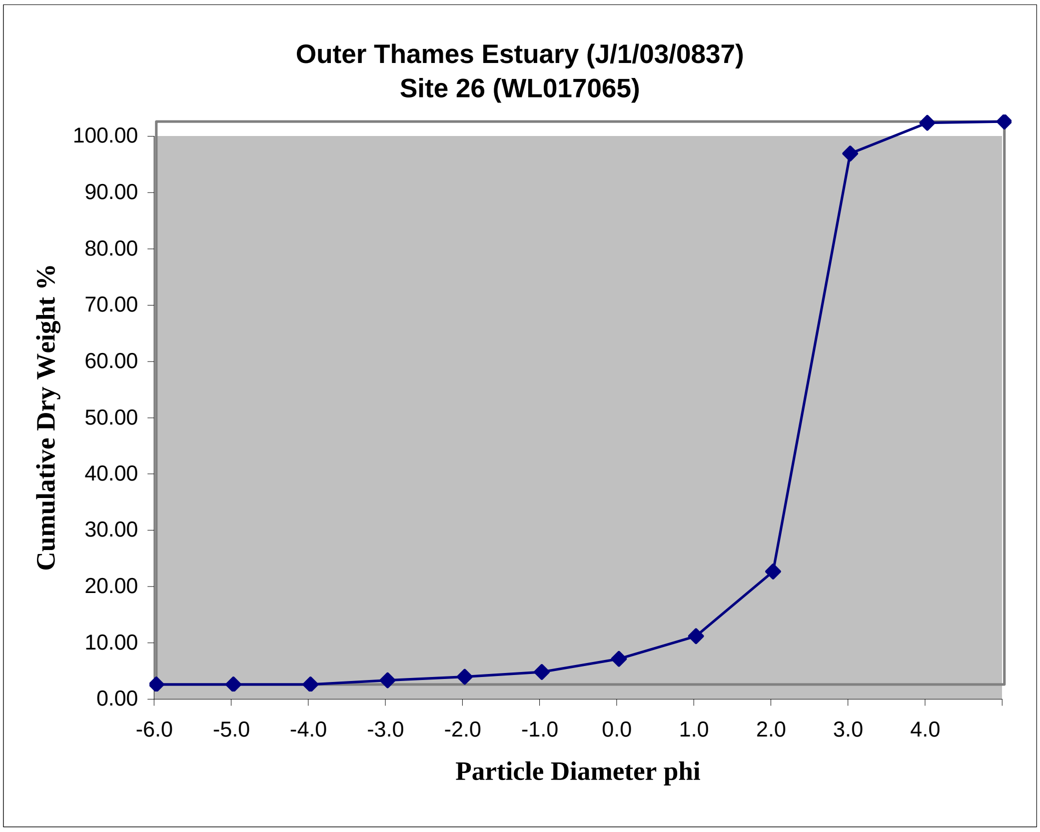
Mean mm	0.20
Md mm	0.19
Mean phi	2.30
Md phi	2.40
Sorting	0.74
Skq	-0.42
Kurtosis	1.75

%Gravel	1.36
% Sand	98.42
% Fines	0.22
% Org C	0.885

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 26 (WL017065)
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Fractional Dry Weight %
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 26 (WL017065)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Cumulative Dry Weight %
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 27 (WL017066)

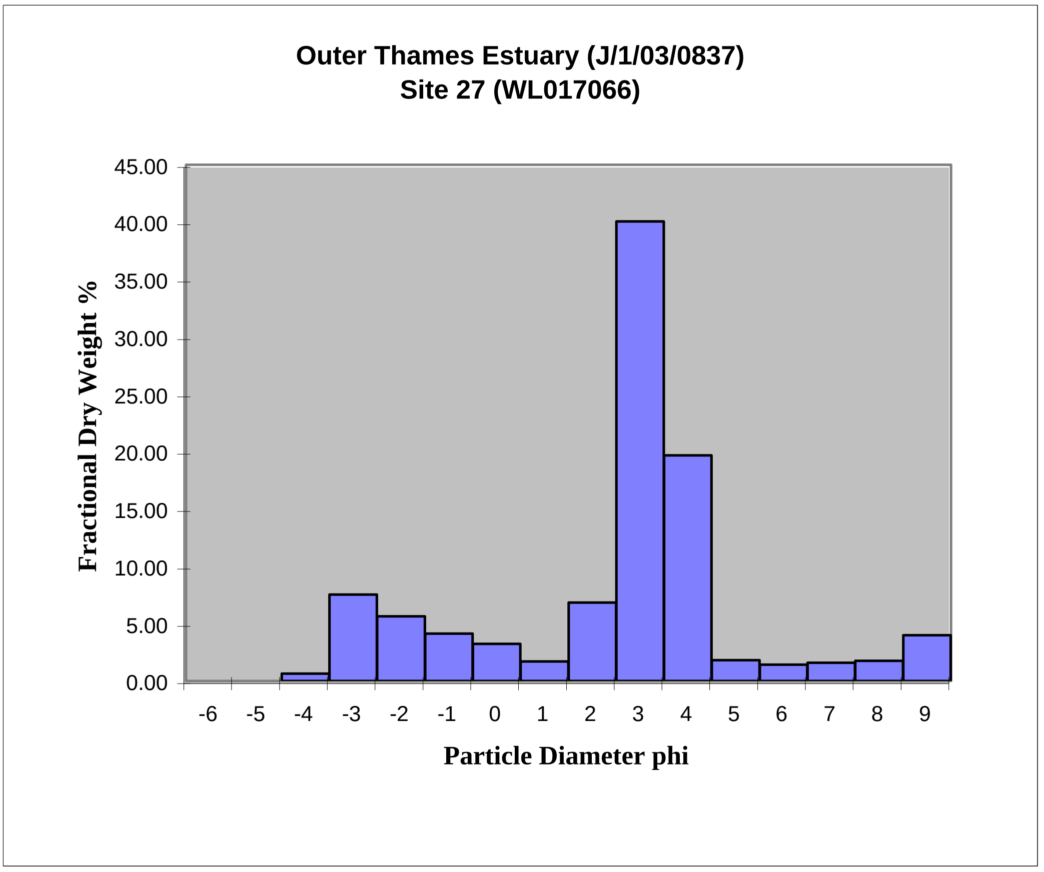
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	1.758	0.64	0.64
Gravel	8	-3.0	20.554	7.53	8.18
	4	-2.0	15.380	5.64	13.81
Coarse Sand	2	-1.0	11.254	4.12	17.94
	1	0.0	8.793	3.22	21.16
Medium Sand	0.5	1.0	4.629	1.70	22.86
	0.25	2.0	18.625	6.83	29.68
Fine Sand	0.125	3.0	109.313	40.06	69.74
	0.063	4.0	53.681	19.67	89.41
Silt	0.032	5.0	4.973	1.82	91.23
	0.0156	6.0	3.878	1.42	92.65
	0.0078	7.0	4.340	1.59	94.25
	0.0039	8.0	4.807	1.76	96.01
Clay	<0.0039	9.0	10.897	3.99	100.00
		Total Weight	273	100	

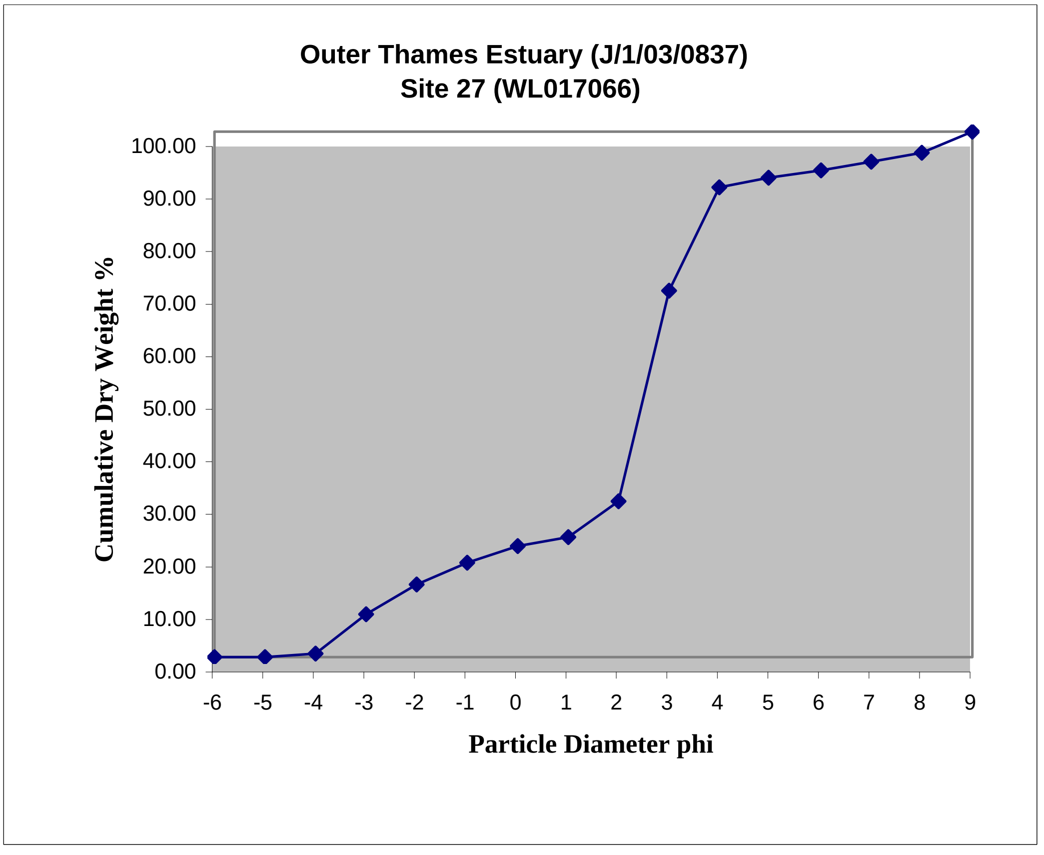
Mean mm	0.33
Md mm	0.18
Mean phi	1.58
Md phi	2.51
Sorting	2.94
Skq	-0.31
Kurtosis	2.28

%Gravel	13.81
% Sand	75.60
% Fines	10.59
% Org C	1.216

Silty gravelly sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 27 (WL017066)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 27 (WL017066)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 28 (WL017067)

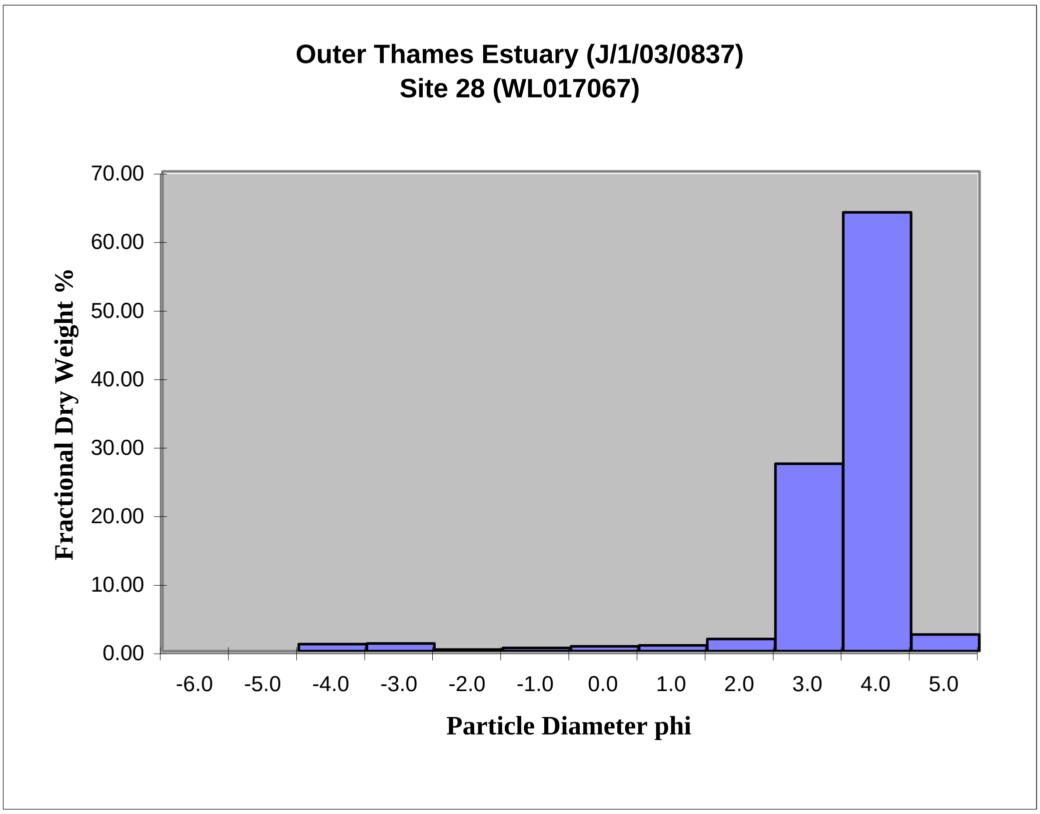
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	2.721	1.04	1.04
Gravel	8	-3.0	2.950	1.13	2.17
	4	-2.0	0.649	0.25	2.42
Coarse Sand	2	-1.0	1.221	0.47	2.88
	1	0.0	1.861	0.71	3.60
Medium Sand	0.5	1.0	2.167	0.83	4.43
	0.25	2.0	4.641	1.78	6.20
Fine Sand	0.125	3.0	71.478	27.34	33.54
	0.063	4.0	167.345	64.01	97.56
Silt/Clay	<0.063	5.0	6.389	2.44	100.00
		Total Weight	261.422	100.00	

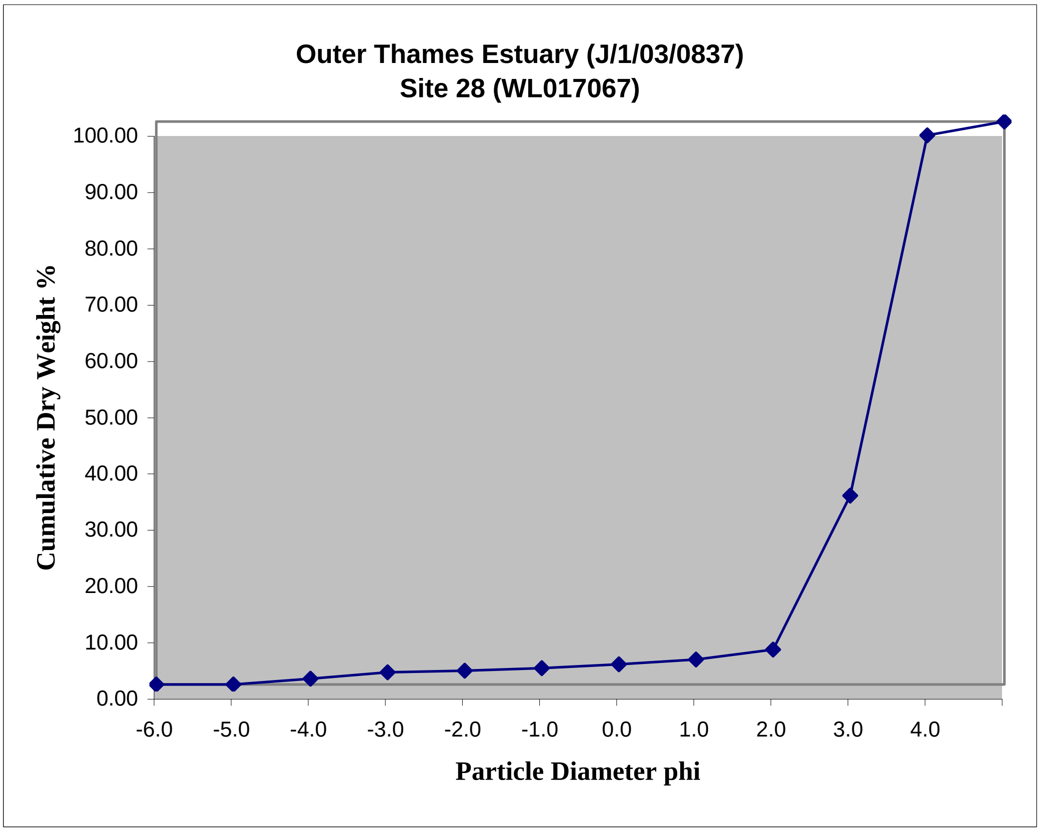
Mean mm	0.19
Md mm	0.10
Mean phi	2.37
Md phi	3.26
Sorting	-0.24
Skq	14.45
Kurtosis	0.07

%Gravel	2.42
% Sand	95.14
% Fines	2.44
% Org C	0.783

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 28 (WL017067)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 28 (WL017067)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 29 (WL017068)

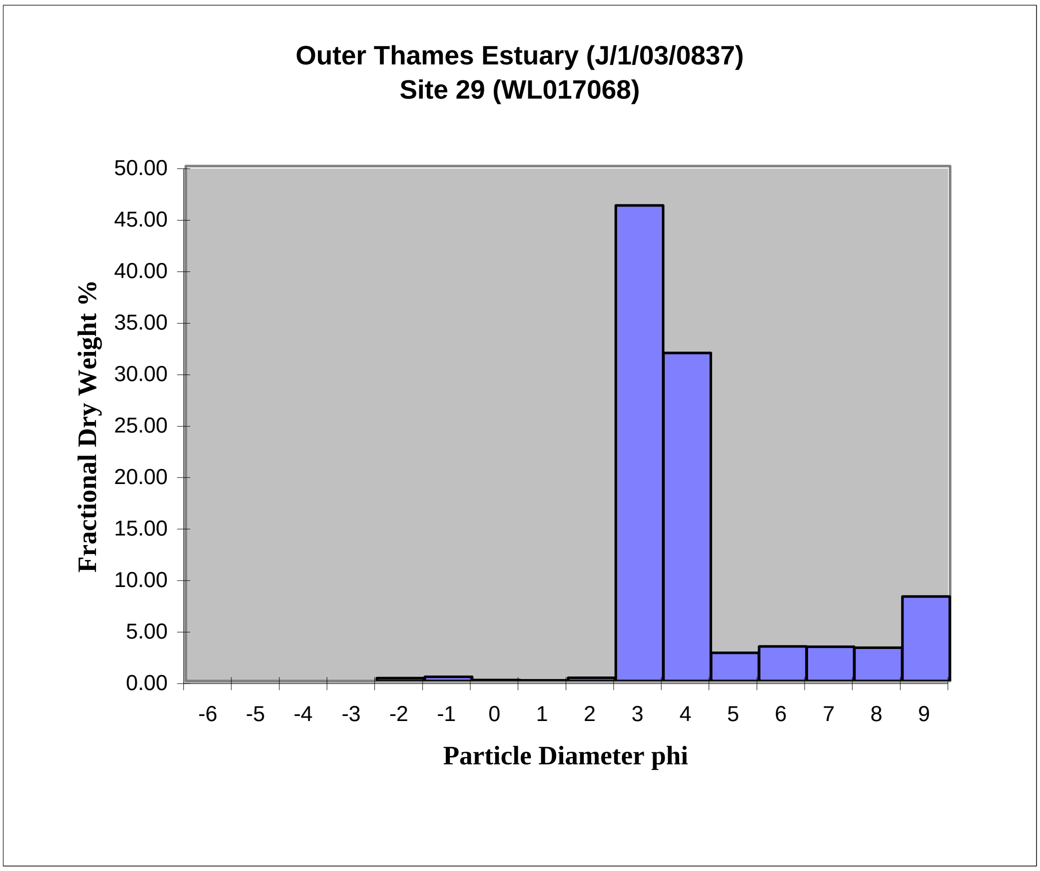
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.490	0.27	0.27
Coarse Sand	2	-1.0	0.712	0.39	0.66
	1	0.0	0.181	0.10	0.76
Medium Sand	0.5	1.0	0.096	0.05	0.81
	0.25	2.0	0.553	0.30	1.12
Fine Sand	0.125	3.0	83.846	46.16	47.28
	0.063	4.0	57.829	31.84	79.12
Silt	0.032	5.0	4.981	2.74	81.86
	0.0156	6.0	6.103	3.36	85.22
	0.0078	7.0	6.056	3.33	88.56
	0.0039	8.0	5.878	3.24	91.79
Clay	<0.0039	9.0	14.908	8.21	100.00
		Total Weight	182	100	

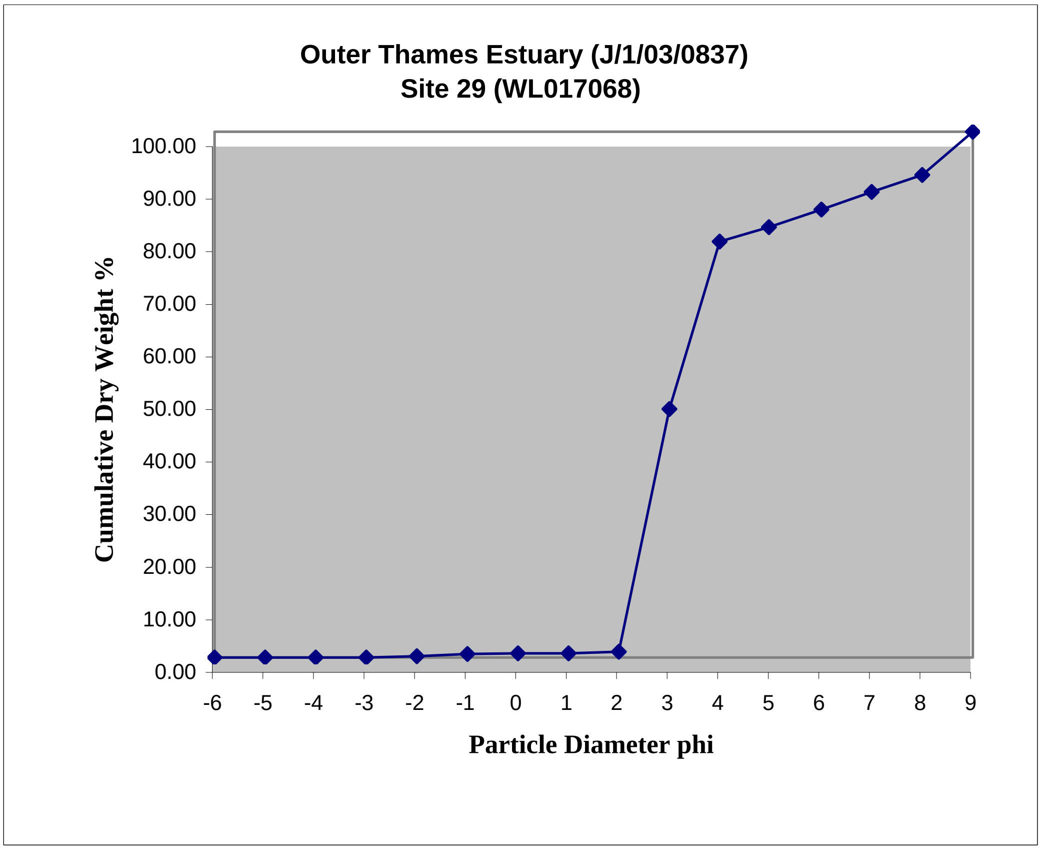
Mean mm	0.08
Md mm	0.12
Mean phi	3.68
Md phi	3.08
Sorting	1.72
Skq	0.60
Kurtosis	1.80

%Gravel	0.27
% Sand	78.85
% Fines	20.88
% Org C	1.393

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 29 (WL017068)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 29 (WL017068)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 30 (WL017069)

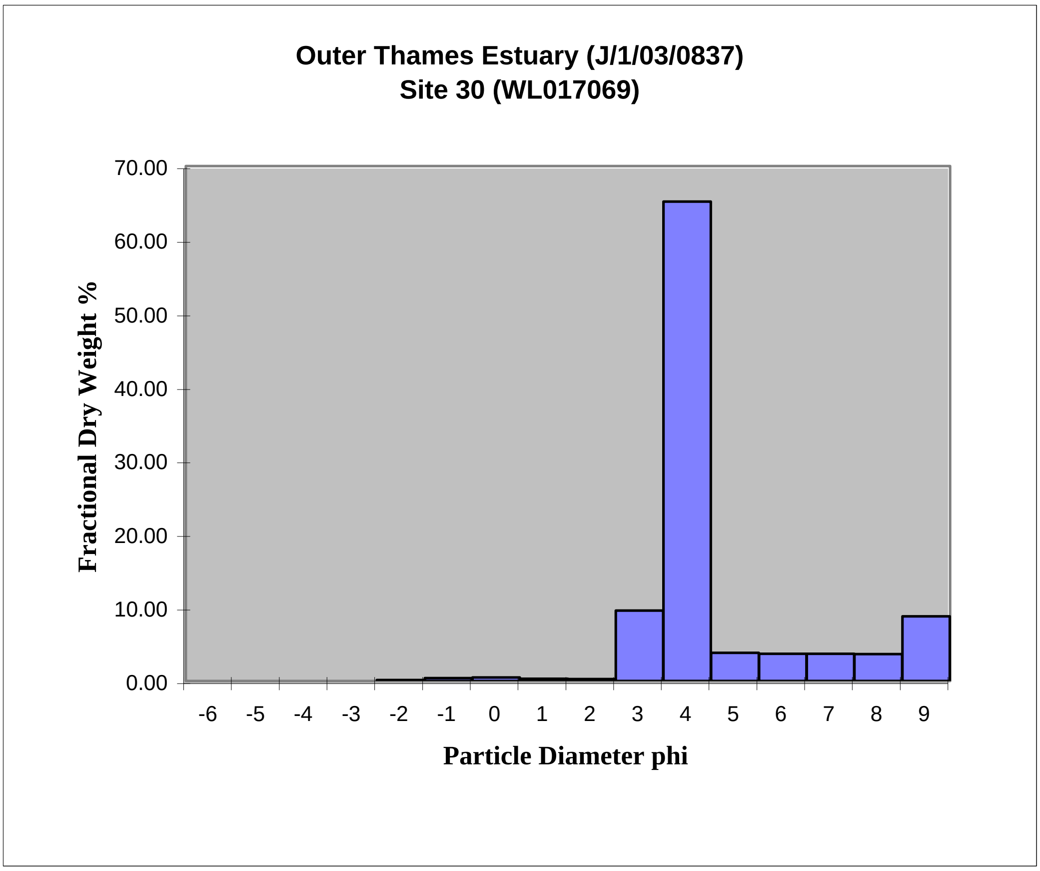
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.224	0.12	0.12
Coarse Sand	2	-1.0	0.713	0.38	0.51
	1	0.0	0.889	0.48	0.99
Medium Sand	0.5	1.0	0.595	0.32	1.31
	0.25	2.0	0.505	0.27	1.58
Fine Sand	0.125	3.0	17.708	9.56	11.14
	0.063	4.0	120.755	65.19	76.33
Silt	0.032	5.0	7.076	3.82	80.15
	0.0156	6.0	6.855	3.70	83.85
	0.0078	7.0	6.888	3.72	87.57
	0.0039	8.0	6.761	3.65	91.22
Clay	<0.0039	9.0	16.262	8.78	100.00
		Total Weight	185	100	

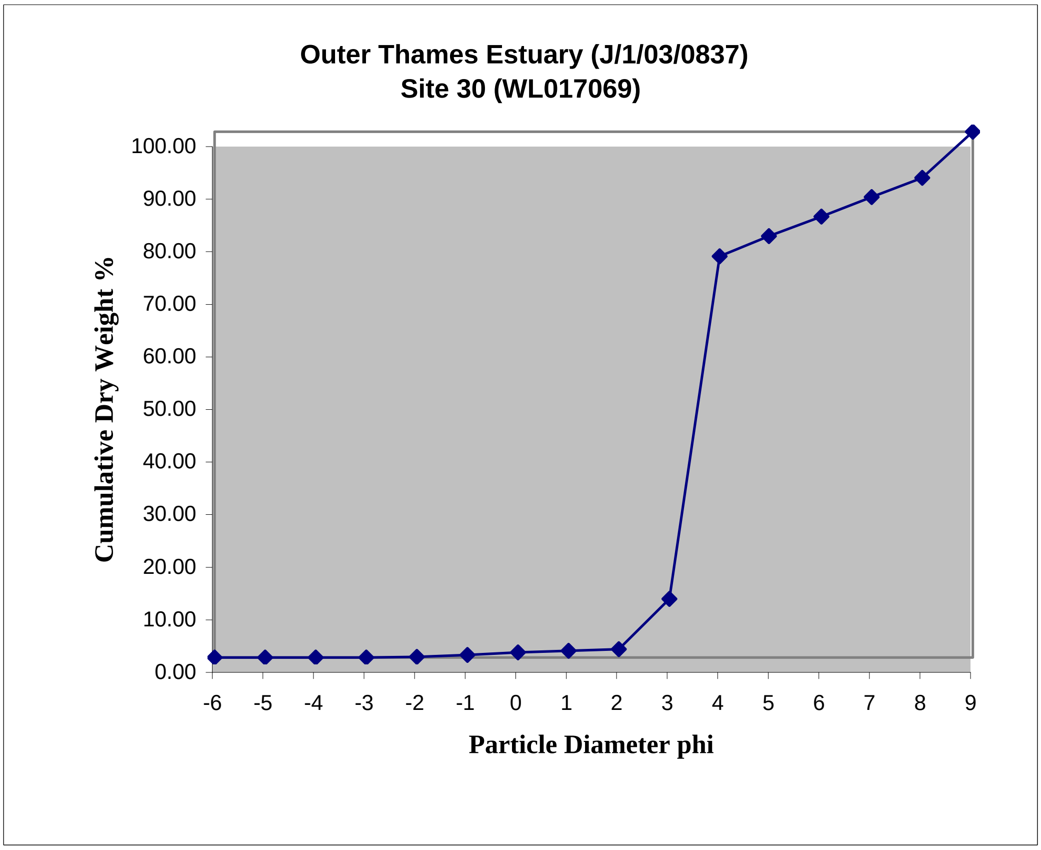
Mean mm	0.05
Md mm	0.08
Mean phi	4.24
Md phi	3.59
Sorting	1.59
Skq	0.61
Kurtosis	3.03

%Gravel	0.12
% Sand	76.21
% Fines	23.67
% Org C	1.486

Silty sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 30 (WL017069)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 30 (WL017069)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 31 (WL017070)

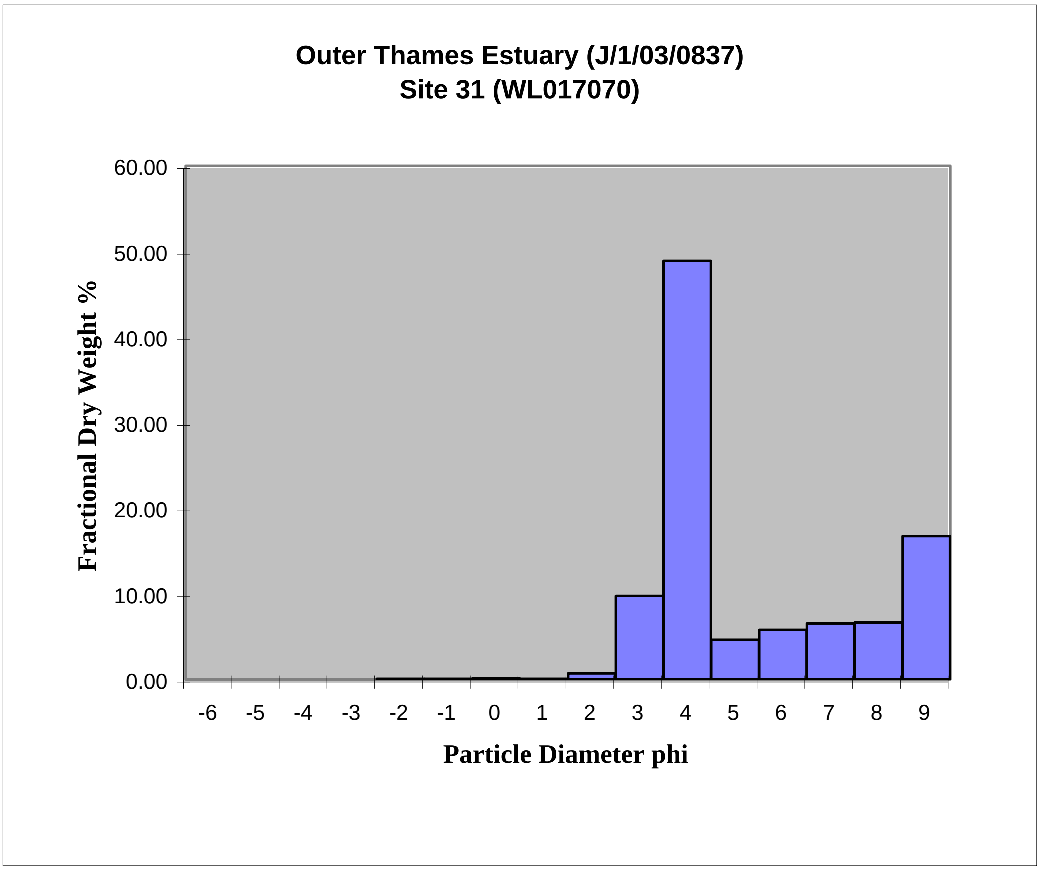
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.035	0.03	0.03
Coarse Sand	2	-1.0	0.032	0.03	0.06
	1	0.0	0.114	0.10	0.16
Medium Sand	0.5	1.0	0.080	0.07	0.24
	0.25	2.0	0.776	0.71	0.94
Fine Sand	0.125	3.0	10.714	9.76	10.70
	0.063	4.0	53.712	48.91	59.61
Silt	0.032	5.0	5.104	4.65	64.26
	0.0156	6.0	6.362	5.79	70.05
	0.0078	7.0	7.168	6.53	76.58
	0.0039	8.0	7.311	6.66	83.24
Clay	<0.0039	9.0	18.407	16.76	100.00
		Total Weight	110	100	

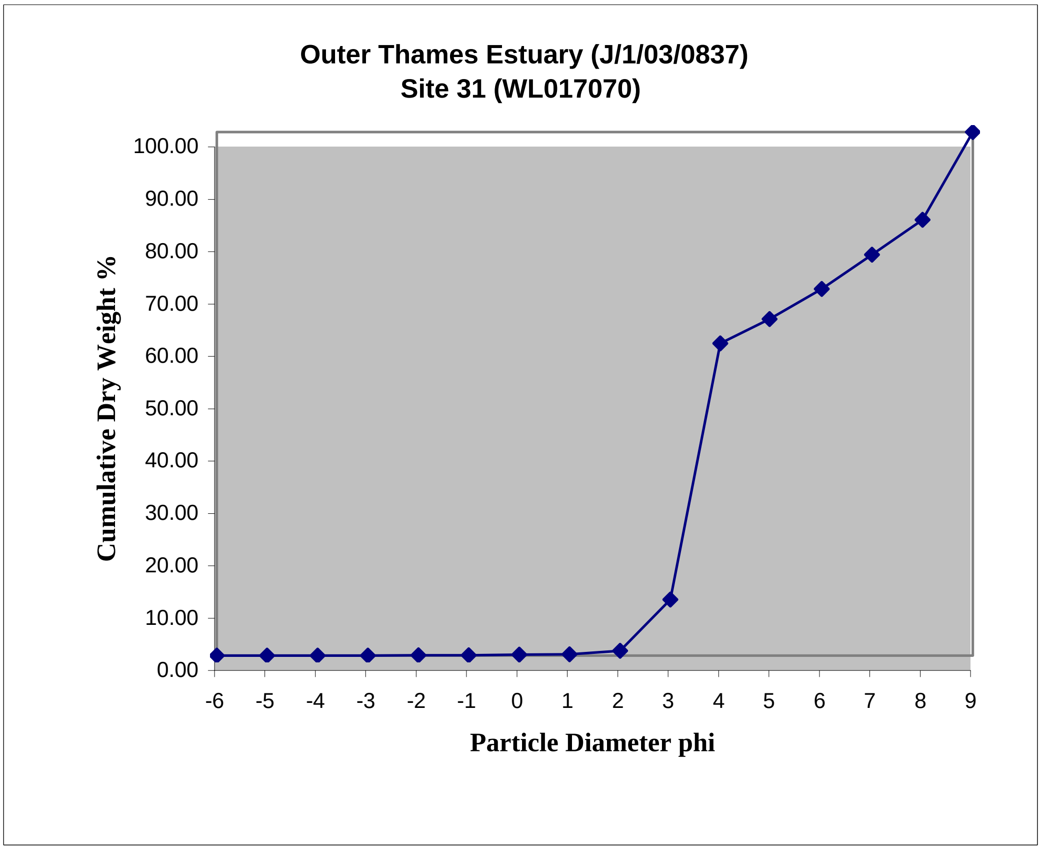
Mean mm	0.03
Md mm	0.07
Mean phi	4.96
Md phi	3.79
Sorting	2.05
Skq	0.61
Kurtosis	0.64

%Gravel	0.03
% Sand	59.58
% Fines	40.39
% Org C	2.054

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 31 (WL017070)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 31 (WL017070)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 32 (WL017071)

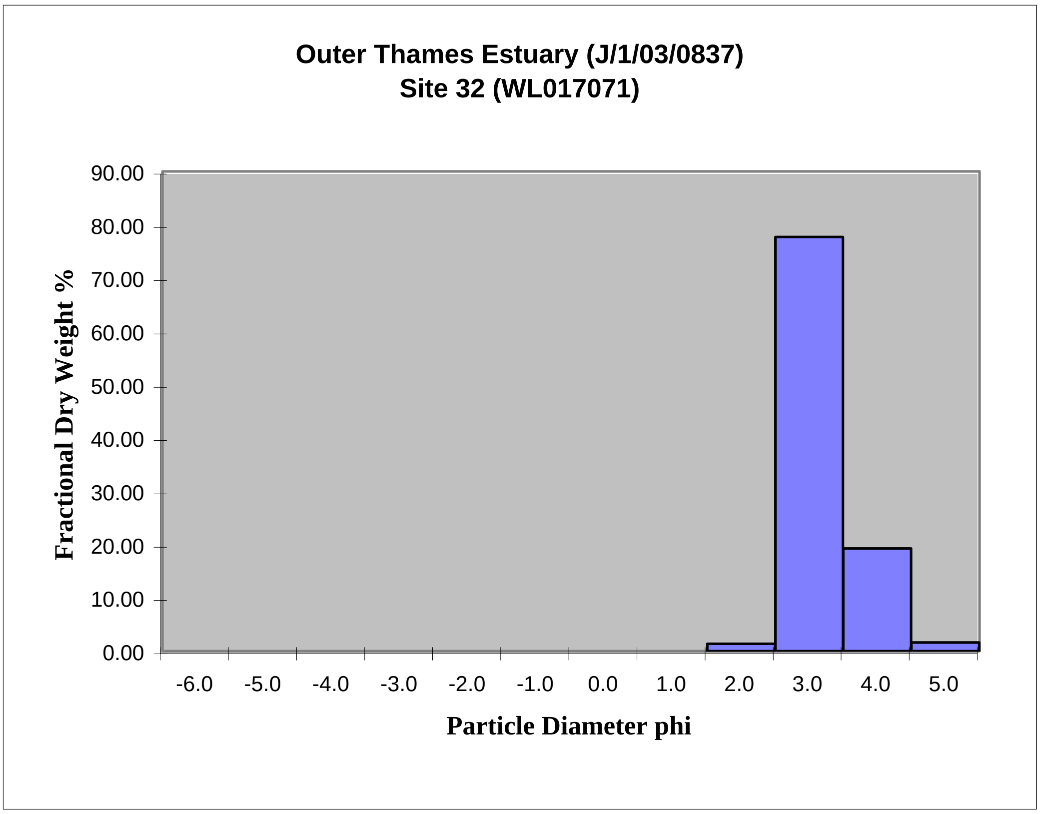
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.023	0.01	0.01
	1	0.0	0.025	0.01	0.02
Medium Sand	0.5	1.0	0.041	0.02	0.03
	0.25	2.0	3.778	1.41	1.44
Fine Sand	0.125	3.0	208.740	77.68	79.12
	0.063	4.0	51.774	19.27	98.39
Silt/Clay	<0.063	5.0	4.339	1.61	100.00
		Total Weight	268.72	100.00	

Mean mm	0.17
Md mm	0.16
Mean phi	2.58
Md phi	2.63
Sorting	0.30
Skq	-0.35
Kurtosis	0.48

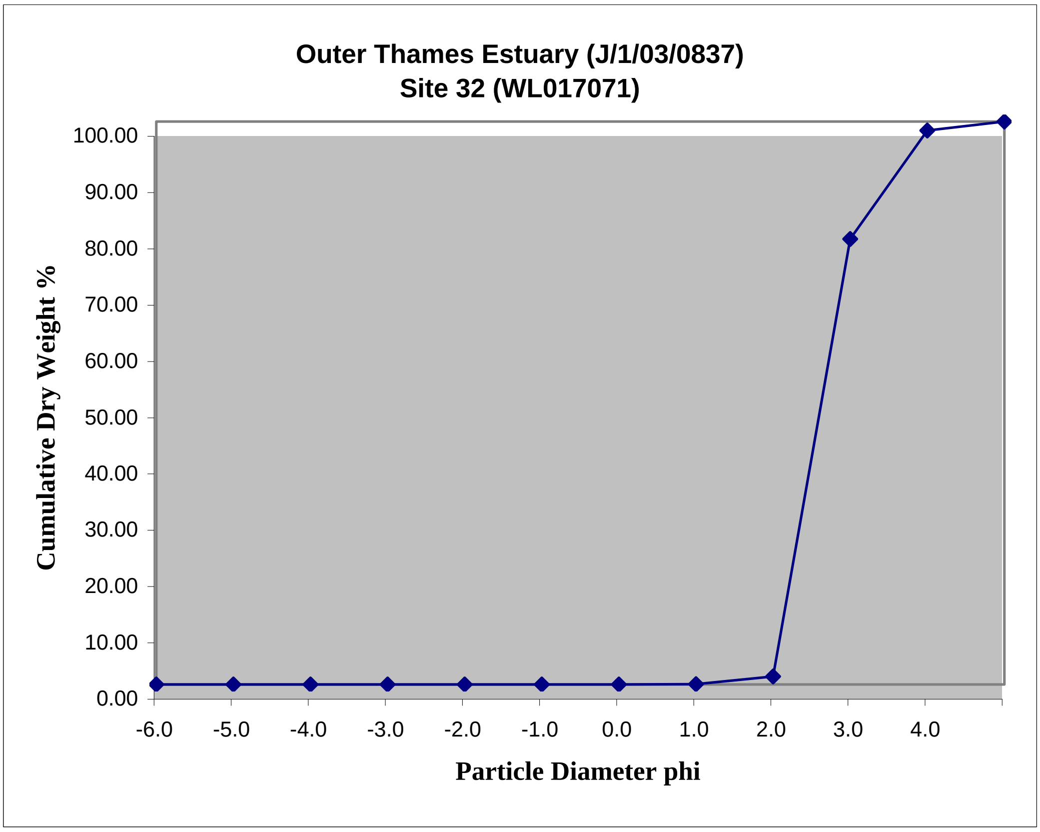
%Gravel	0.00
% Sand	98.39
% Fines	1.61
% Org C	0.919

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.



Outer Thames Estuary (J/1/03/0837)
Site 32 (WL017071)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi



Outer Thames Estuary (J/1/03/0837)
Site 32 (WL017071)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 33 (WL017072)

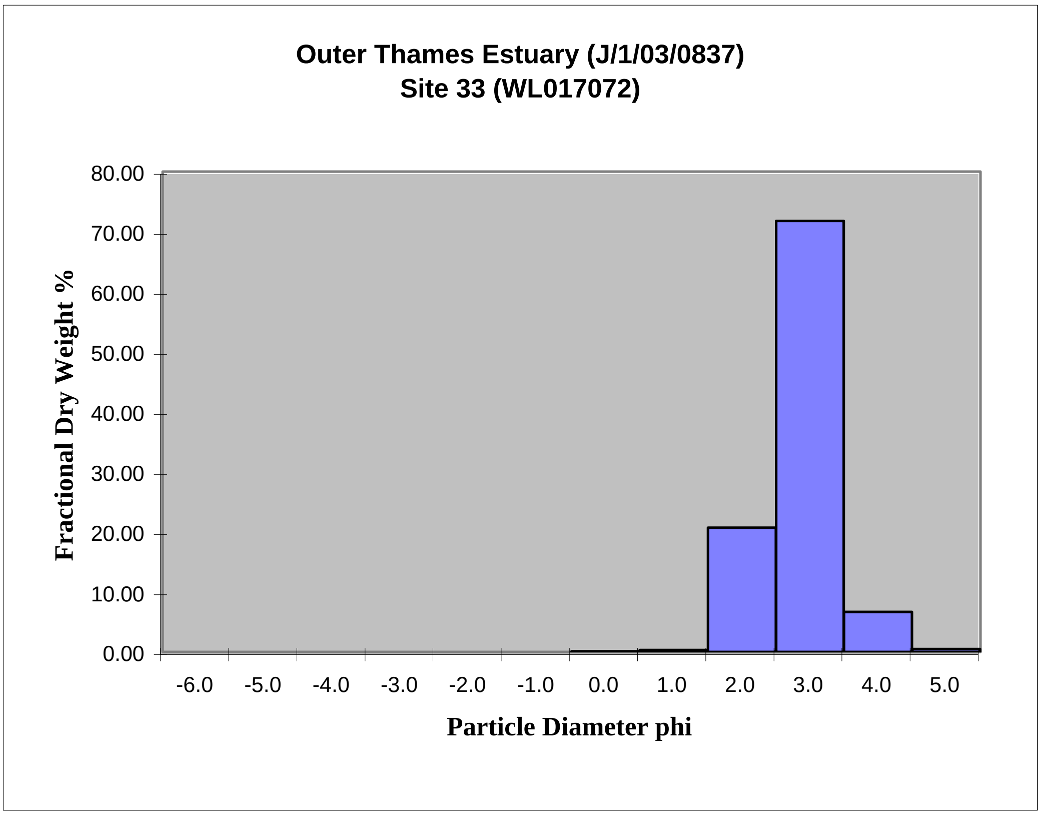
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.008	0.00	0.00
Coarse Sand	2	-1.0	0.072	0.03	0.03
	1	0.0	0.095	0.03	0.06
Medium Sand	0.5	1.0	0.840	0.30	0.37
	0.25	2.0	57.333	20.70	21.06
Fine Sand	0.125	3.0	198.868	71.79	92.85
	0.063	4.0	18.462	6.66	99.51
Silt/Clay	<0.063	5.0	1.350	0.49	100.00
		Total Weight	277.028	100.00	

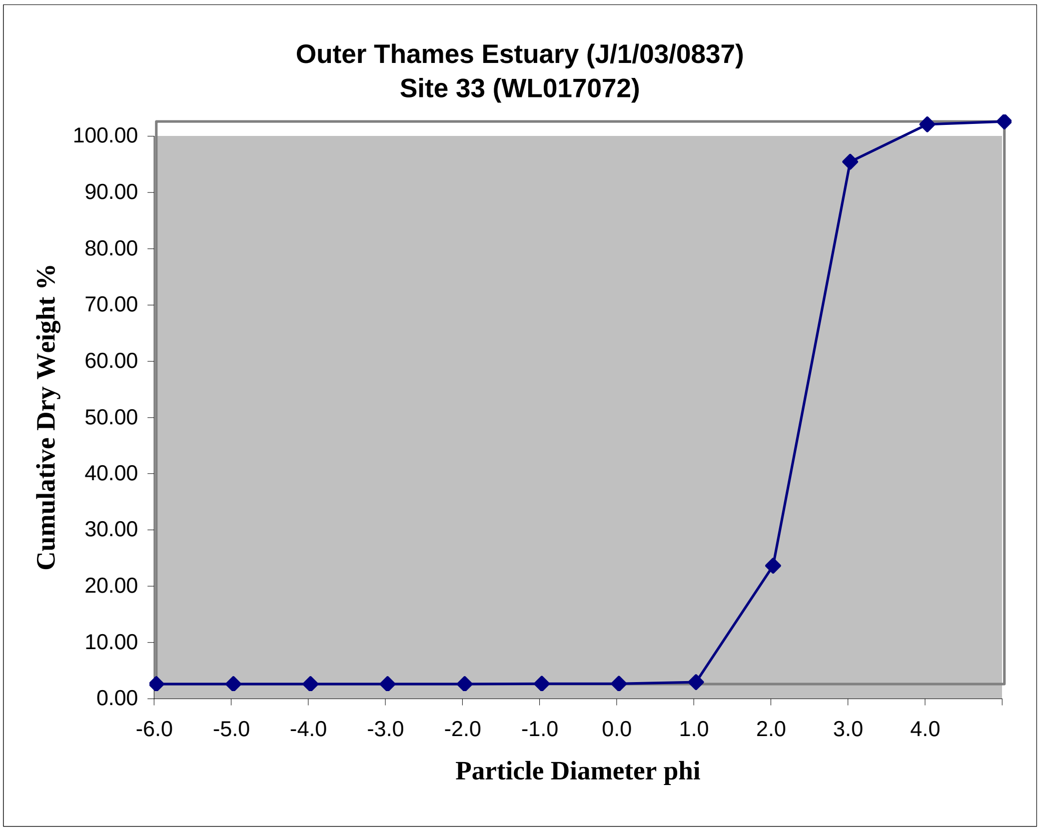
Mean mm	0.20
Md mm	0.19
Mean phi	2.35
Md phi	2.40
Sorting	0.55
Skq	-0.25
Kurtosis	1.03

%Gravel	0.00
% Sand	99.51
% Fines	0.49
% Org C	0.625

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 33 (WL017072)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 33 (WL017072)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 34 (WL017073)

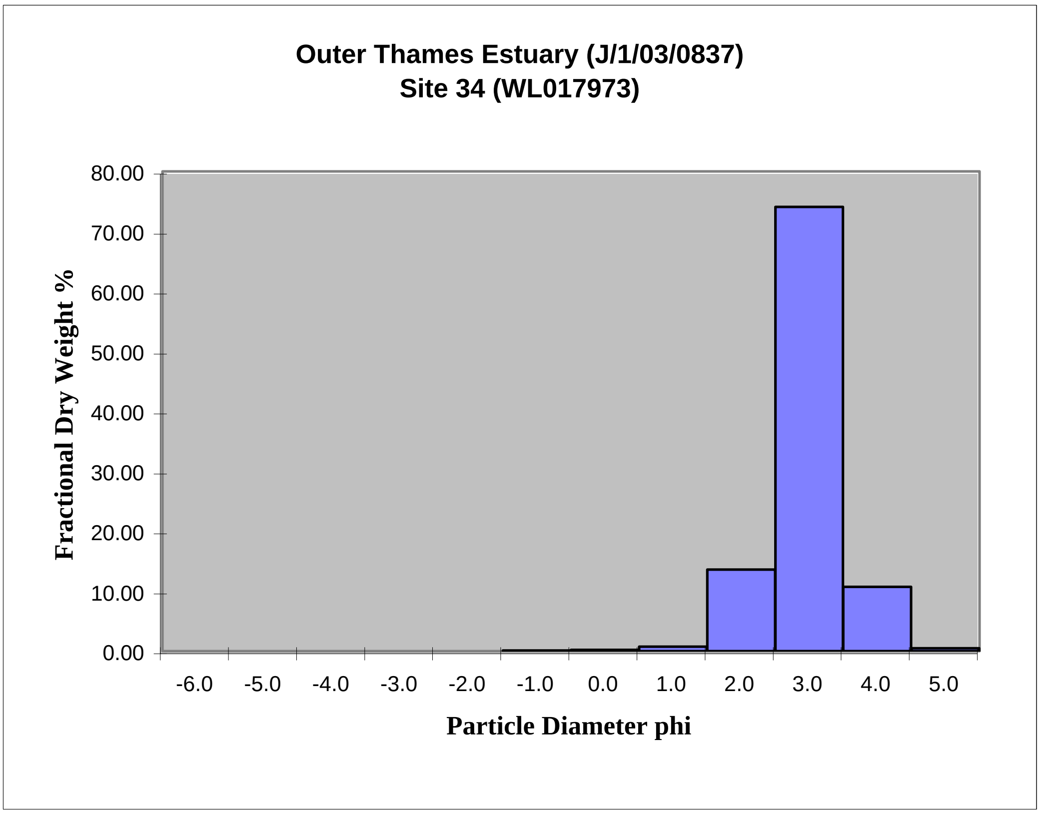
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.038	0.01	0.01
Coarse Sand	2	-1.0	0.342	0.12	0.14
	1	0.0	0.638	0.23	0.37
Medium Sand	0.5	1.0	2.026	0.73	1.10
	0.25	2.0	37.616	13.62	14.72
Fine Sand	0.125	3.0	204.615	74.09	88.81
	0.063	4.0	29.552	10.70	99.51
Silt/Clay	<0.063	5.0	1.361	0.49	100.00
		Total Weight	276.188	100.00	

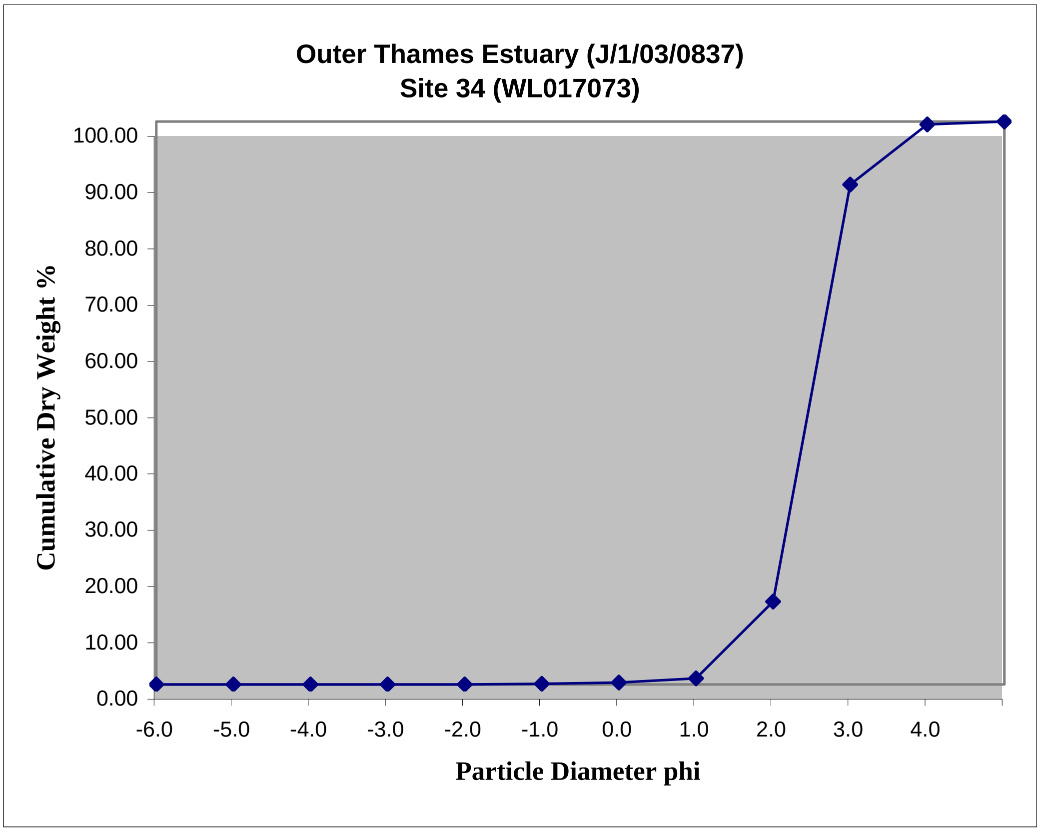
Mean mm	0.18
Md mm	0.18
Mean phi	2.48
Md phi	2.48
Sorting	0.48
Skq	-0.22
Kurtosis	1.00

%Gravel	0.01
% Sand	99.49
% Fines	0.49
% Org C	0.781

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 34 (WL017973)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 34 (WL017073)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 35 (WL017074)

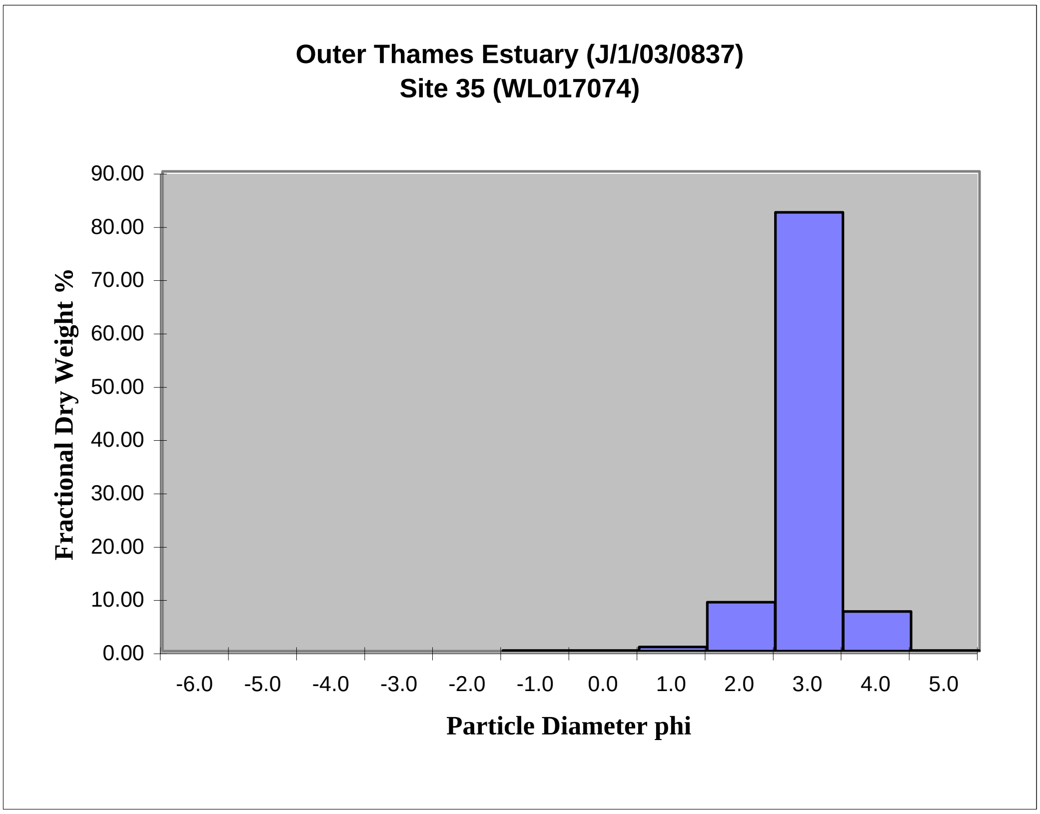
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.103	0.04	0.04
	1	0.0	0.348	0.13	0.17
Medium Sand	0.5	1.0	2.033	0.79	0.96
	0.25	2.0	23.692	9.16	10.12
Fine Sand	0.125	3.0	212.888	82.30	92.42
	0.063	4.0	19.258	7.45	99.87
Silt/Clay	<0.063	5.0	0.346	0.13	100.00
		Total Weight	258.668	100.00	

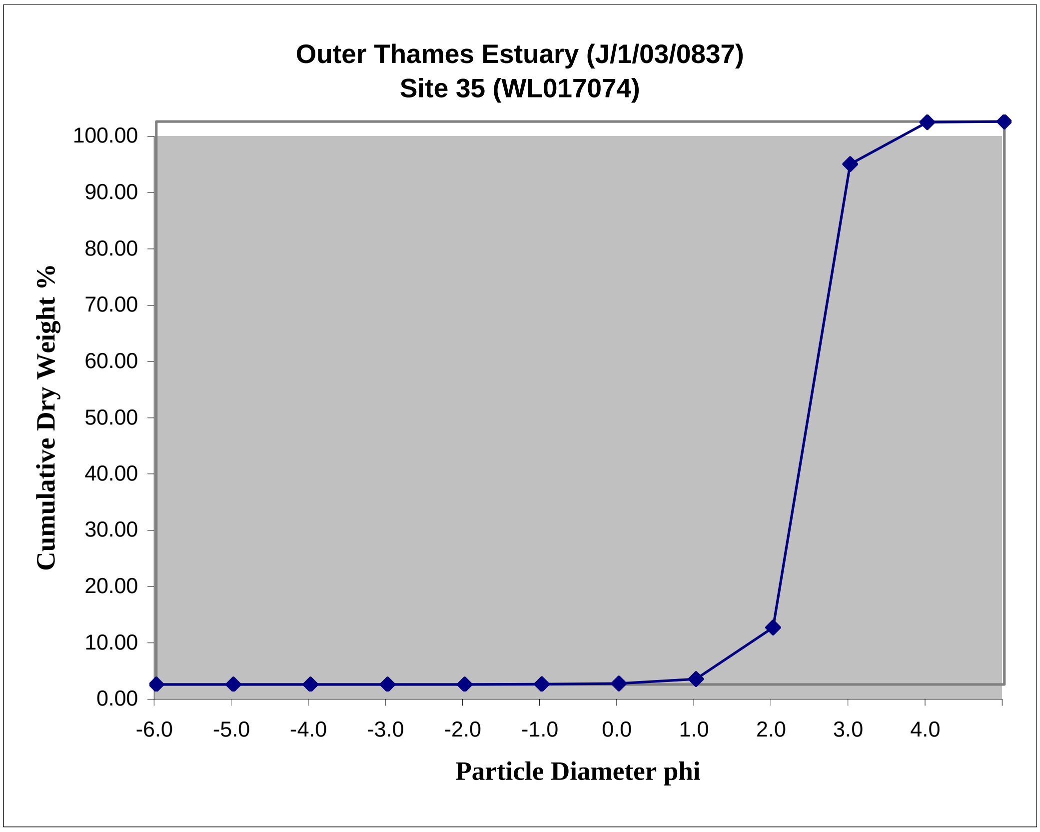
Mean mm	0.18
Md mm	0.18
Mean phi	2.48
Md phi	2.48
Sorting	0.44
Skq	-0.18
Kurtosis	1.03

%Gravel	0.00
% Sand	99.87
% Fines	0.13
% Org C	0.466

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 35 (WL017074)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 35 (WL017074)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 36 (WL017075)

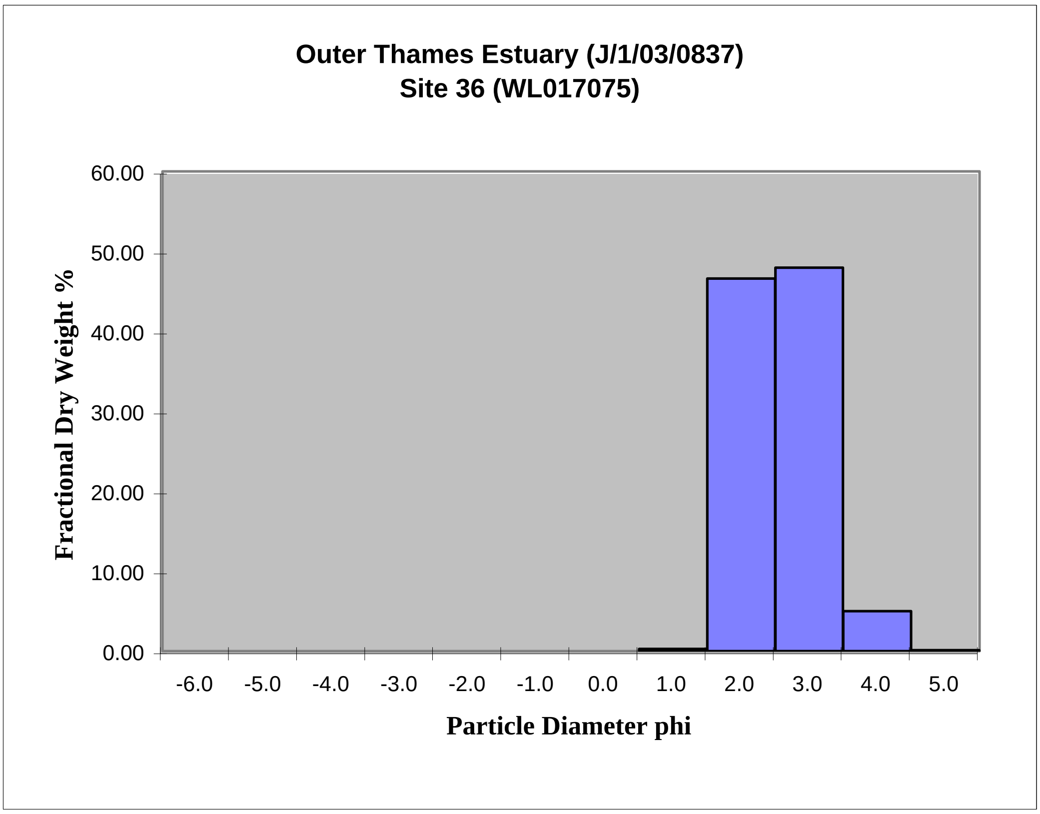
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.011	0.00	0.00
	1	0.0	0.050	0.02	0.02
Medium Sand	0.5	1.0	0.748	0.28	0.31
	0.25	2.0	122.982	46.60	46.91
Fine Sand	0.125	3.0	126.576	47.96	94.87
	0.063	4.0	13.181	4.99	99.87
Silt/Clay	<0.063	5.0	0.349	0.13	100.00
		Total Weight	263.897	100.00	

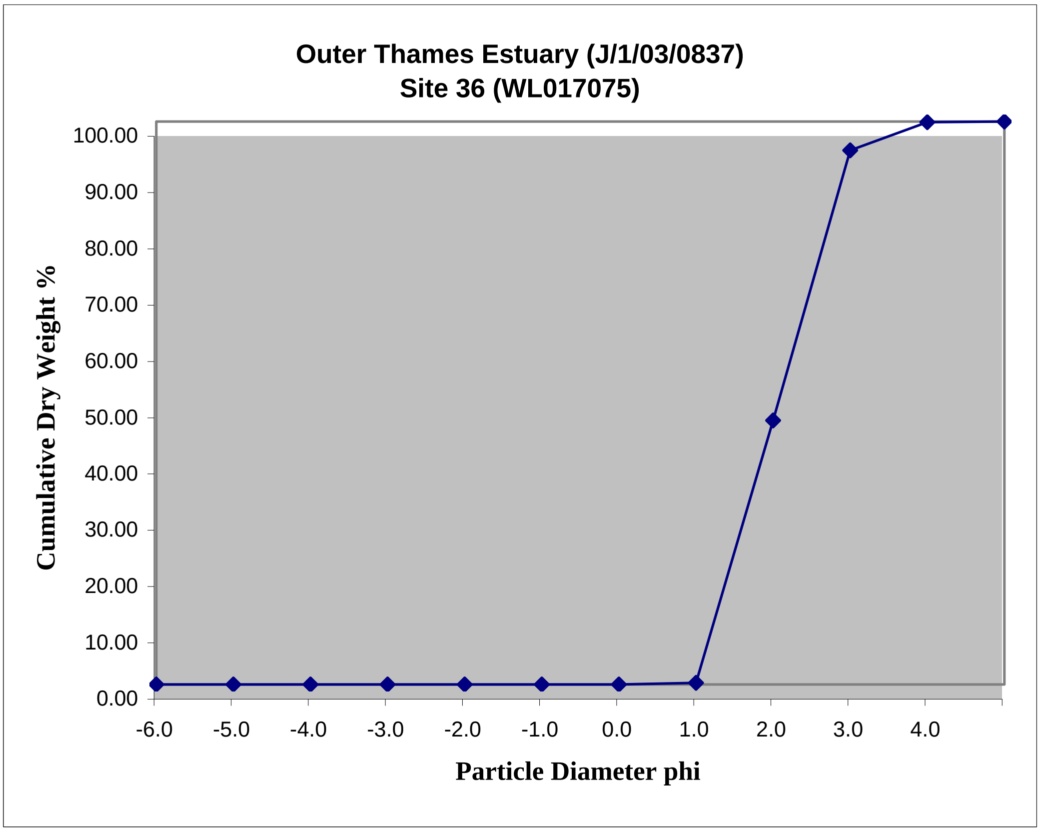
Mean mm	0.24
Md mm	0.24
Mean phi	2.06
Md phi	2.06
Sorting	0.65
Skq	-0.01
Kurtosis	0.74

%Gravel	0.00
% Sand	99.87
% Fines	0.13
% Org C	0.471

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 36 (WL017075)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 36 (WL017075)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 37 (WL017076)

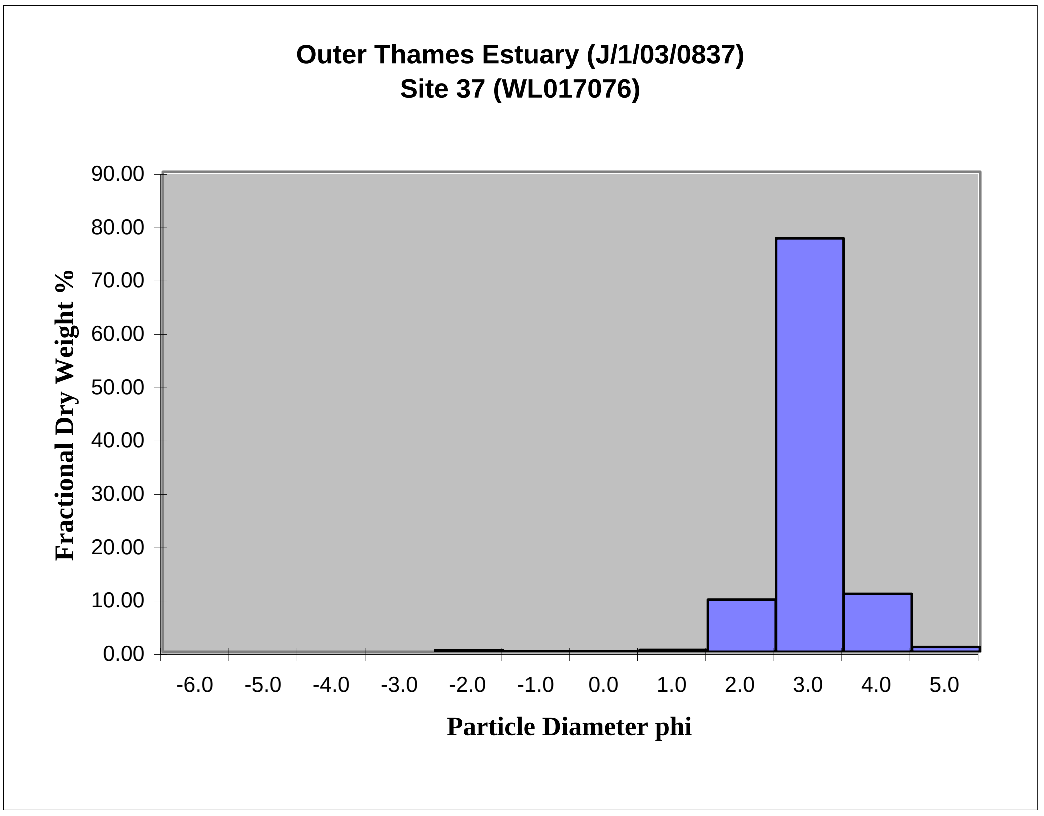
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.848	0.31	0.31
Coarse Sand	2	-1.0	0.395	0.14	0.45
	1	0.0	0.271	0.10	0.55
Medium Sand	0.5	1.0	1.050	0.38	0.93
	0.25	2.0	26.924	9.80	10.73
Fine Sand	0.125	3.0	213.109	77.53	88.26
	0.063	4.0	29.873	10.87	99.13
Silt/Clay	<0.063	5.0	2.392	0.87	100.00
		Total Weight	274.862	100.00	

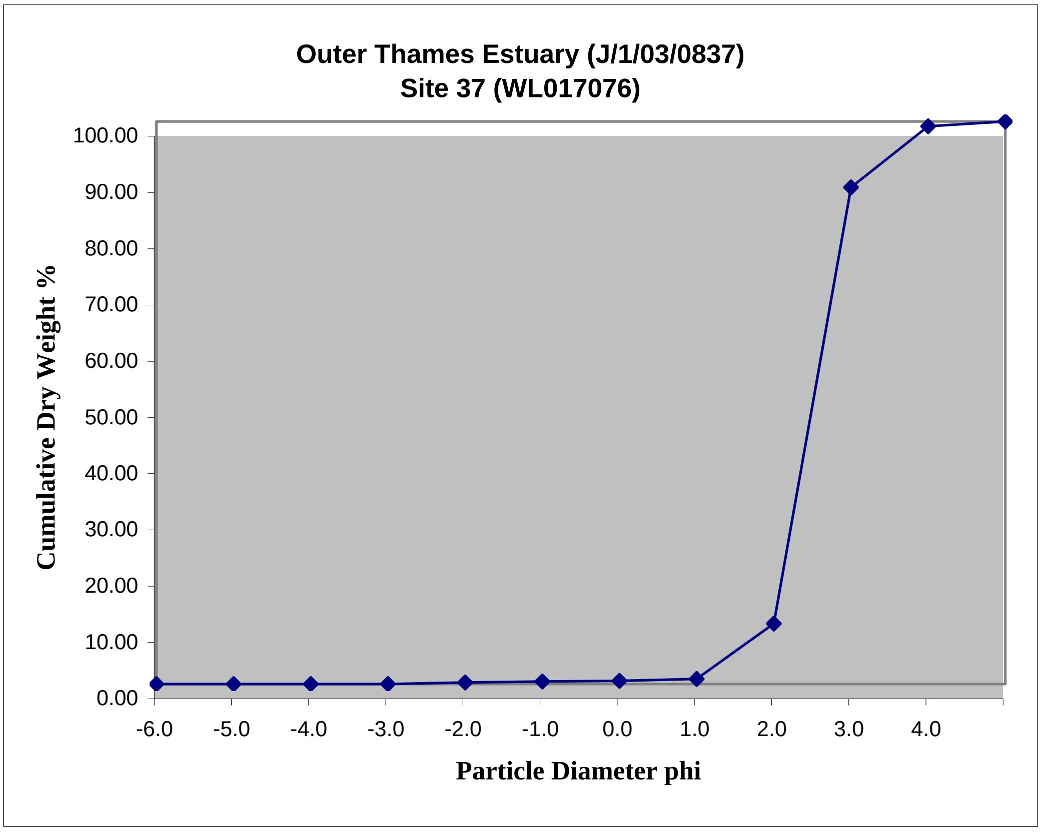
Mean mm	0.18
Md mm	0.18
Mean phi	2.51
Md phi	2.51
Sorting	0.45
Skq	-0.22
Kurtosis	0.96

%Gravel	0.31
% Sand	98.82
% Fines	0.87
% Org C	0.735

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 37 (WL017076)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 37 (WL017076)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 38 (WL017077)

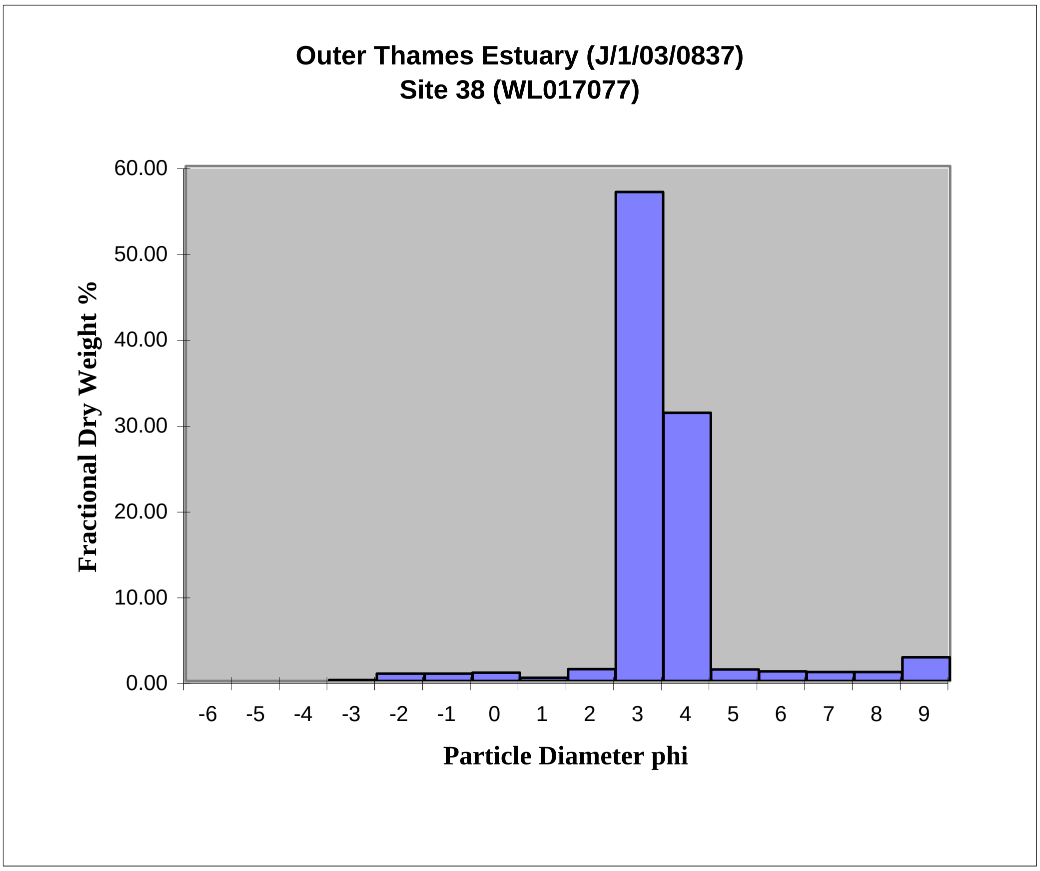
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.272	0.10	0.10
	4	-2.0	2.334	0.86	0.96
Coarse Sand	2	-1.0	2.363	0.87	1.82
	1	0.0	2.629	0.97	2.79
Medium Sand	0.5	1.0	0.970	0.36	3.15
	0.25	2.0	3.736	1.37	4.52
Fine Sand	0.125	3.0	155.171	56.97	61.49
	0.063	4.0	85.069	31.23	92.72
Silt	0.032	5.0	3.612	1.33	94.05
	0.0156	6.0	3.005	1.10	95.15
	0.0078	7.0	2.825	1.04	96.19
	0.0039	8.0	2.849	1.05	97.23
Clay	<0.0039	9.0	7.536	2.77	100.00
		Total Weight	272	100	

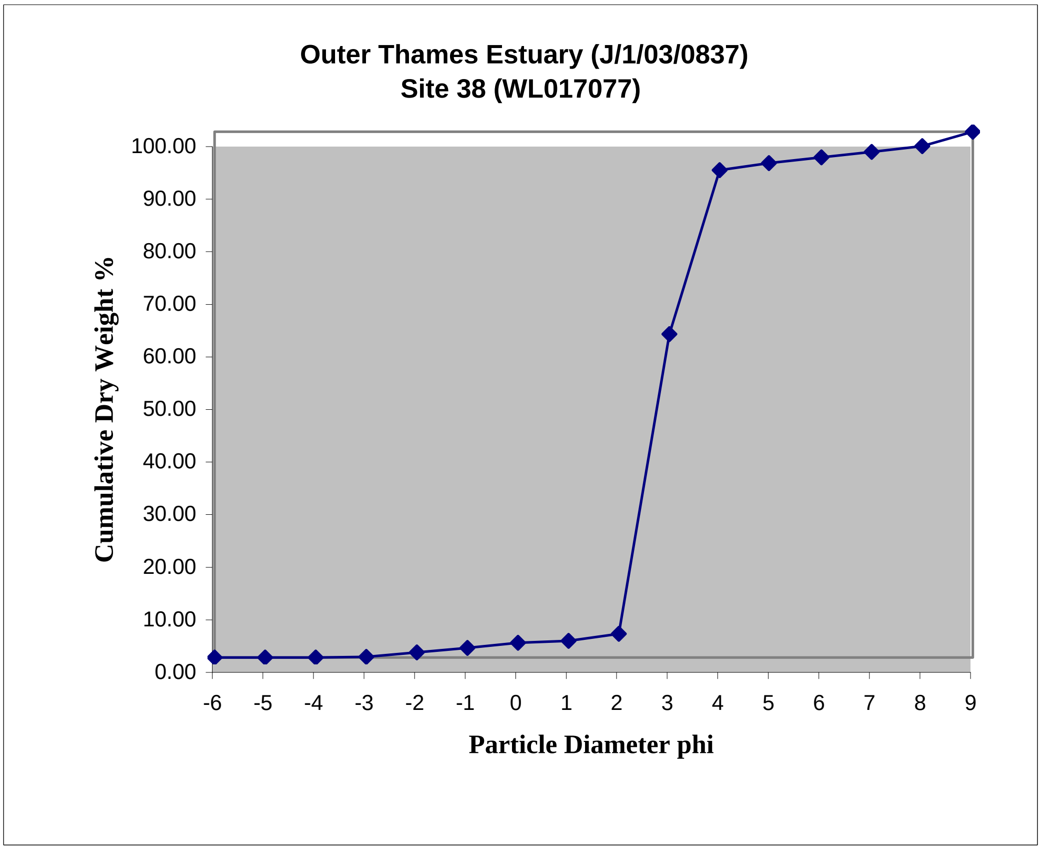
Mean mm	0.13
Md mm	0.14
Mean phi	2.90
Md phi	2.80
Sorting	0.96
Skq	0.40
Kurtosis	1.48

%Gravel	0.96
% Sand	91.76
% Fines	7.28
% Org C	1.030

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 38 (WL017077)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 38 (WL017077)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 39 (WL017078)

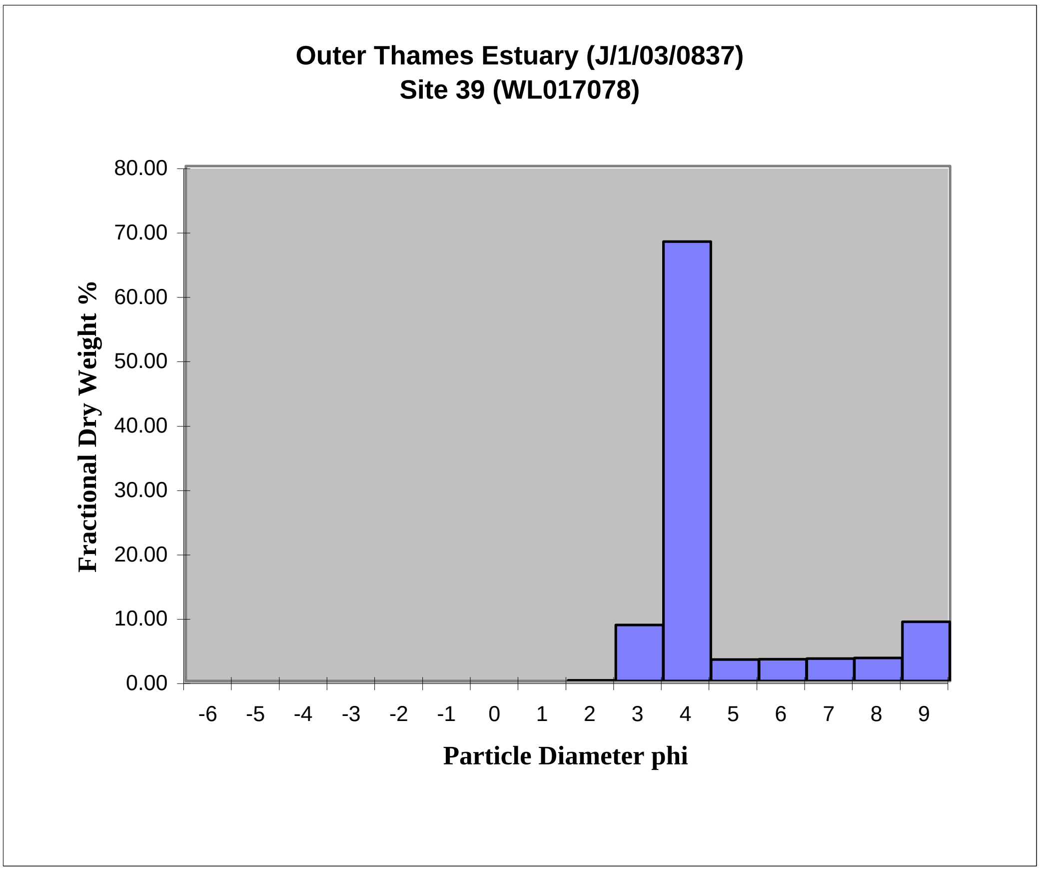
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.013	0.01	0.01
Medium Sand	0.5	1.0	0.026	0.01	0.02
	0.25	2.0	0.190	0.11	0.13
Fine Sand	0.125	3.0	15.595	8.69	8.82
	0.063	4.0	122.462	68.24	77.06
Silt	0.032	5.0	5.950	3.32	80.38
	0.0156	6.0	6.024	3.36	83.73
	0.0078	7.0	6.260	3.49	87.22
	0.0039	8.0	6.448	3.59	90.82
Clay	<0.0039	9.0	16.479	9.18	100.00
		Total Weight	179	100	

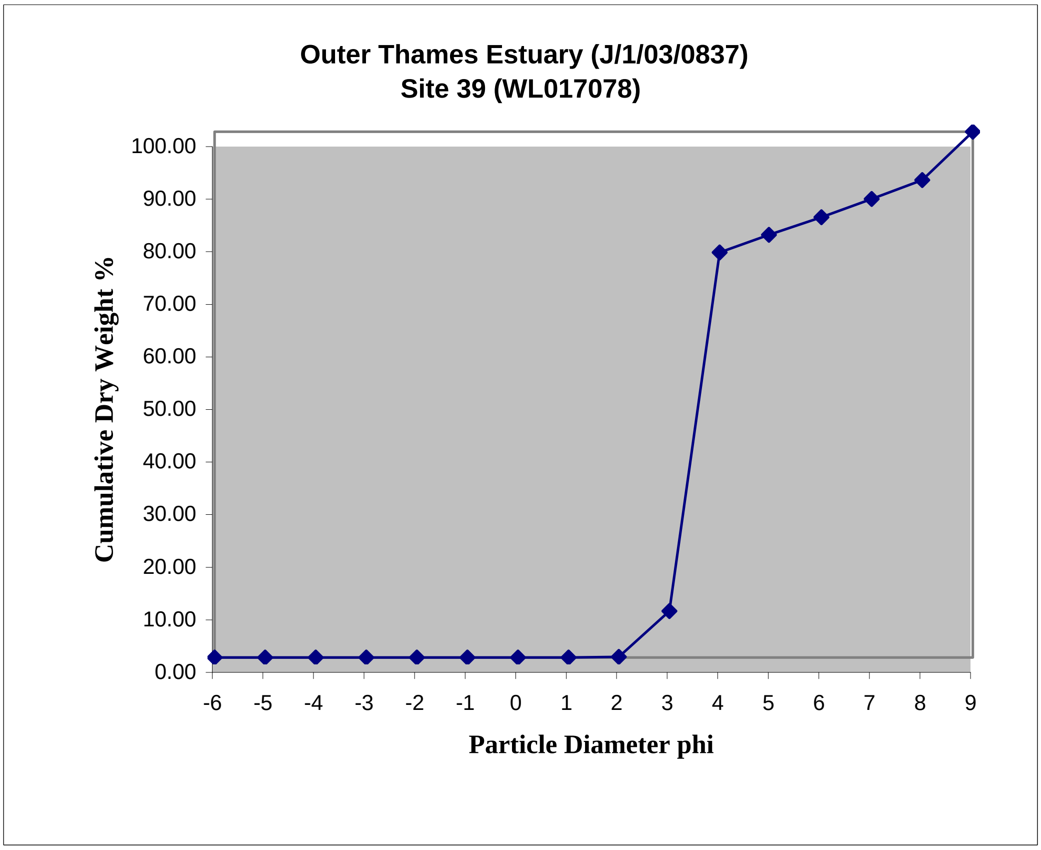
Mean mm	0.05
Md mm	0.08
Mean phi	4.26
Md phi	3.60
Sorting	1.56
Skq	0.64
Kurtosis	3.05

%Gravel	0.00
% Sand	77.06
% Fines	22.94
% Org C	1.646

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 39 (WL017078)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 39 (WL017078)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 40 (WL017079)

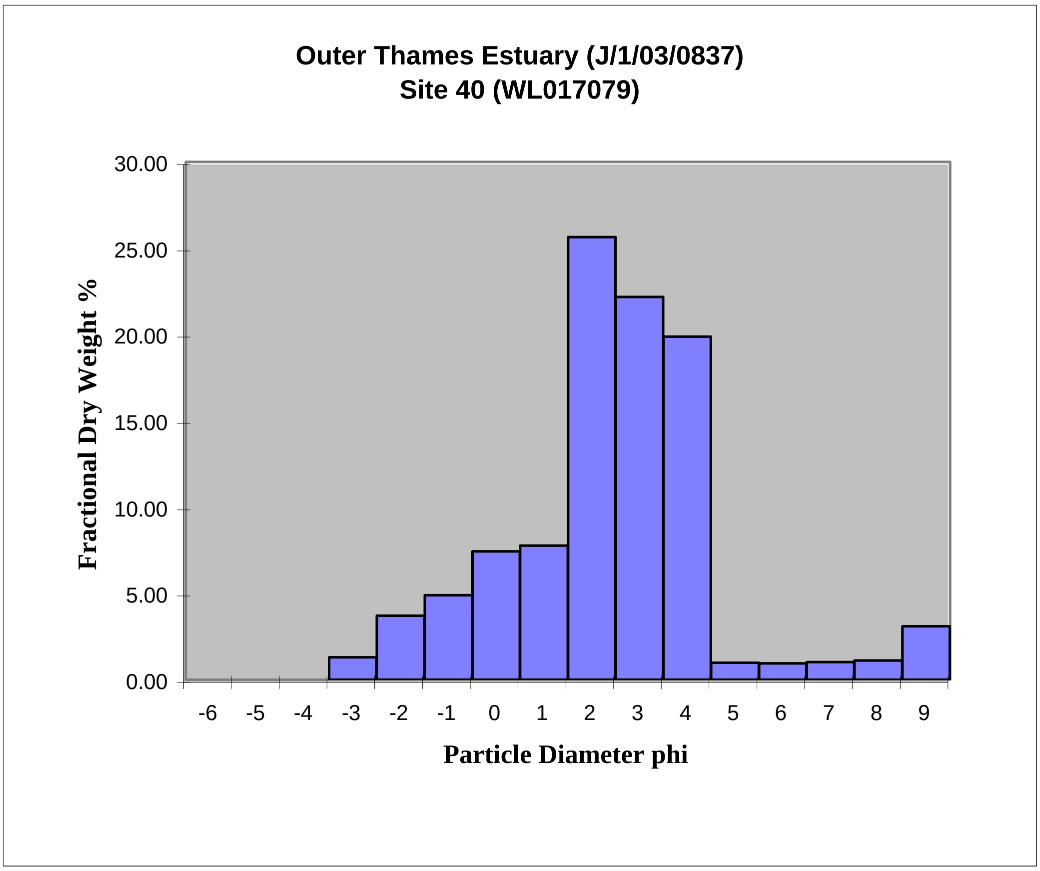
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	3.991	1.30	1.30
	4	-2.0	11.423	3.71	5.01
Coarse Sand	2	-1.0	15.069	4.90	9.90
	1	0.0	22.896	7.44	17.34
Medium Sand	0.5	1.0	23.941	7.78	25.12
	0.25	2.0	78.960	25.65	50.77
Fine Sand	0.125	3.0	68.282	22.18	72.95
	0.063	4.0	61.192	19.88	92.83
Silt	0.032	5.0	3.005	0.98	93.81
	0.0156	6.0	2.913	0.95	94.76
	0.0078	7.0	3.143	1.02	95.78
	0.0039	8.0	3.440	1.12	96.89
Clay	<0.0039	9.0	9.559	3.11	100.00
		Total Weight	308	100	

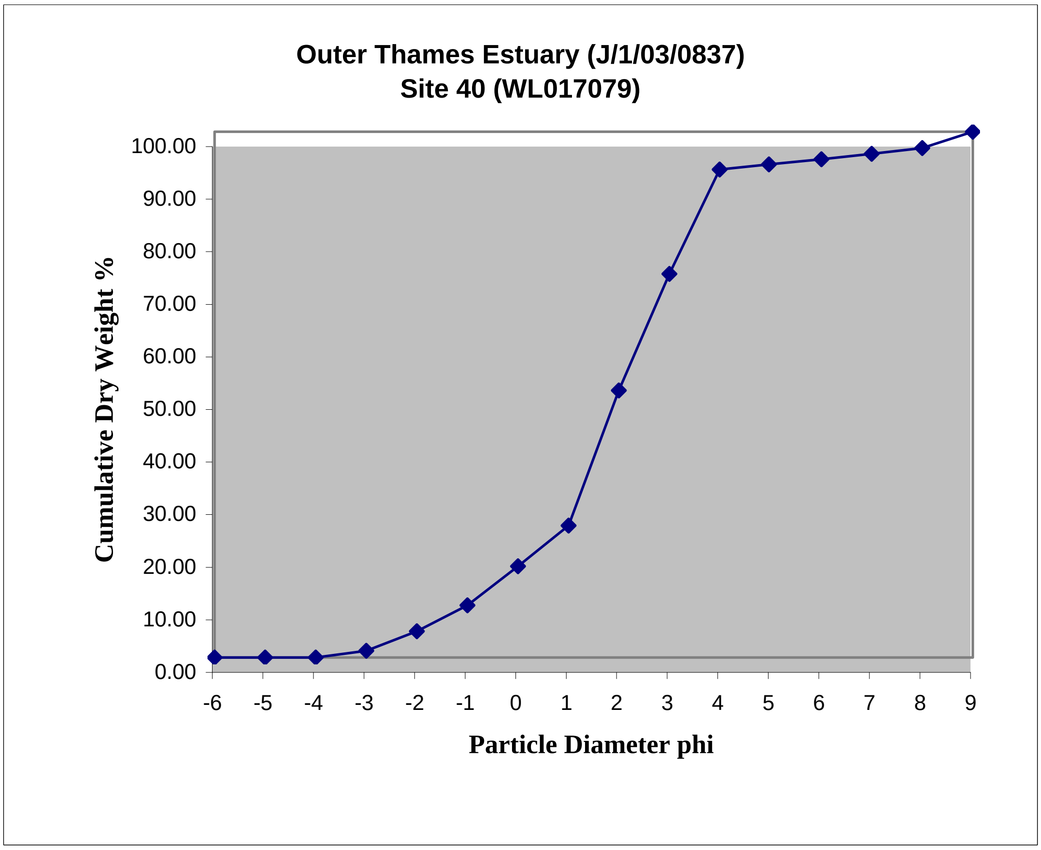
Mean mm	0.29
Md mm	0.26
Mean phi	1.78
Md phi	1.97
Sorting	2.18
Skq	-0.06
Kurtosis	1.60

%Gravel	5.01
% Sand	87.83
% Fines	7.17
% Org C	0.779

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 40 (WL017079)
Fractional Dry Weight %
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 40 (WL017079)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 41 (WL017080)

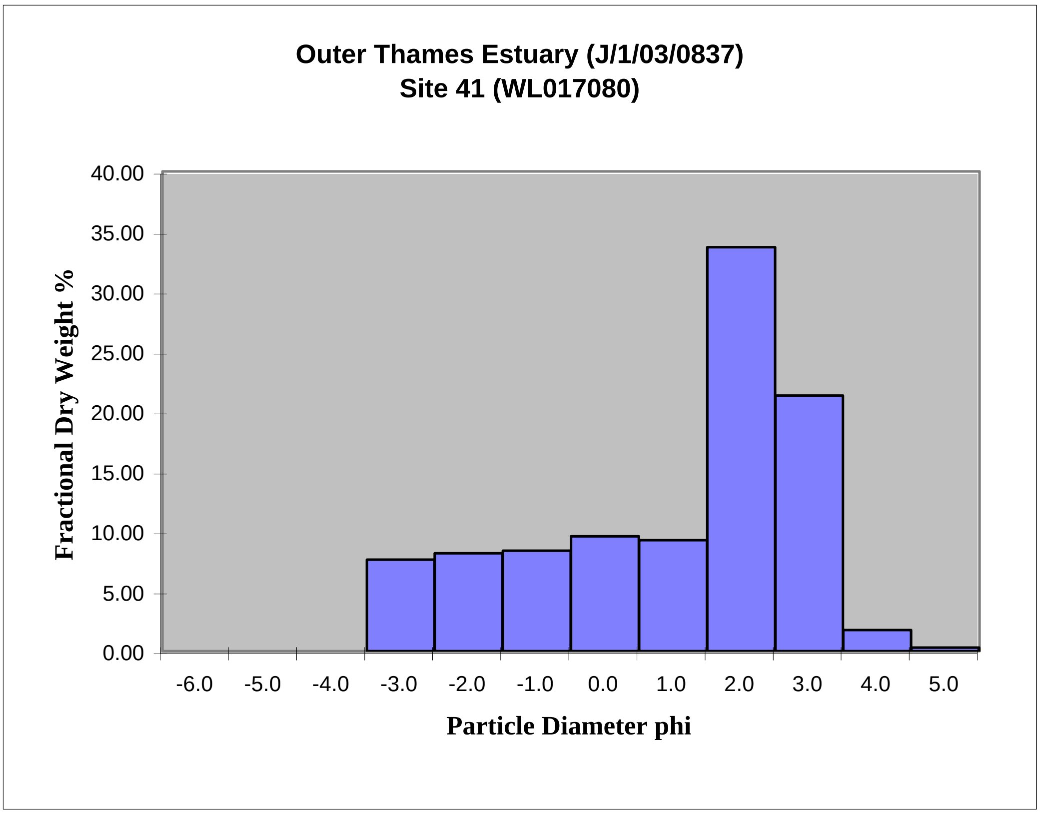
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	23.260	7.62	7.62
	4	-2.0	24.916	8.16	15.79
Coarse Sand	2	-1.0	25.532	8.37	24.15
	1	0.0	29.218	9.57	33.73
Medium Sand	0.5	1.0	28.215	9.25	42.97
	0.25	2.0	102.807	33.69	76.66
Fine Sand	0.125	3.0	65.016	21.30	97.97
	0.063	4.0	5.350	1.75	99.72
Silt/Clay	<0.063	5.0	0.855	0.28	100.00
		Total Weight	305.169	100.00	

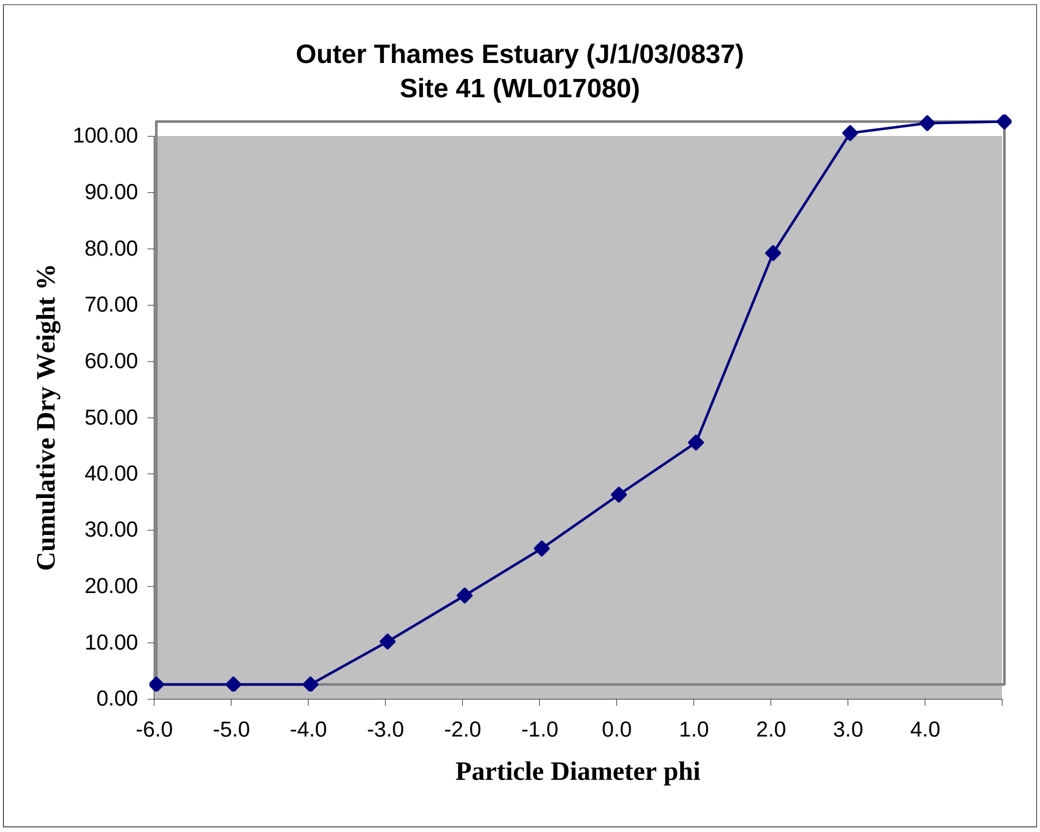
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.69
Md mm	0.43
Mean phi	0.53
Md phi	1.21
Sorting	2.02
Skq	-0.47
Kurtosis	0.89

%Gravel	15.79
% Sand	83.93
% Fines	0.28
% Org C	1.163

Sand


Outer Thames Estuary (J/1/03/0837)
Site 41 (WL017080)
Fractional Dry Weight %
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 41 (WL017080)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 42 (WL017081)

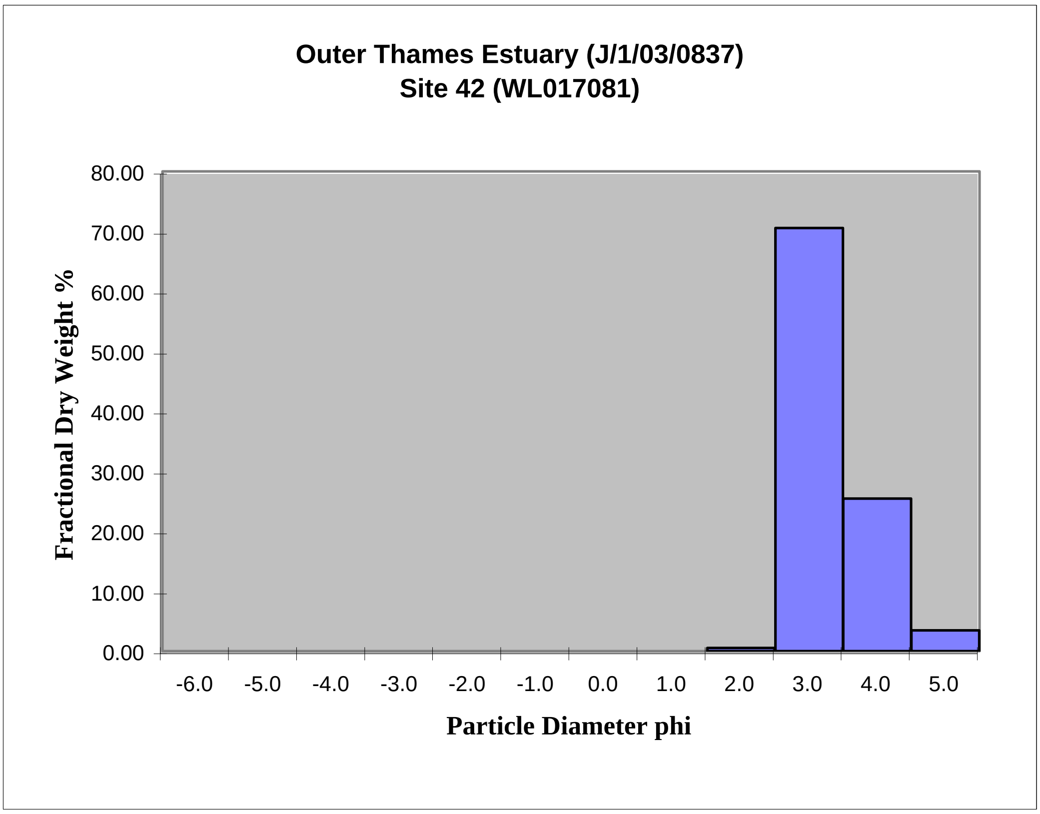
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.020	0.01	0.01
	0.25	2.0	1.453	0.53	0.54
Fine Sand	0.125	3.0	193.073	70.54	71.08
	0.063	4.0	69.673	25.45	96.53
Silt/Clay	<0.063	5.0	9.497	3.47	100.00
		Total Weight	273.716	100.00	

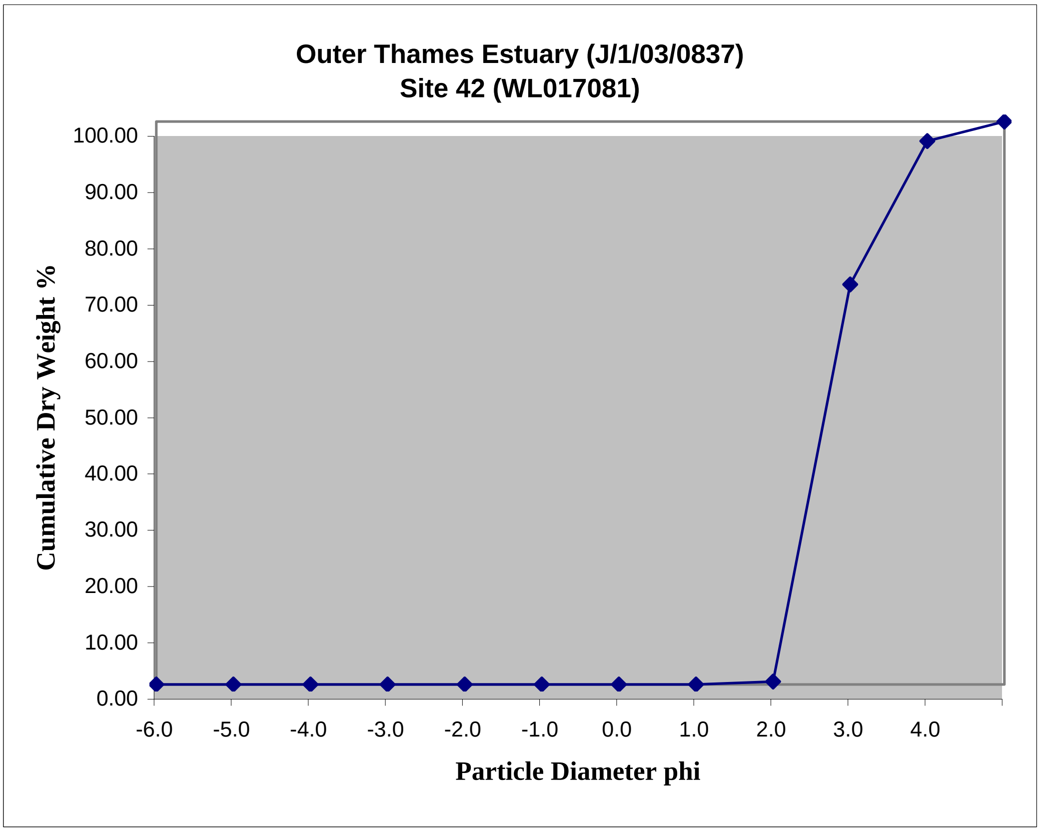
Mean mm	0.17
Md mm	0.15
Mean phi	2.58
Md phi	2.70
Sorting	0.24
Skq	-0.87
Kurtosis	0.41

%Gravel	0.00
% Sand	96.53
% Fines	3.47
% Org C	0.831

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 42 (WL017081)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 42 (WL017081)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 44 H (WL017083)

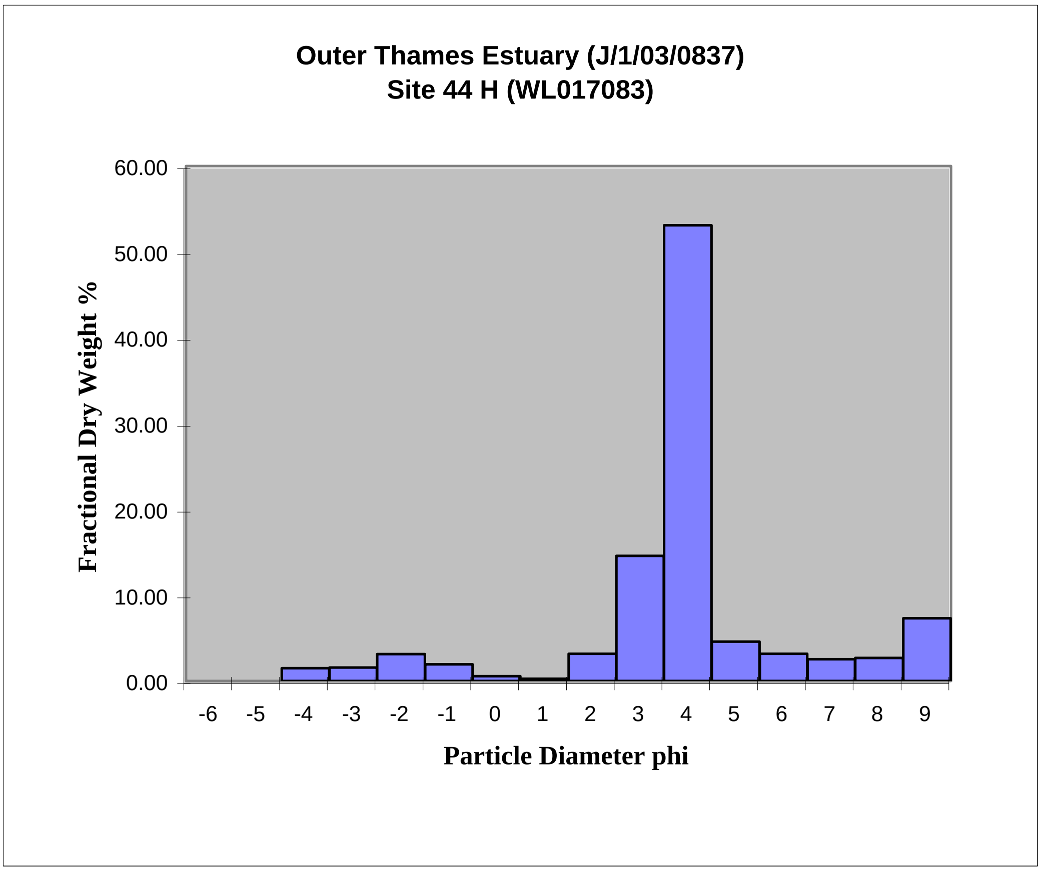
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	3.246	1.49	1.49
Gravel	8	-3.0	3.406	1.56	3.05
	4	-2.0	6.796	3.12	6.17
Coarse Sand	2	-1.0	4.206	1.93	8.10
	1	0.0	1.202	0.55	8.65
Medium Sand	0.5	1.0	0.534	0.24	8.89
	0.25	2.0	6.881	3.16	12.05
Fine Sand	0.125	3.0	31.756	14.57	26.62
	0.063	4.0	115.779	53.11	79.73
Silt	0.032	5.0	9.982	4.58	84.31
	0.0156	6.0	6.922	3.18	87.48
	0.0078	7.0	5.521	2.53	90.02
	0.0039	8.0	5.814	2.67	92.68
Clay	<0.0039	9.0	15.952	7.32	100.00
		Total Weight	218	100	

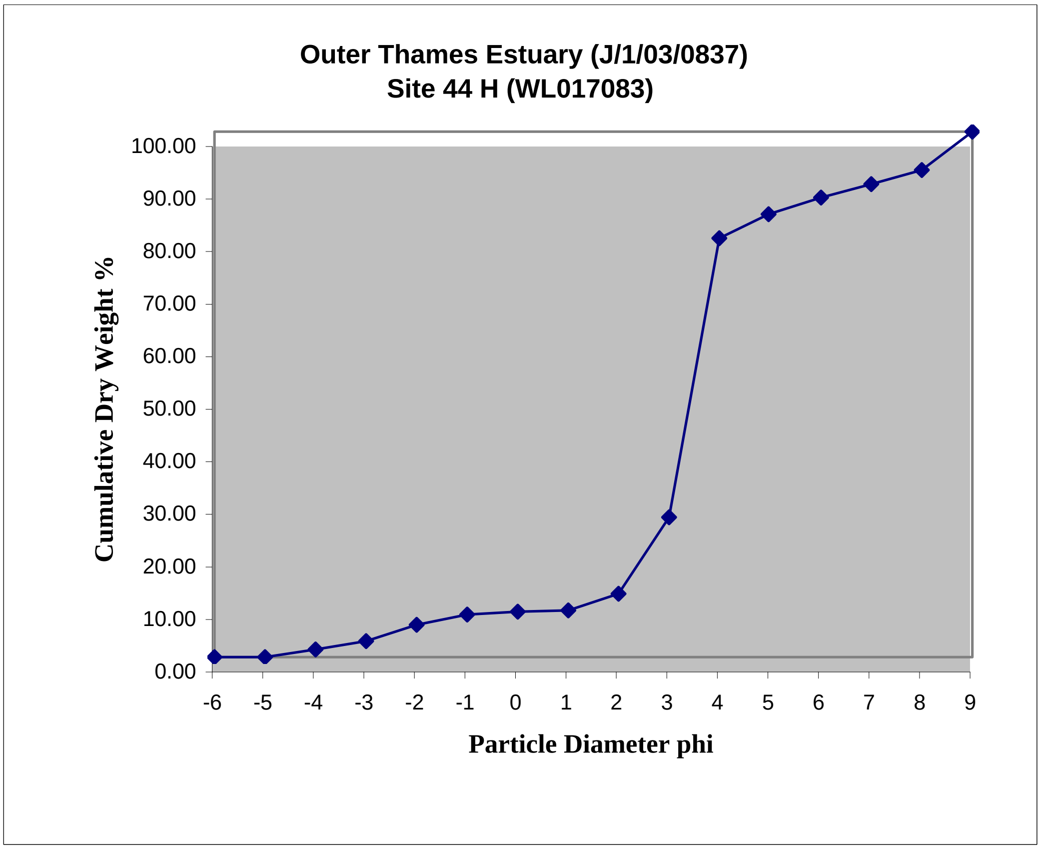
Mean mm	0.09
Md mm	0.09
Mean phi	3.54
Md phi	3.44
Sorting	2.23
Skq	0.00
Kurtosis	4.19

%Gravel	6.17
% Sand	73.56
% Fines	20.27
% Org C	1.224

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 44 H (WL017083)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 44 H (WL017083)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 45 (WL017084)

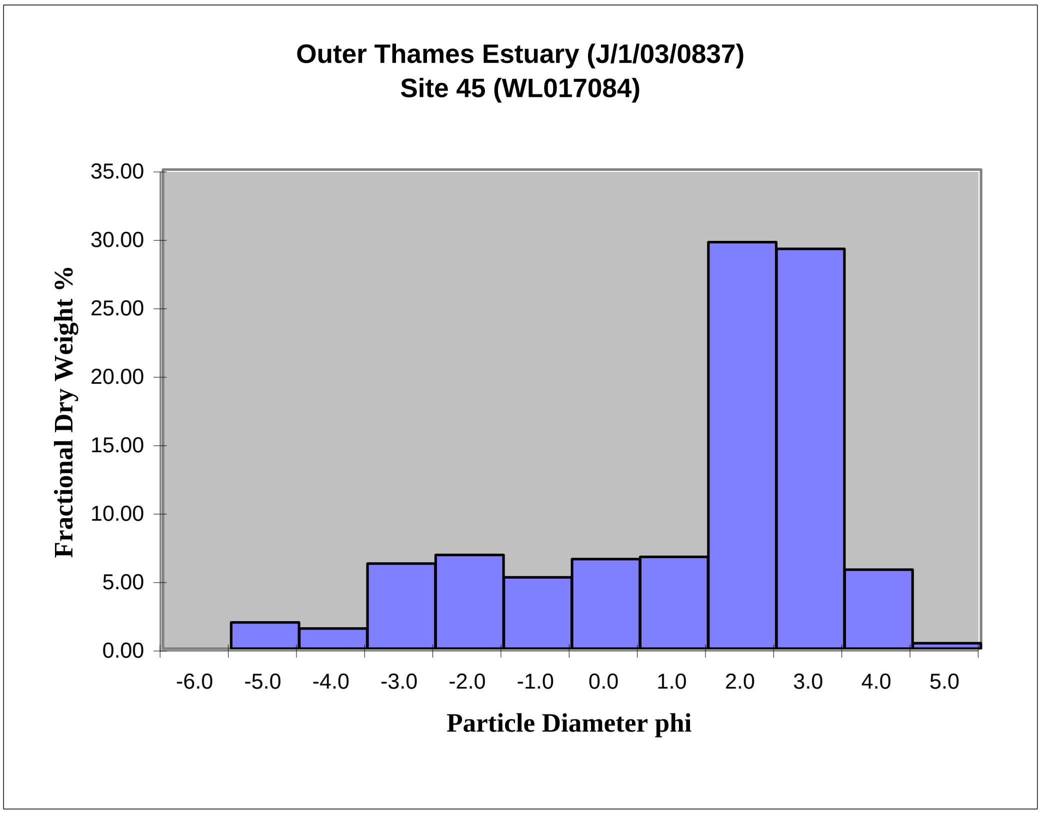
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	6.431	1.92	1.92
	16	-4.0	4.949	1.48	3.40
Gravel	8	-3.0	20.795	6.21	9.60
	4	-2.0	22.962	6.85	16.45
Coarse Sand	2	-1.0	17.452	5.21	21.66
	1	0.0	21.922	6.54	28.20
Medium Sand	0.5	1.0	22.440	6.70	34.90
	0.25	2.0	99.532	29.70	64.60
Fine Sand	0.125	3.0	97.901	29.22	93.82
	0.063	4.0	19.356	5.78	99.60
Silt/Clay	<0.063	5.0	1.352	0.40	100.00
		Total Weight	335.092	100.00	

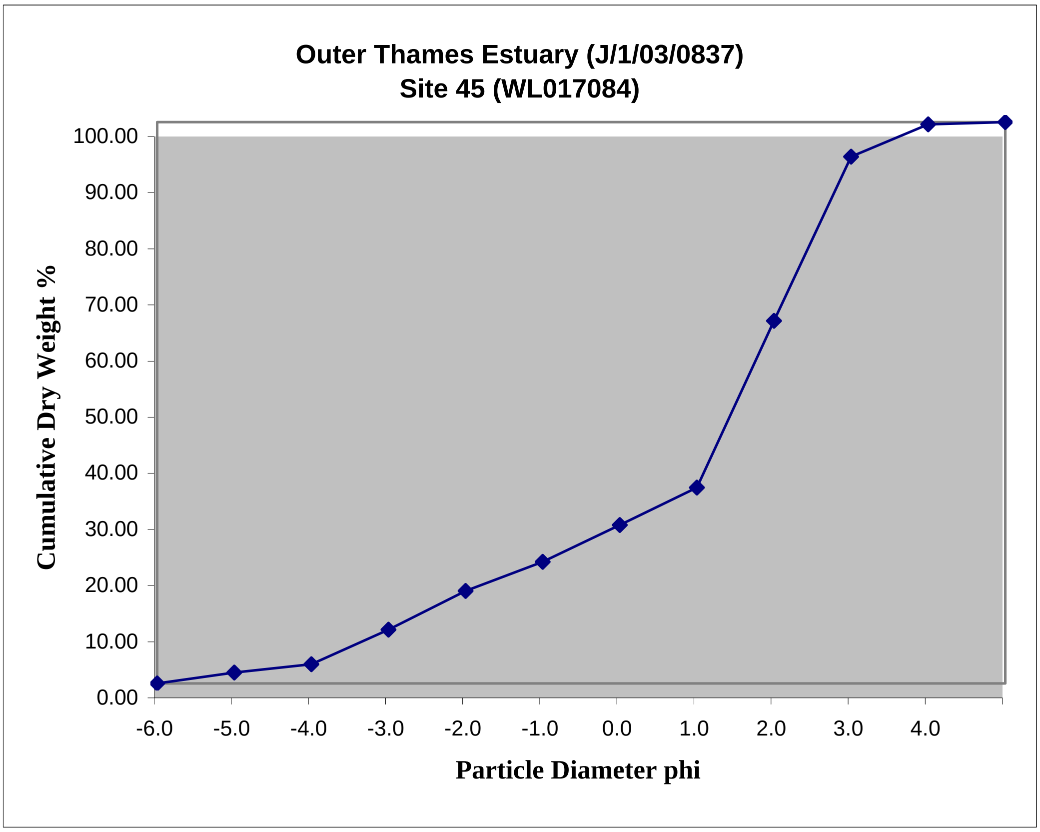
Mean mm	0.61
Md mm	0.35
Mean phi	0.70
Md phi	1.51
Sorting	2.20
Skq	-0.54
Kurtosis	0.97

%Gravel	16.45
% Sand	83.14
% Fines	0.40
% Org C	1.059

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 45 (WL017084)
Fractional Dry Weight %
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 45 (WL017084)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 46 (WL017085)

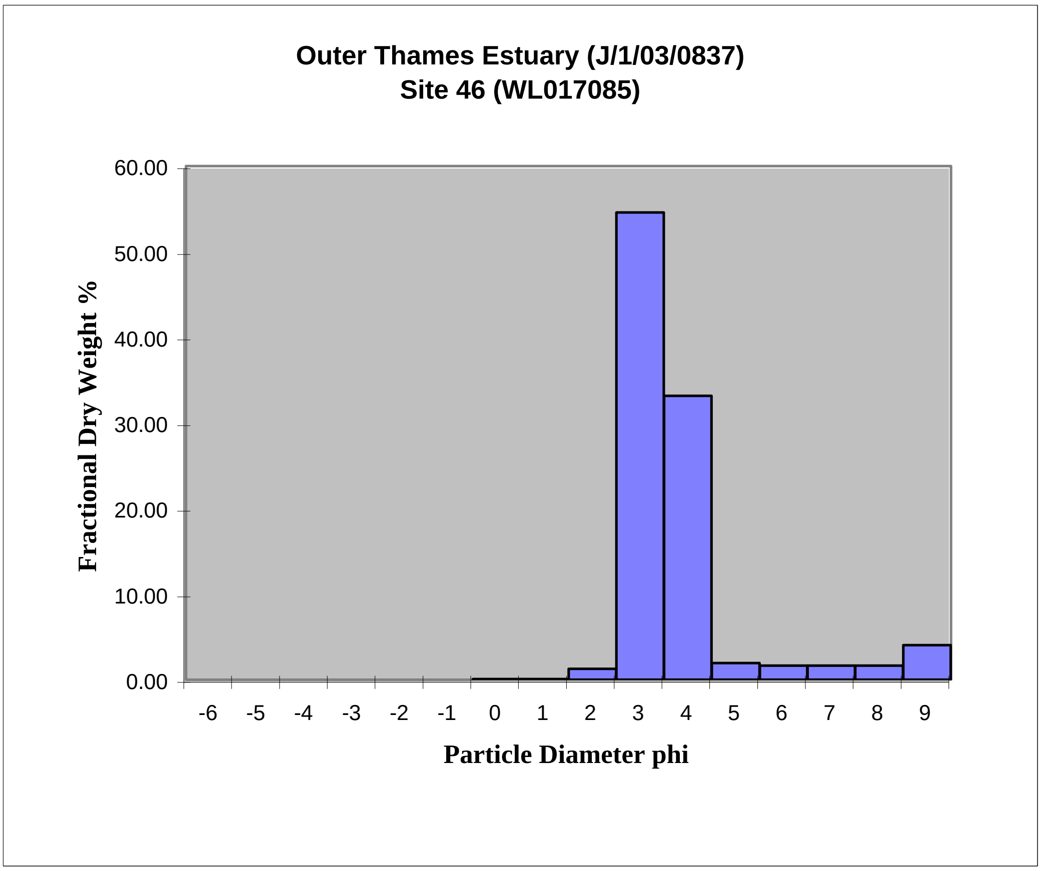
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.002	0.00	0.00
	1	0.0	0.063	0.02	0.02
Medium Sand	0.5	1.0	0.139	0.05	0.08
	0.25	2.0	3.477	1.28	1.36
Fine Sand	0.125	3.0	147.991	54.58	55.94
	0.063	4.0	89.897	33.15	89.09
Silt	0.032	5.0	5.258	1.94	91.03
	0.0156	6.0	4.468	1.65	92.68
	0.0078	7.0	4.458	1.64	94.32
	0.0039	8.0	4.452	1.64	95.96
Clay	<0.0039	9.0	10.946	4.04	100.00
		Total Weight	271	100	

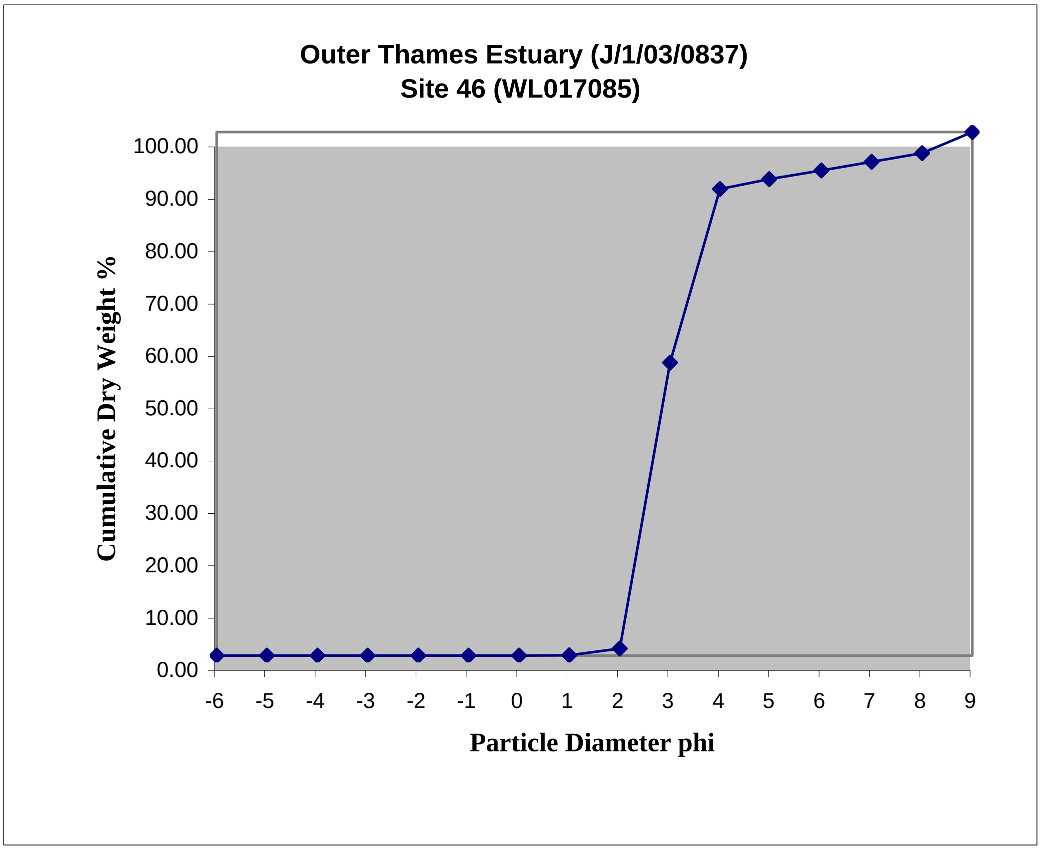
Mean mm	0.13
Md mm	0.13
Mean phi	3.00
Md phi	2.89
Sorting	1.20
Skq	0.45
Kurtosis	1.93

%Gravel	0.00
% Sand	89.09
% Fines	10.91
% Org C	0.848

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 46 (WL017085)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 46 (WL017085)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 47 (WL017086)

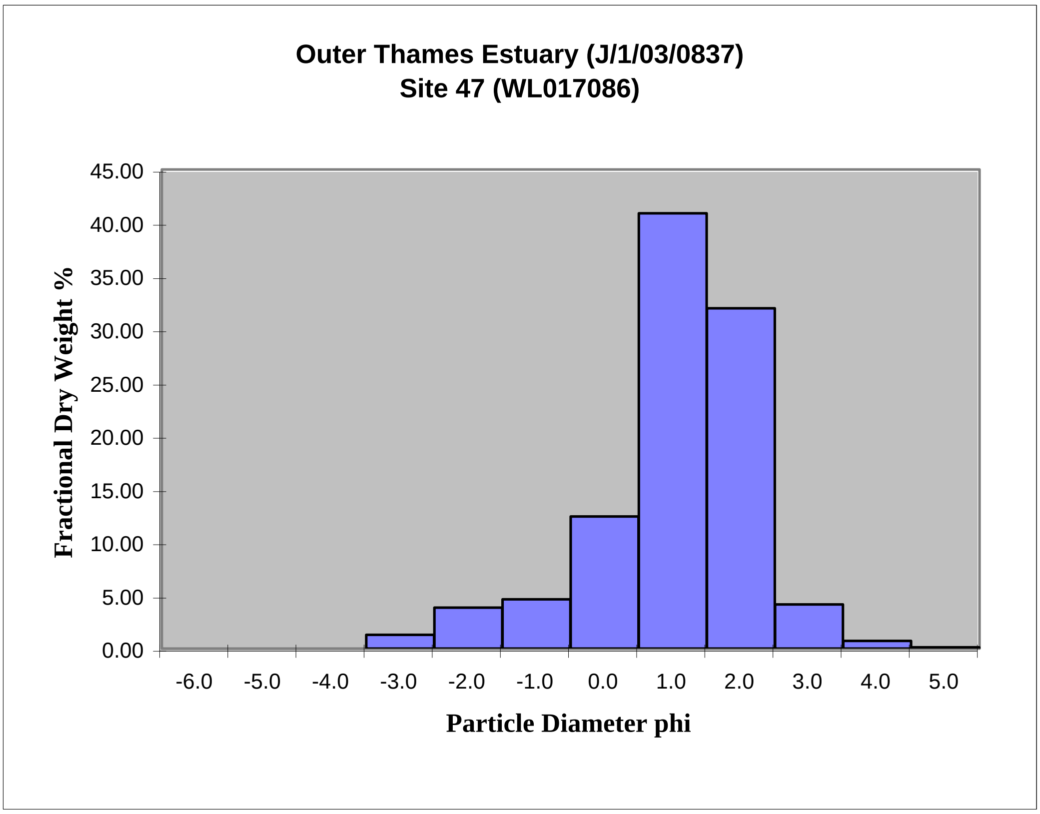
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	4.072	1.29	1.29
	4	-2.0	12.177	3.85	5.14
Coarse Sand	2	-1.0	14.649	4.63	9.77
	1	0.0	39.220	12.41	22.18
Medium Sand	0.5	1.0	129.247	40.88	63.06
	0.25	2.0	101.037	31.96	95.02
Fine Sand	0.125	3.0	13.097	4.14	99.16
	0.063	4.0	2.282	0.72	99.89
Silt/Clay	<0.063	5.0	0.363	0.11	100.00
		Total Weight	316.144	100.00	

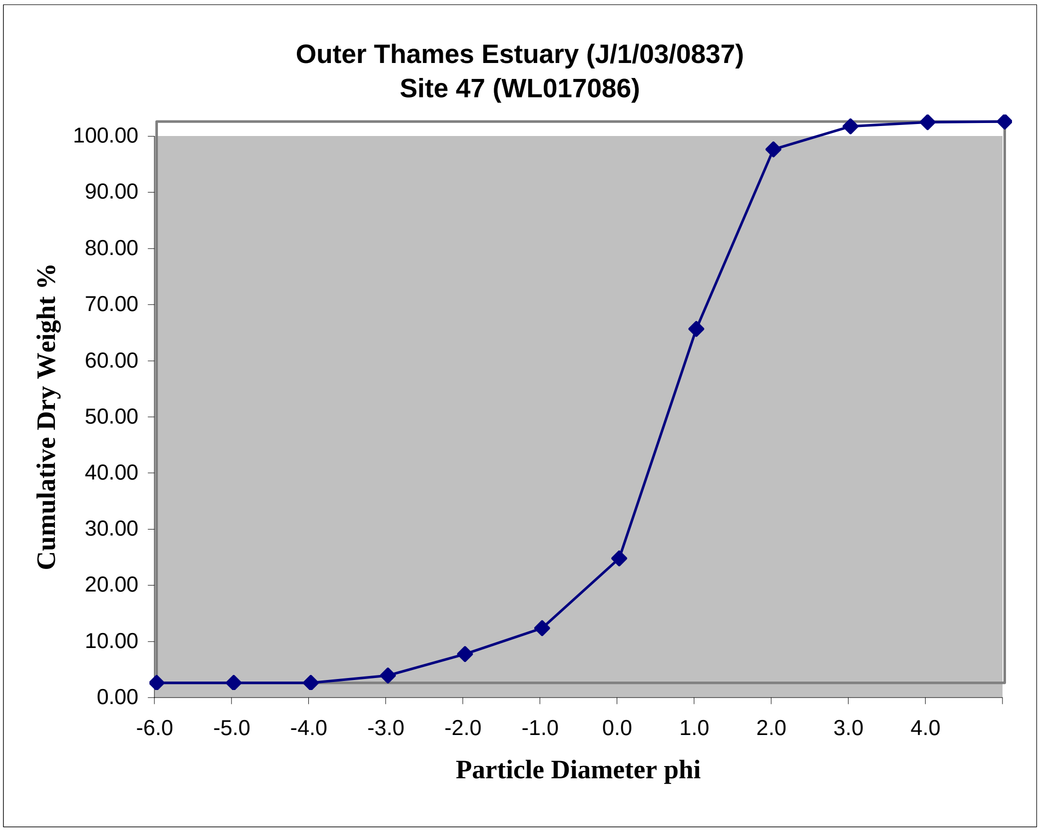
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.65
Md mm	0.62
Mean phi	0.61
Md phi	0.68
Sorting	1.15
Skq	-0.22
Kurtosis	1.27

%Gravel	5.14
% Sand	94.75
% Fines	0.11
% Org C	0.377

Sand


Outer Thames Estuary (J/1/03/0837)
Site 47 (WL017086)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 47 (WL017086)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 48 (WL017087)

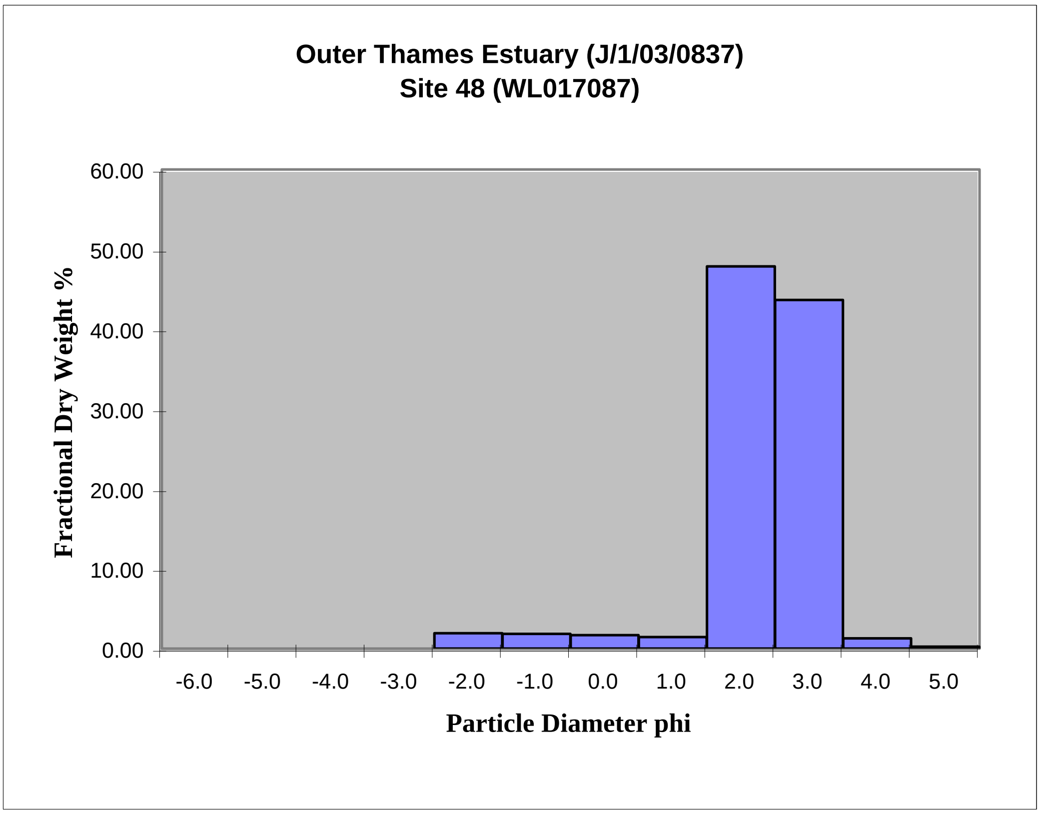
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	5.073	1.94	1.94
Coarse Sand	2	-1.0	4.808	1.84	3.78
	1	0.0	4.430	1.69	5.47
Medium Sand	0.5	1.0	3.786	1.45	6.92
	0.25	2.0	125.199	47.87	54.79
Fine Sand	0.125	3.0	114.217	43.67	98.47
	0.063	4.0	3.393	1.30	99.76
Silt/Clay	<0.063	5.0	0.621	0.24	100.00
		Total Weight	261.527	100.00	

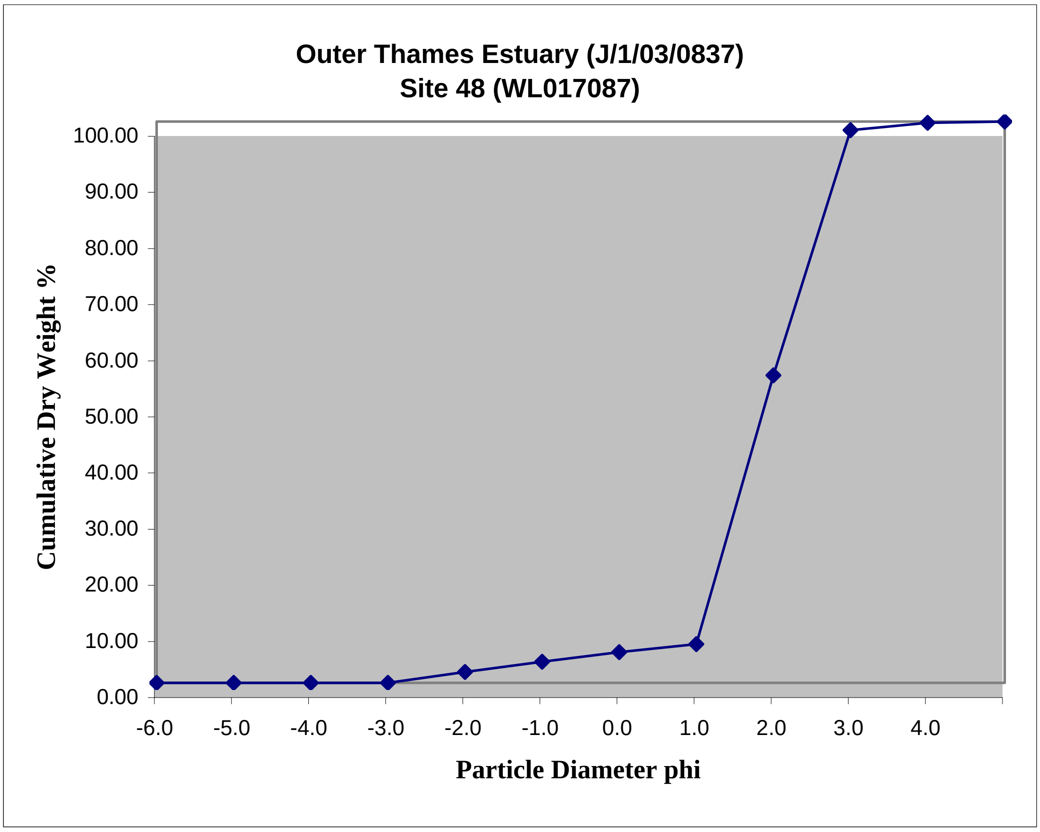
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.26
Md mm	0.27
Mean phi	1.92
Md phi	1.90
Sorting	0.85
Skq	-0.16
Kurtosis	1.21

%Gravel	1.94
% Sand	97.82
% Fines	0.24
% Org C	0.725

Sand


Outer Thames Estuary (J/1/03/0837)
Site 48 (WL017087)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 48 (WL017087)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 49 H (WL017088)

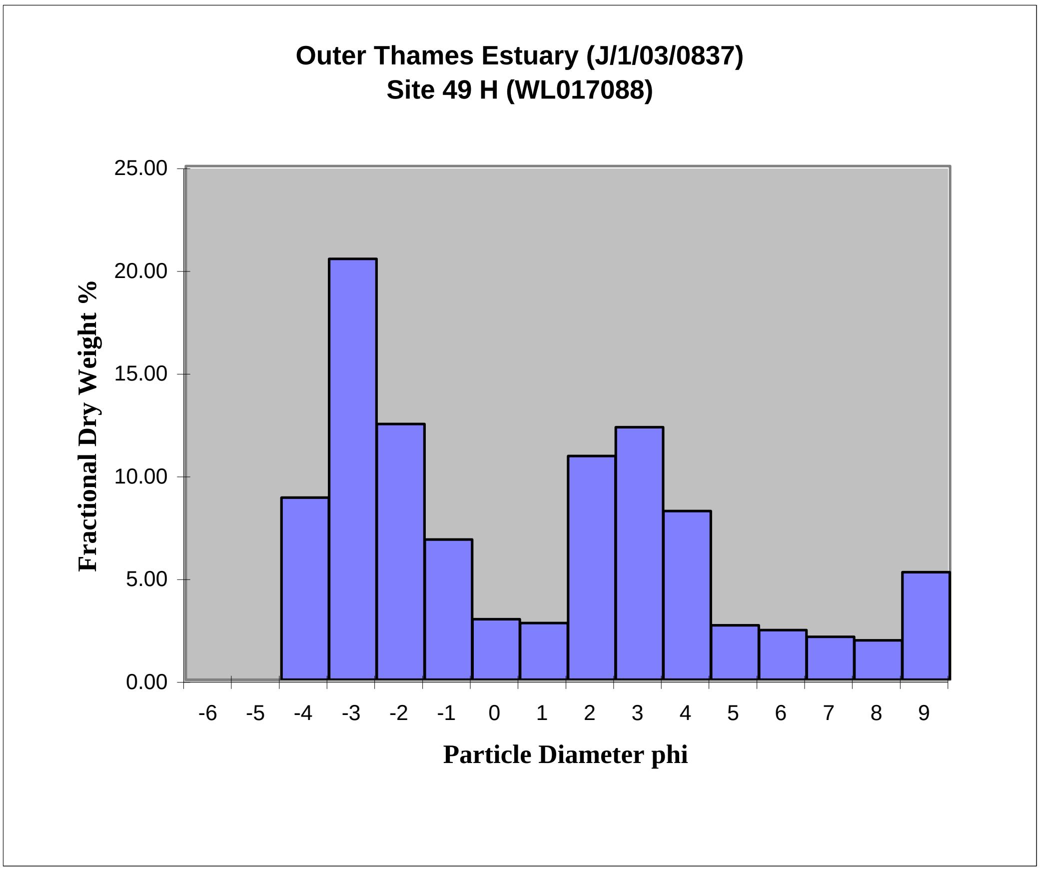
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	29.090	8.86	8.86
Gravel	8	-3.0	67.294	20.49	29.34
	4	-2.0	40.857	12.44	41.78
Coarse Sand	2	-1.0	22.391	6.82	48.60
	1	0.0	9.674	2.95	51.54
Medium Sand	0.5	1.0	9.060	2.76	54.30
	0.25	2.0	35.770	10.89	65.19
Fine Sand	0.125	3.0	40.370	12.29	77.48
	0.063	4.0	26.964	8.21	85.69
Silt	0.032	5.0	8.705	2.65	88.34
	0.0156	6.0	7.954	2.42	90.76
	0.0078	7.0	6.849	2.09	92.85
	0.0039	8.0	6.291	1.92	94.76
Clay	<0.0039	9.0	17.211	5.24	100.00
		Total Weight	328	100	

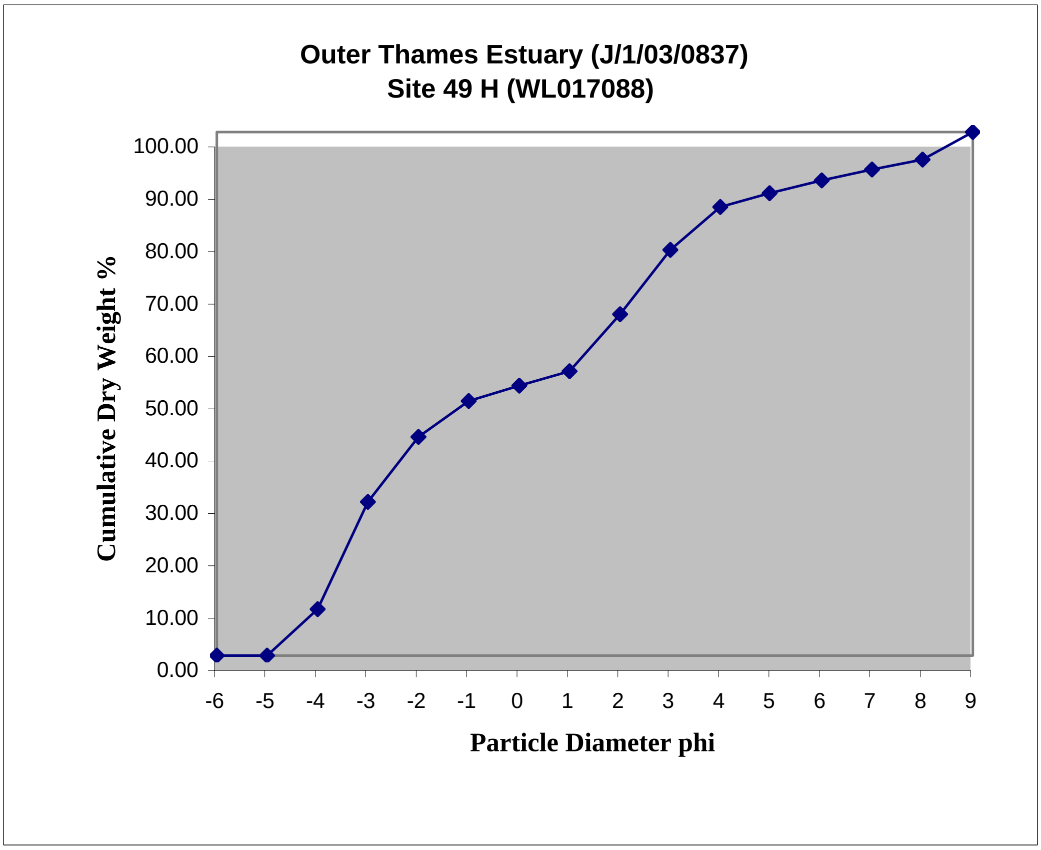
Mean mm	1.09
Md mm	1.44
Mean phi	-0.13
Md phi	-0.52
Sorting	3.74
Skq	0.26
Kurtosis	0.85

%Gravel	41.78
% Sand	43.91
% Fines	14.31
% Org C	1.705

Silty gravelly sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 49 H (WL017088)
Fractional Dry Weight %
25.00
20.00
15.00
10.00
5.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 49 H (WL017088)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 50 H (WL017089)

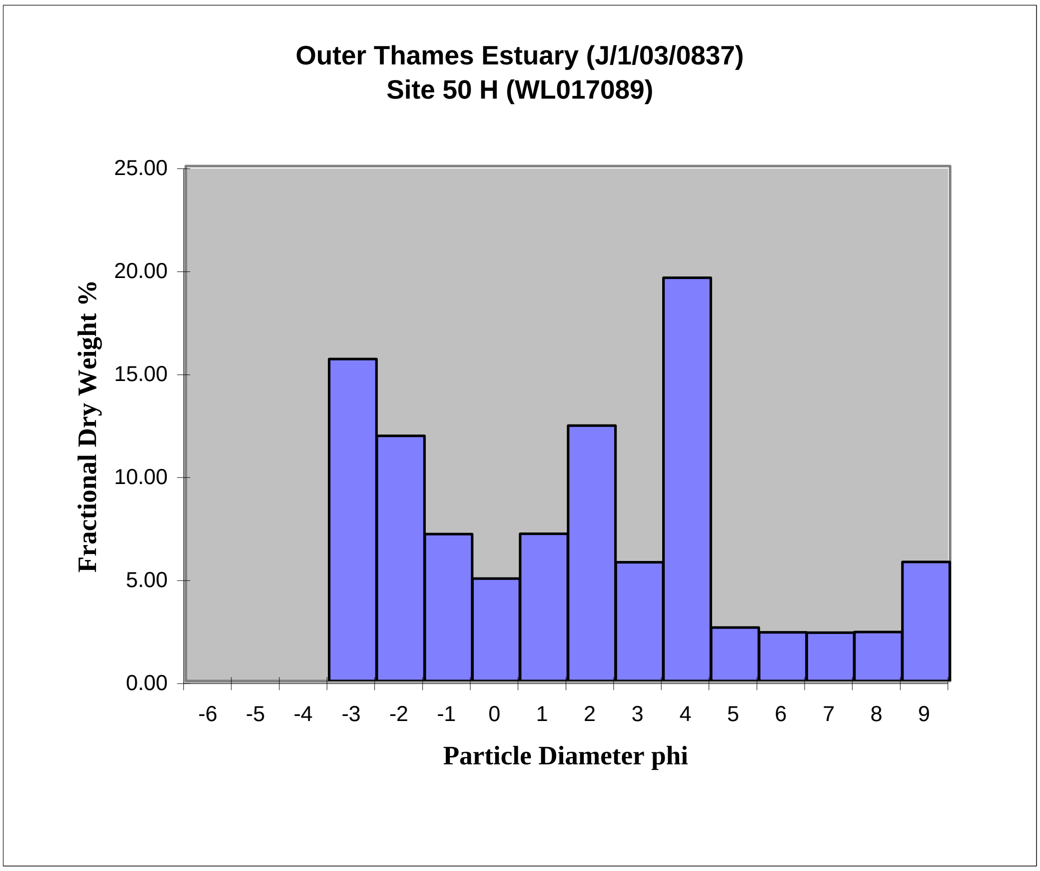
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	39.817	15.63	15.63
	4	-2.0	30.331	11.91	27.54
Coarse Sand	2	-1.0	18.157	7.13	34.67
	1	0.0	12.646	4.96	39.63
Medium Sand	0.5	1.0	18.223	7.15	46.78
	0.25	2.0	31.566	12.39	59.18
Fine Sand	0.125	3.0	14.703	5.77	64.95
	0.063	4.0	49.877	19.58	84.53
Silt	0.032	5.0	6.603	2.59	87.12
	0.0156	6.0	6.028	2.37	89.49
	0.0078	7.0	5.993	2.35	91.84
	0.0039	8.0	6.053	2.38	94.21
Clay	<0.0039	9.0	14.736	5.79	100.00
		Total Weight	255	100	

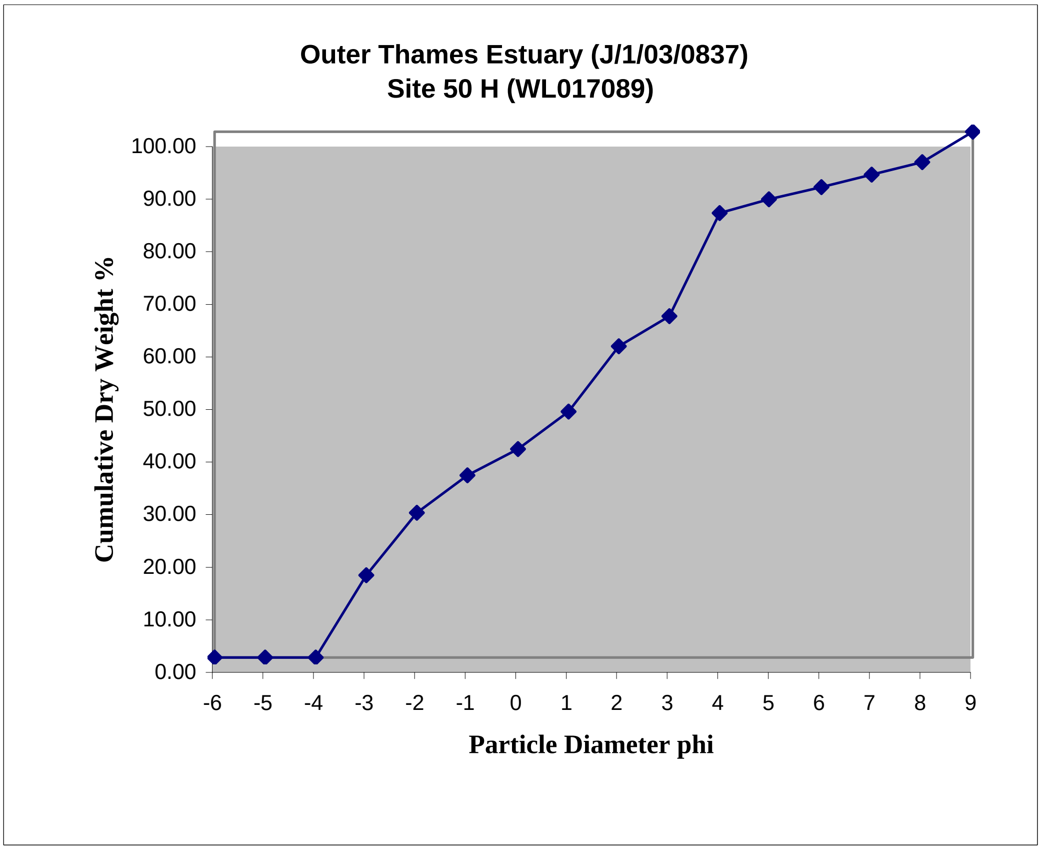
Mean mm	0.59
Md mm	0.42
Mean phi	0.75
Md phi	1.26
Sorting	3.50
Skq	-0.03
Kurtosis	0.84

%Gravel	27.54
% Sand	56.99
% Fines	15.47
% Org C	1.382

Silty gravelly sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 50 H (WL017089)
Fractional Dry Weight %
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 50 H (WL017089)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 51 (WL017090)

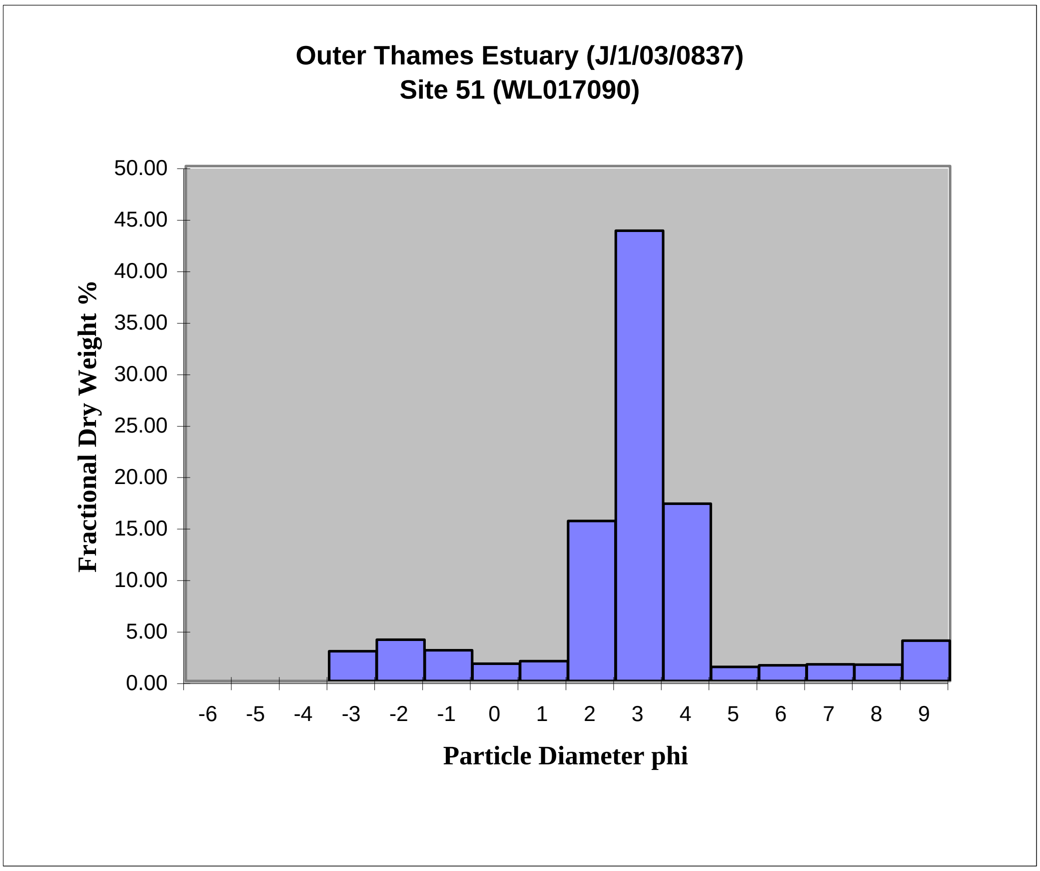
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	6.716	2.89	2.89
	4	-2.0	9.306	4.01	6.90
Coarse Sand	2	-1.0	6.924	2.98	9.88
	1	0.0	3.896	1.68	11.56
Medium Sand	0.5	1.0	4.450	1.92	13.48
	0.25	2.0	36.112	15.55	29.03
Fine Sand	0.125	3.0	101.531	43.73	72.76
	0.063	4.0	39.975	17.22	89.97
Silt	0.032	5.0	3.193	1.38	91.35
	0.0156	6.0	3.535	1.52	92.87
	0.0078	7.0	3.753	1.62	94.49
	0.0039	8.0	3.704	1.60	96.08
Clay	<0.0039	9.0	9.095	3.92	100.00
		Total Weight	232	100	

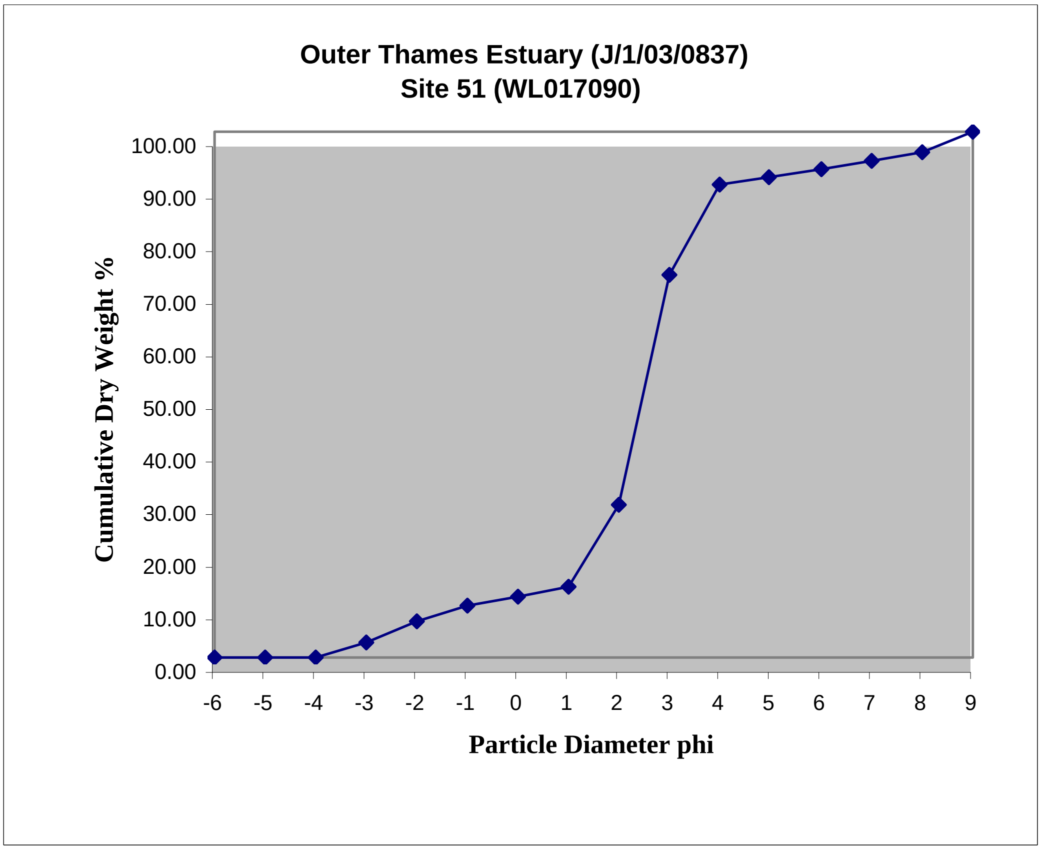
Mean mm	0.19
Md mm	0.18
Mean phi	2.43
Md phi	2.48
Sorting	2.11
Skq	-0.04
Kurtosis	2.89

%Gravel	6.90
% Sand	83.07
% Fines	10.03
% Org C	1.173

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 51 (WL017090)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 51 (WL017090)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 52 (WL017091)

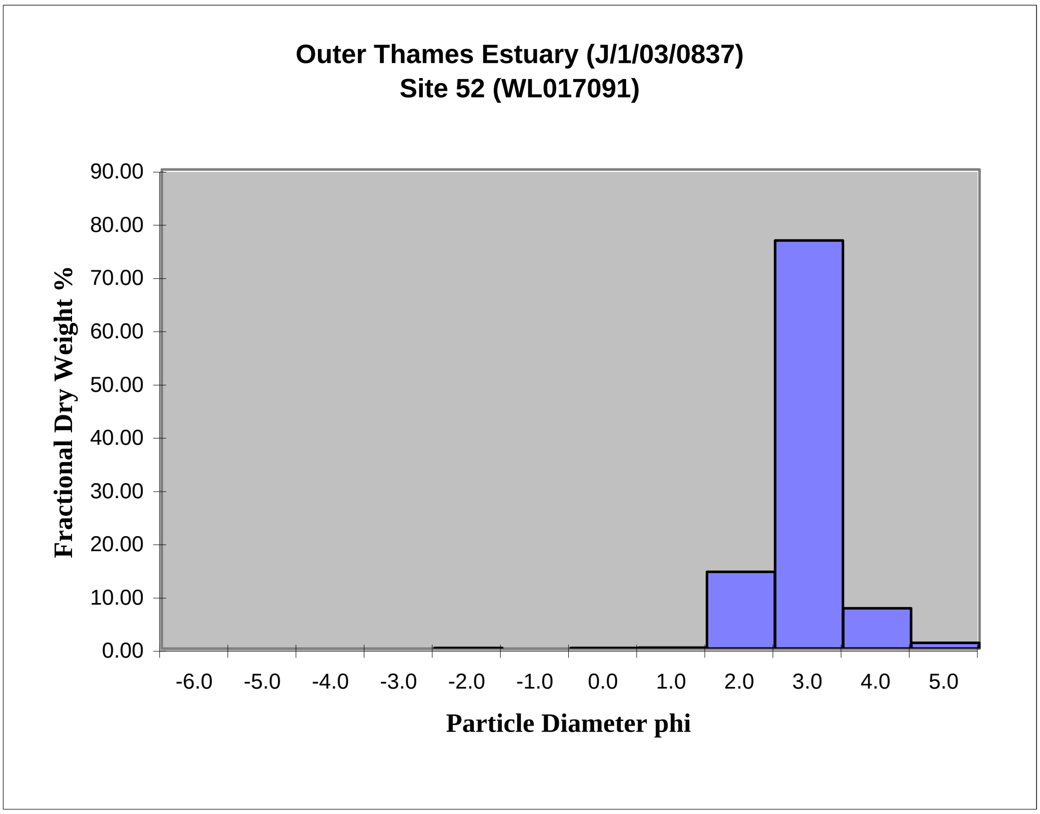
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.130	0.05	0.05
Coarse Sand	2	-1.0	0.062	0.02	0.08
	1	0.0	0.121	0.05	0.13
Medium Sand	0.5	1.0	0.475	0.19	0.32
	0.25	2.0	35.770	14.40	14.72
Fine Sand	0.125	3.0	190.412	76.66	91.38
	0.063	4.0	18.788	7.56	98.95
Silt/Clay	<0.063	5.0	2.616	1.05	100.00
		Total Weight	248.374	100.00	

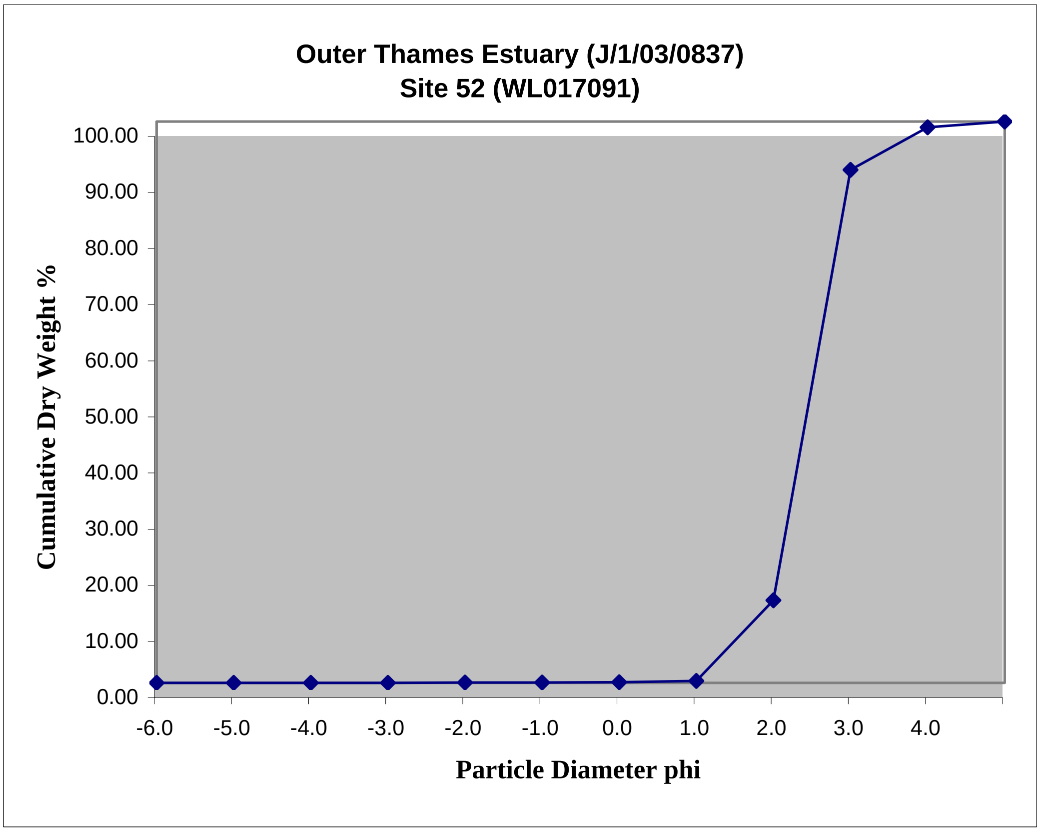
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.18
Md mm	0.18
Mean phi	2.46
Md phi	2.46
Sorting	0.47
Skq	-0.19
Kurtosis	1.03

%Gravel	0.05
% Sand	98.89
% Fines	1.05
% Org C	0.776

Sand


Outer Thames Estuary (J/1/03/0837)
Site 52 (WL017091)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 52 (WL017091)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 53 (WL017092)

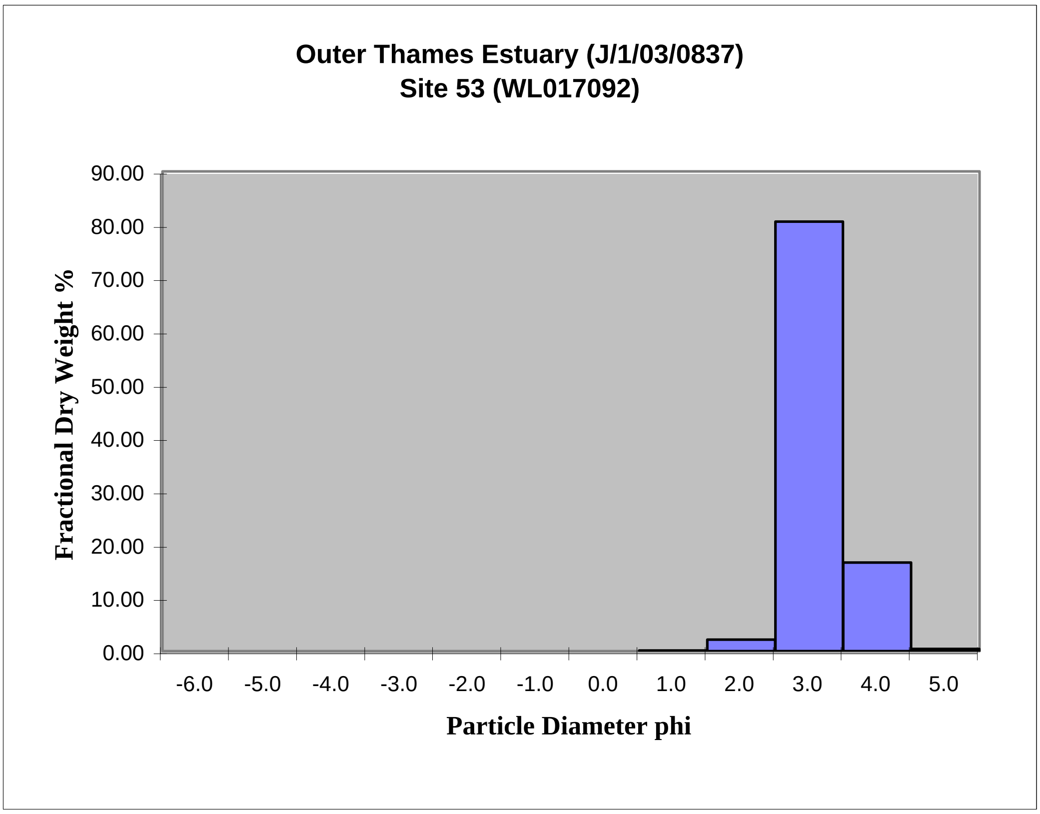
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.043	0.02	0.02
	1	0.0	0.073	0.03	0.04
Medium Sand	0.5	1.0	0.389	0.15	0.19
	0.25	2.0	5.589	2.15	2.34
Fine Sand	0.125	3.0	209.708	80.58	82.92
	0.063	4.0	43.268	16.63	99.55
Silt/Clay	<0.063	5.0	1.169	0.45	100.00
		Total Weight	260.239	100.00	

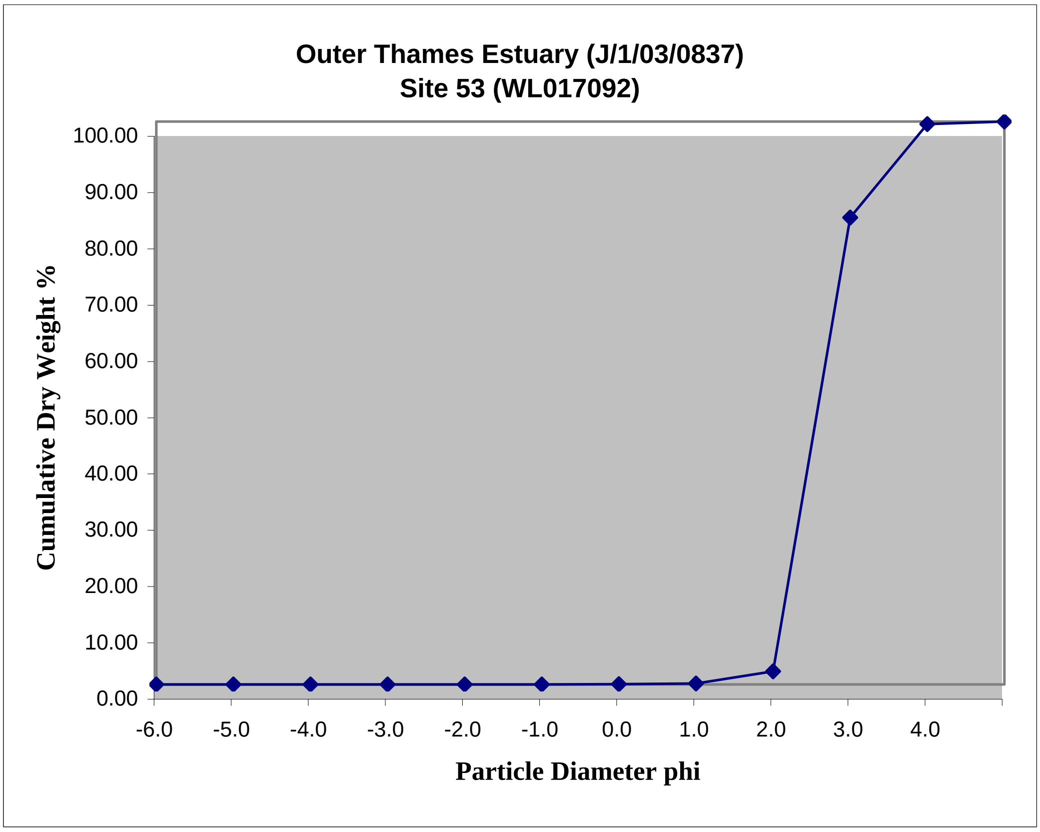
Mean mm	0.17
Md mm	0.17
Mean phi	2.58
Md phi	2.59
Sorting	0.33
Skq	-0.20
Kurtosis	0.54

%Gravel	0.00
% Sand	99.55
% Fines	0.45
% Org C	0.558

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 53 (WL017092)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 53 (WL017092)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 54 (WL017093)

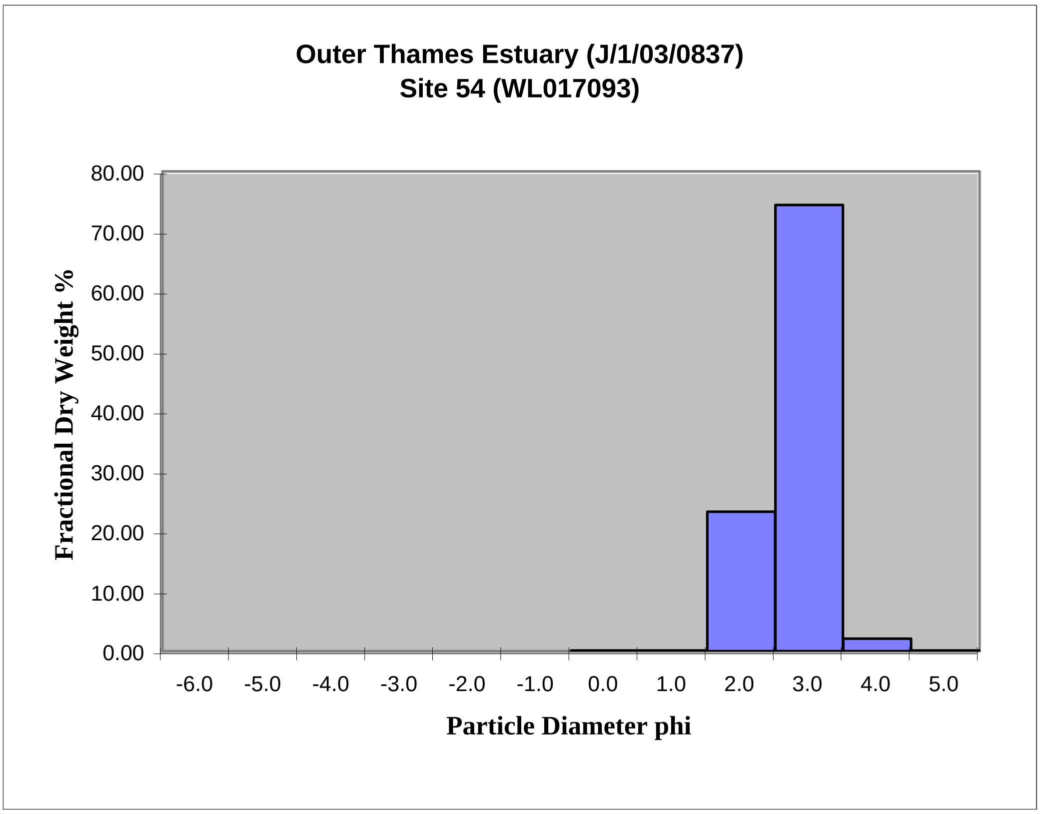
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.059	0.02	0.02
Coarse Sand	2	-1.0	0.052	0.02	0.04
	1	0.0	0.120	0.05	0.09
Medium Sand	0.5	1.0	0.282	0.11	0.19
	0.25	2.0	61.452	23.28	23.47
Fine Sand	0.125	3.0	196.434	74.40	97.87
	0.063	4.0	5.453	2.07	99.94
Silt/Clay	<0.063	5.0	0.162	0.06	100.00
		Total Weight	264.014	100.00	

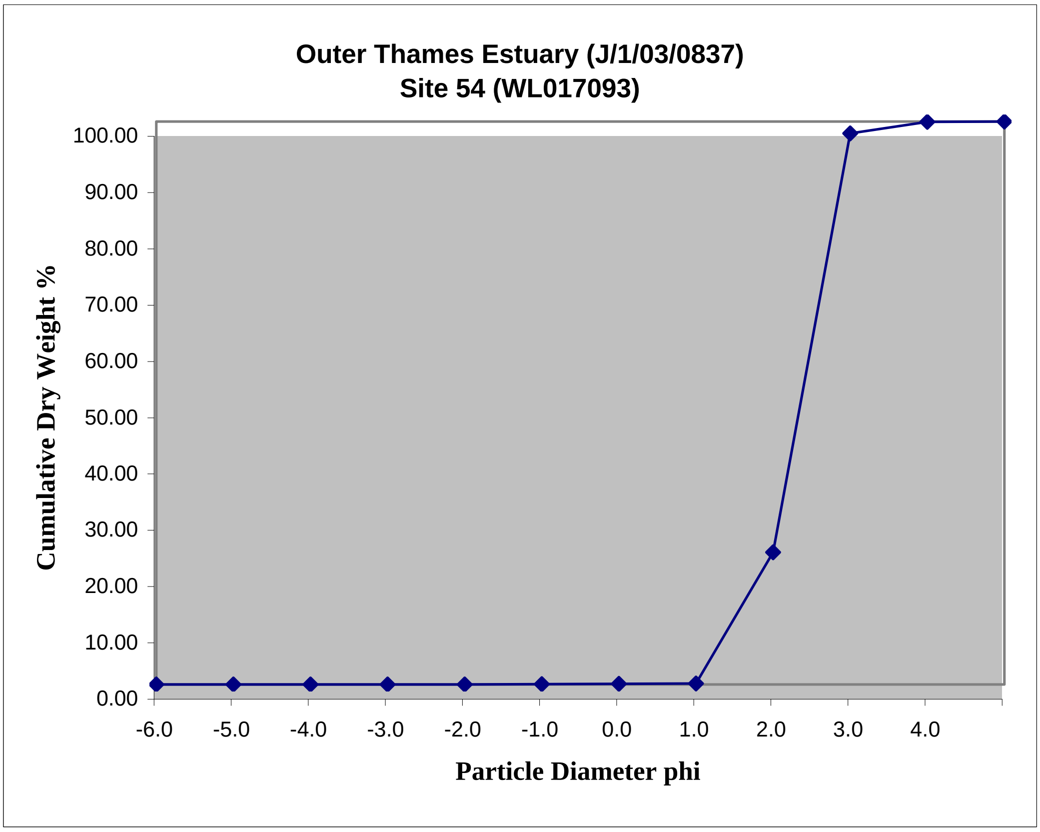
Mean mm	0.21
Md mm	0.20
Mean phi	2.28
Md phi	2.36
Sorting	0.55
Skq	-0.25
Kurtosis	1.07

%Gravel	0.02
% Sand	99.92
% Fines	0.06
% Org C	0.639

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 54 (WL017093)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 54 (WL017093)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 55 (WL017094)

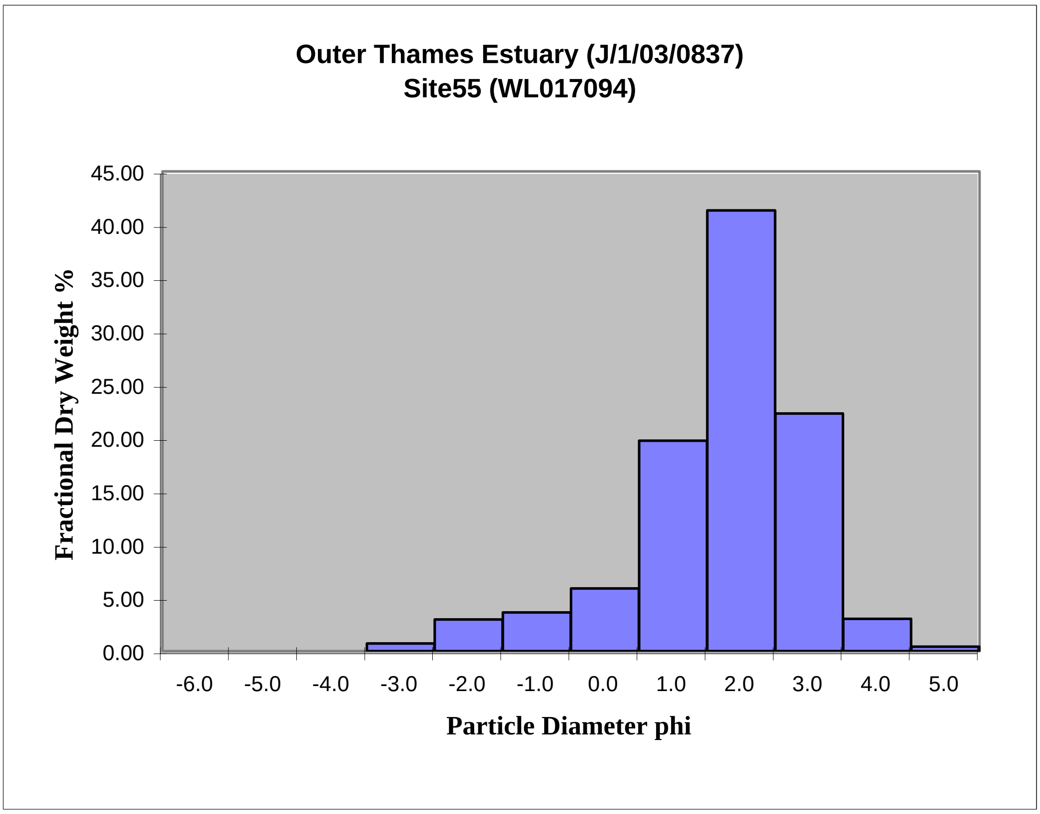
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	2.009	0.73	0.73
	4	-2.0	8.180	2.97	3.69
Coarse Sand	2	-1.0	10.052	3.64	7.34
	1	0.0	16.190	5.87	13.21
Medium Sand	0.5	1.0	54.421	19.73	32.94
	0.25	2.0	113.979	41.33	74.27
Fine Sand	0.125	3.0	61.470	22.29	96.55
	0.063	4.0	8.366	3.03	99.59
Silt/Clay	<0.063	5.0	1.136	0.41	100.00
		Total Weight	275.803	100.00	

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

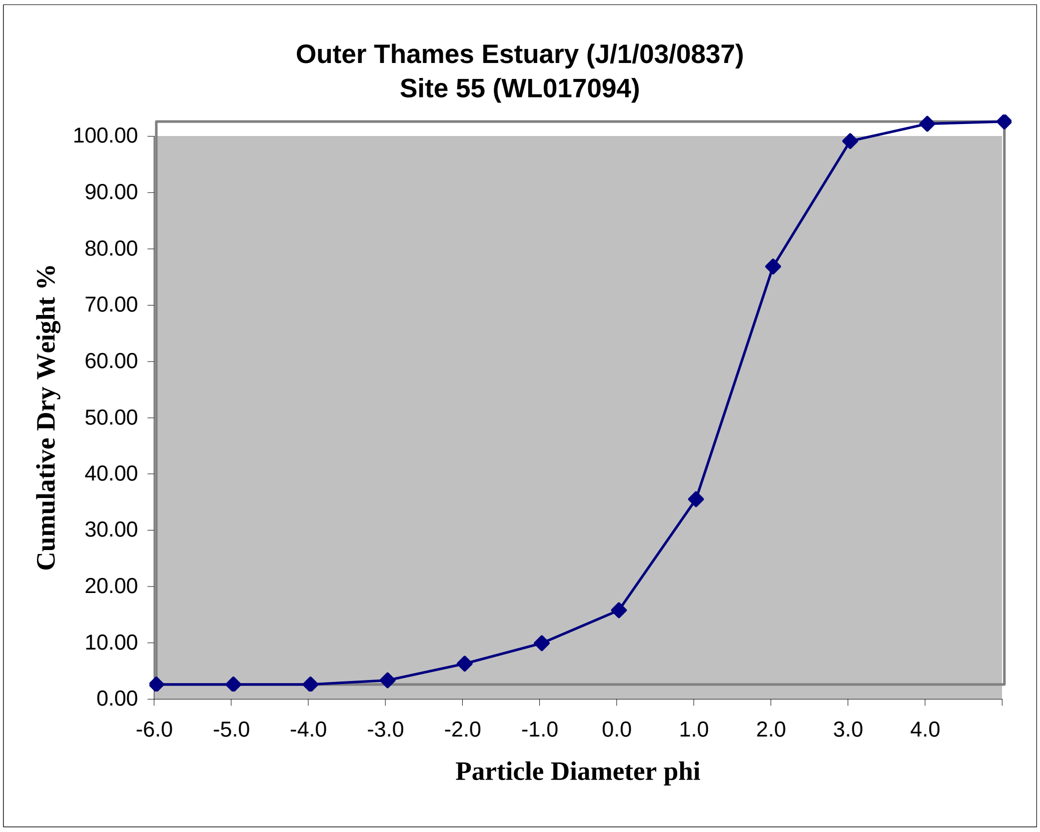
Mean mm	0.40
Md mm	0.38
Mean phi	1.33
Md phi	1.41
Sorting	1.27
Skq	-0.22
Kurtosis	1.31

%Gravel	3.69
% Sand	95.89
% Fines	0.41
% Org C	0.474

Sand



Outer Thames Estuary (J/1/03/0837)
Site55 (WL017094)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi



Outer Thames Estuary (J/1/03/0837)
Site 55 (WL017094)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 56 (WL017095)

*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.585	0.20	0.20
	4	-2.0	4.852	1.64	1.84
Coarse Sand	2	-1.0	10.130	3.43	5.27
	1	0.0	20.169	6.83	12.10
Medium Sand	0.5	1.0	44.511	15.07	27.17
	0.25	2.0	147.090	49.81	76.98
Fine Sand	0.125	3.0	60.424	20.46	97.44
	0.063	4.0	6.347	2.15	99.59
Silt/Clay	<0.063	5.0	1.216	0.41	100.00
		Total Weight	295.324	100.00	

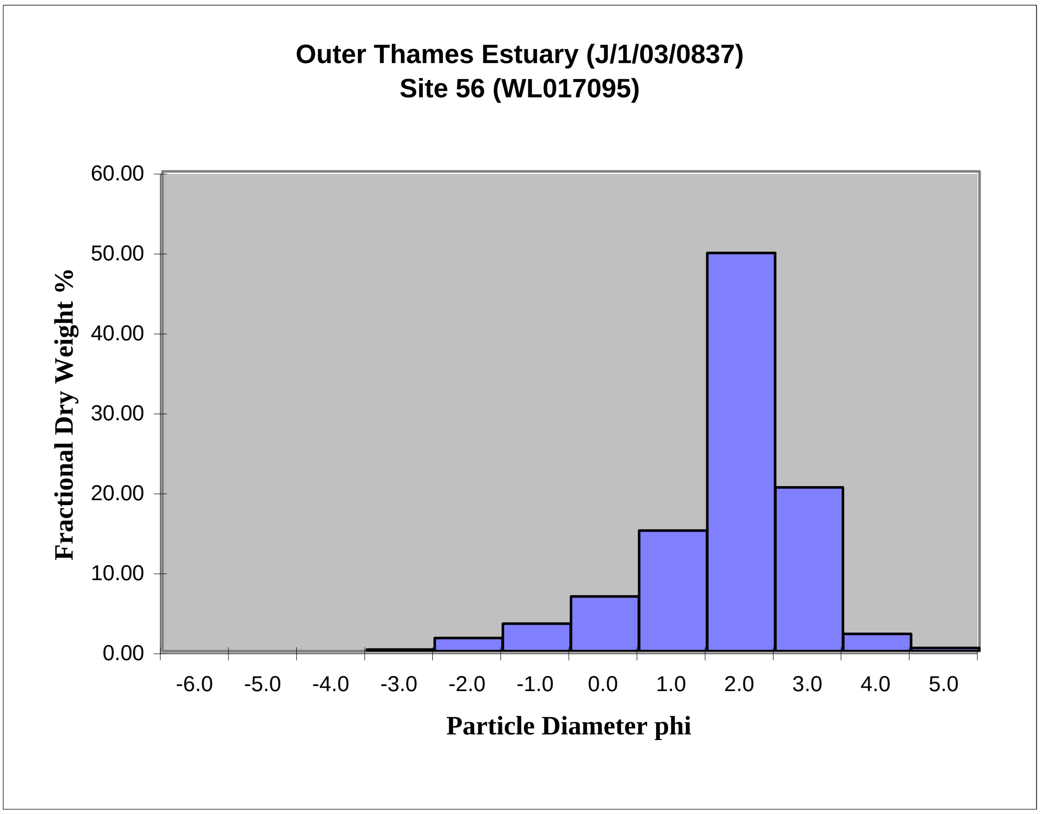
Mean mm	0.39
Md mm	0.36
Mean phi	1.35
Md phi	1.46
Sorting	1.12
Skq	-0.22
Kurtosis	1.47

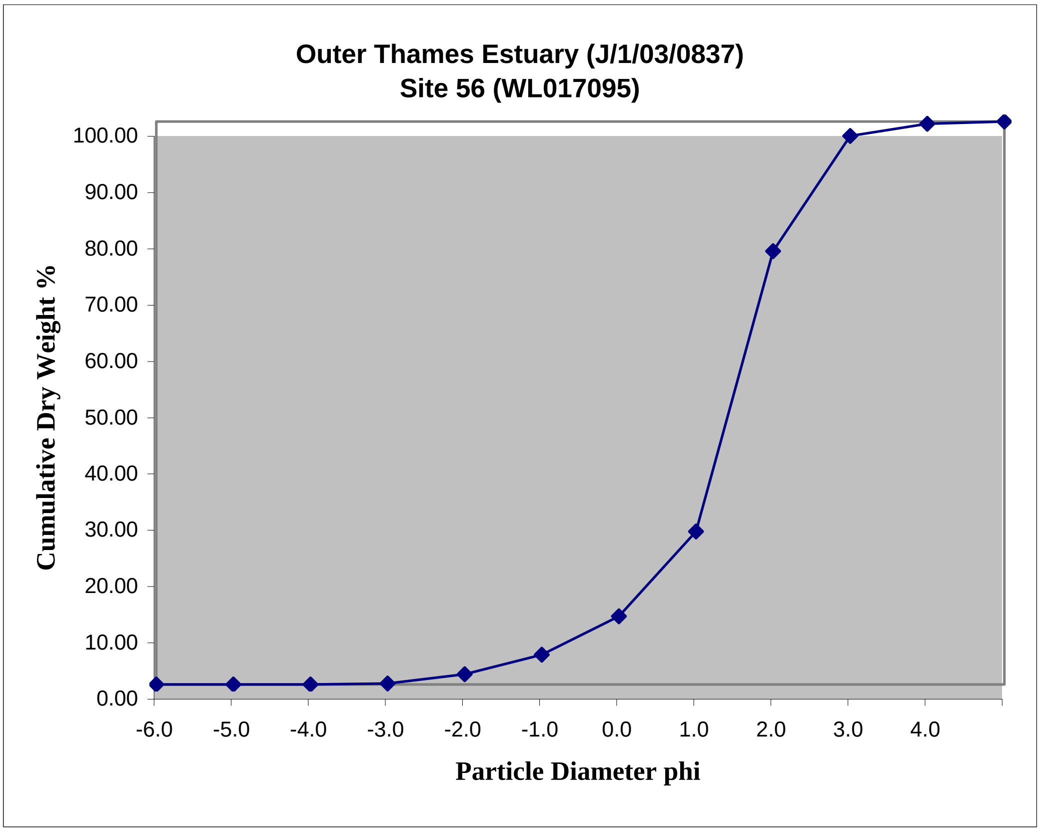
%Gravel	1.84
% Sand	97.75
% Fines	0.41

% Org C 1.509

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 56 (WL017095)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 56 (WL017095)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 57 (WL017096)

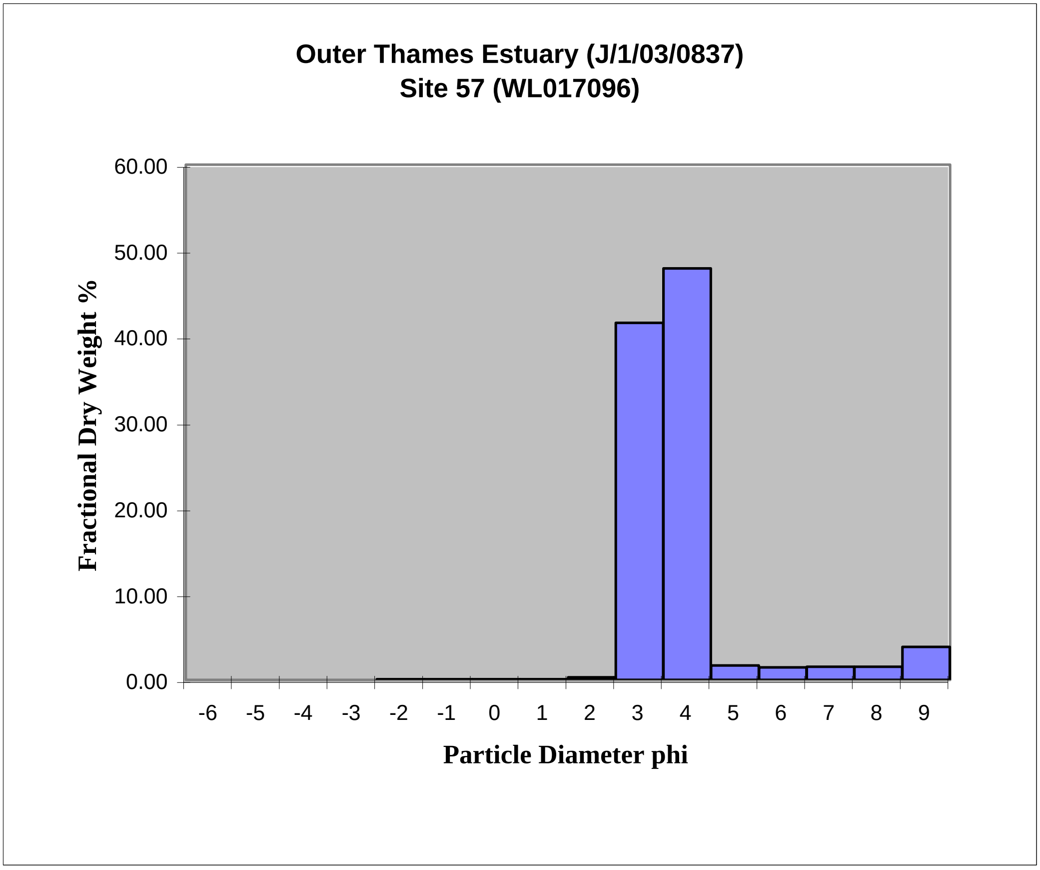
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.056	0.02	0.02
Coarse Sand	2	-1.0	0.172	0.06	0.09
	1	0.0	0.094	0.04	0.12
Medium Sand	0.5	1.0	0.084	0.03	0.15
	0.25	2.0	0.761	0.29	0.44
Fine Sand	0.125	3.0	110.126	41.59	42.03
	0.063	4.0	126.906	47.93	89.96
Silt	0.032	5.0	4.463	1.69	91.64
	0.0156	6.0	3.884	1.47	93.11
	0.0078	7.0	4.011	1.51	94.62
	0.0039	8.0	4.078	1.54	96.16
Clay	<0.0039	9.0	10.157	3.84	100.00
		Total Weight	265	100	

Mean mm	0.11
Md mm	0.11
Mean phi	3.13
Md phi	3.16
Sorting	1.15
Skq	0.26
Kurtosis	1.93

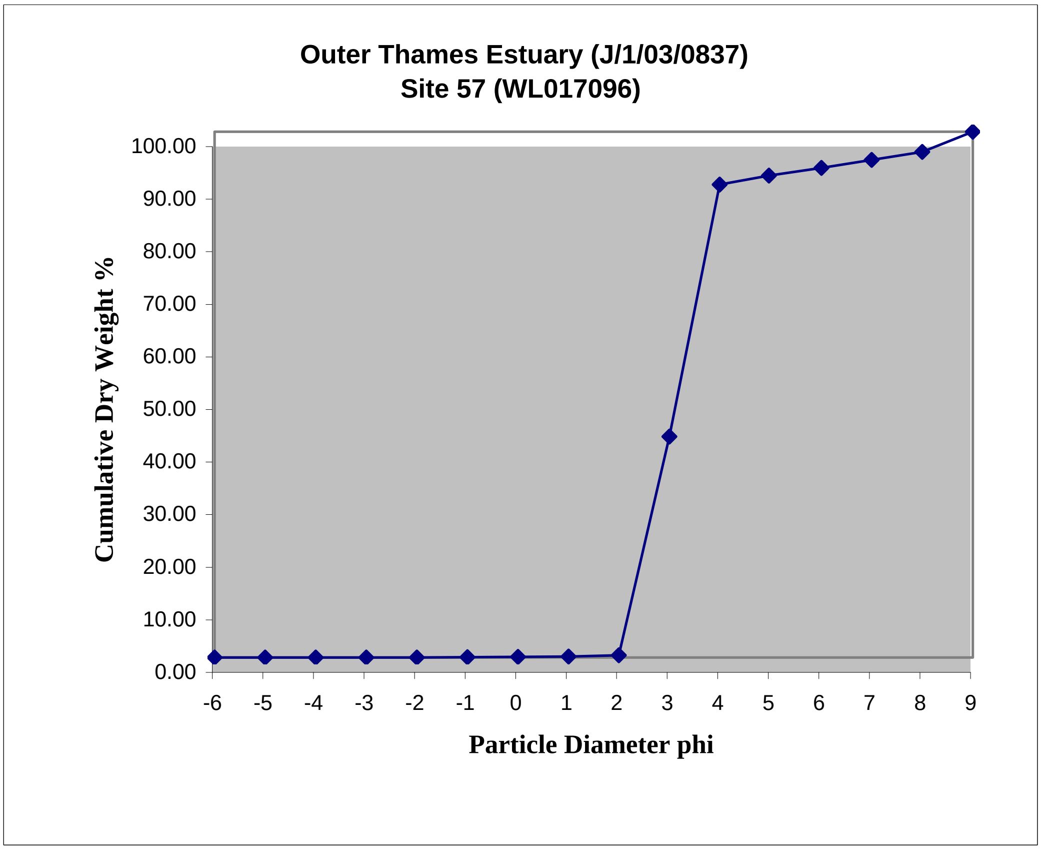
%Gravel	0.02
% Sand	89.94
% Fines	10.04
% Org C	0.831

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.



Outer Thames Estuary (J/1/03/0837)
Site 57 (WL017096)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi



Outer Thames Estuary (J/1/03/0837)
Site 57 (WL017096)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 58 (WL017097)

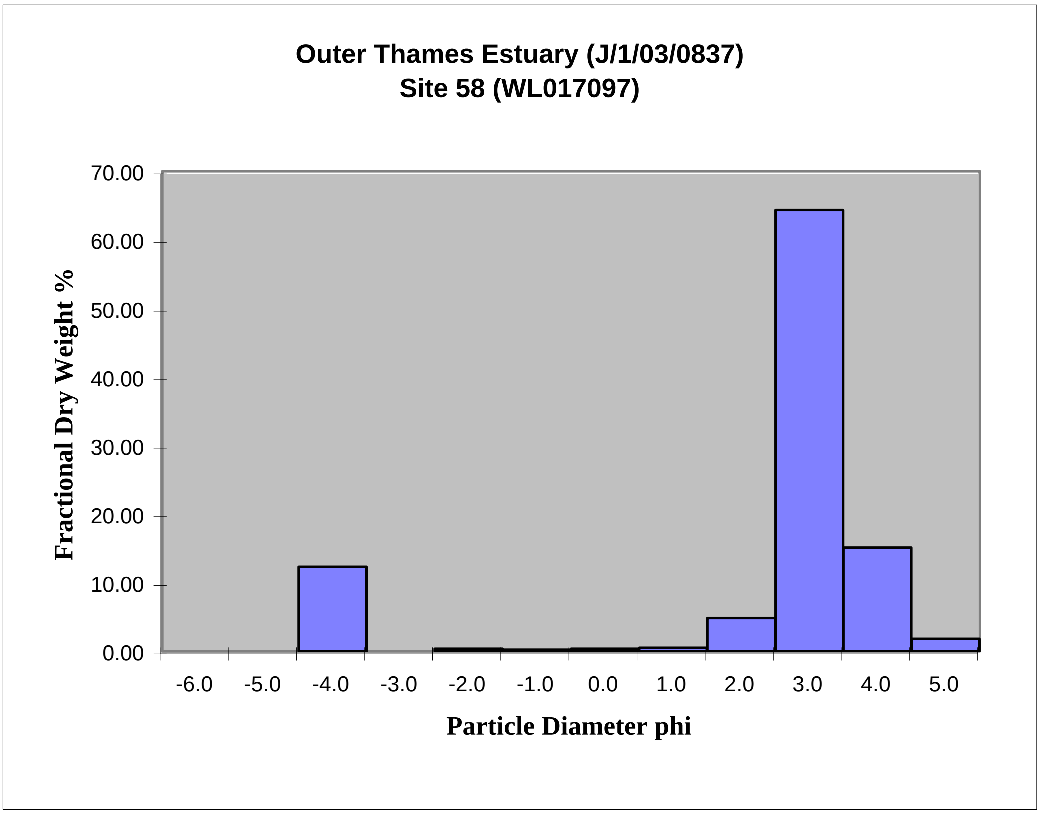
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	34.860	12.33	12.33
Gravel	8	-3.0	0.000	0.00	12.33
	4	-2.0	1.044	0.37	12.70
Coarse Sand	2	-1.0	0.642	0.23	12.93
	1	0.0	1.109	0.39	13.32
Medium Sand	0.5	1.0	1.455	0.51	13.84
	0.25	2.0	13.736	4.86	18.70
Fine Sand	0.125	3.0	181.853	64.35	83.05
	0.063	4.0	42.720	15.12	98.16
Silt/Clay	<0.063	5.0	5.195	1.84	100.00
		Total Weight	282.614	100.00	

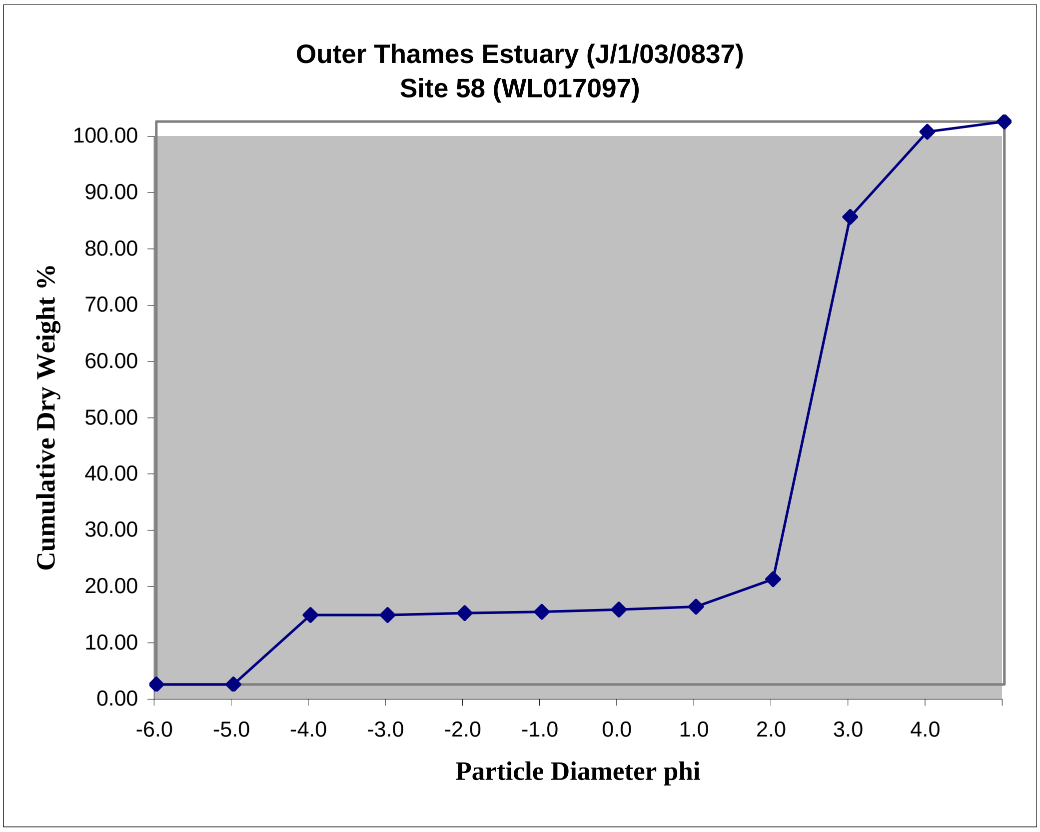
* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.20
Md mm	0.18
Mean phi	2.31
Md phi	2.49
Sorting	1.51
Skq	-0.63
Kurtosis	3.93

%Gravel	12.70
% Sand	85.46
% Fines	1.84
% Org C	0.718

Sand


Outer Thames Estuary (J/1/03/0837)
Site 58 (WL017097)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 58 (WL017097)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 59 (WL017098)

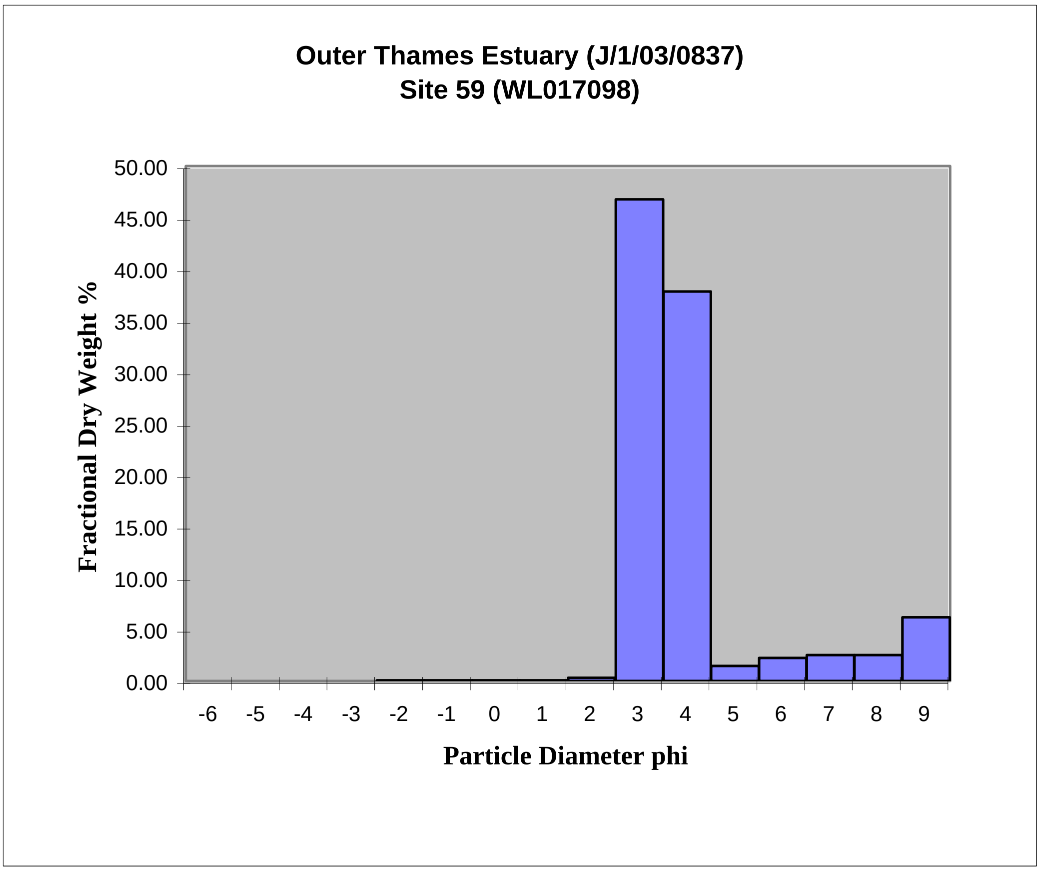
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.056	0.02	0.02
Coarse Sand	2	-1.0	0.172	0.07	0.10
	1	0.0	0.094	0.04	0.14
Medium Sand	0.5	1.0	0.084	0.04	0.17
	0.25	2.0	0.761	0.32	0.50
Fine Sand	0.125	3.0	110.126	46.76	47.25
	0.063	4.0	89.078	37.82	85.07
Silt	0.032	5.0	3.418	1.45	86.52
	0.0156	6.0	5.239	2.22	88.75
	0.0078	7.0	5.963	2.53	91.28
	0.0039	8.0	5.942	2.52	93.80
Clay	<0.0039	9.0	14.595	6.20	100.00
		Total Weight	236	100	

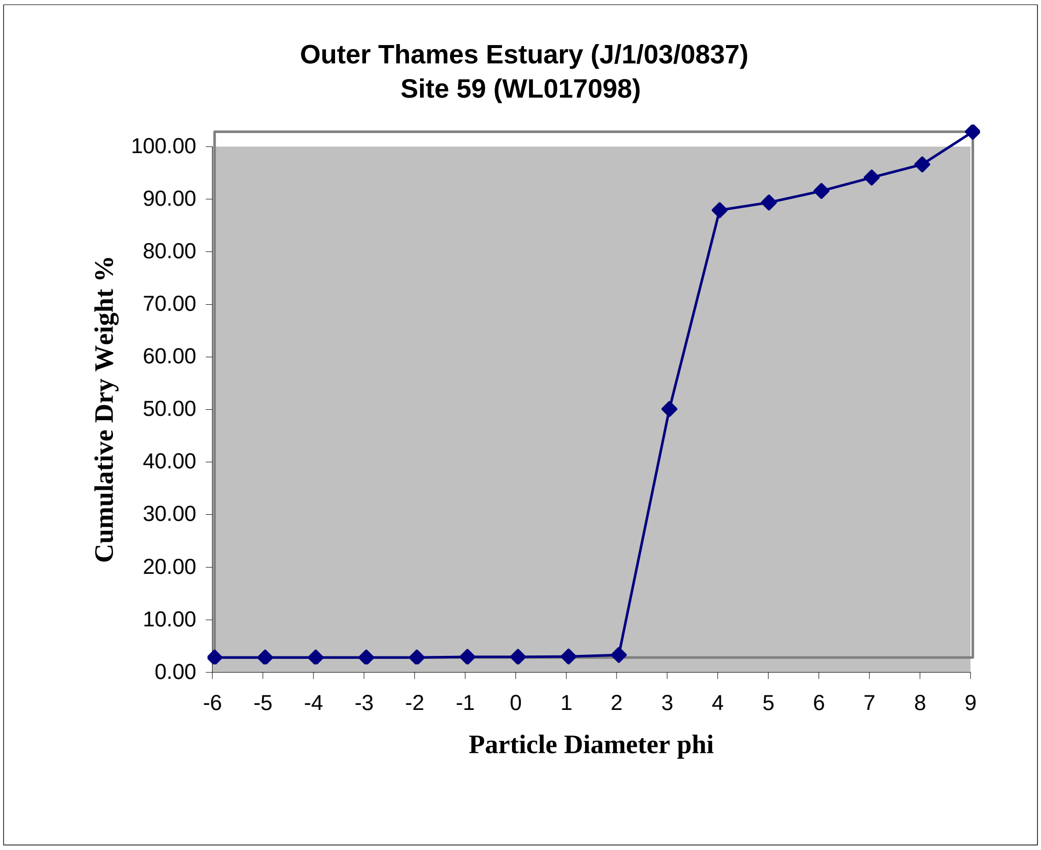
Mean mm	0.11
Md mm	0.12
Mean phi	3.12
Md phi	3.07
Sorting	1.30
Skq	0.38
Kurtosis	2.01

%Gravel	0.02
% Sand	85.05
% Fines	14.93
% Org C	1.487

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 59 (WL017098)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 59 (WL017098)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 60 (WL017099)

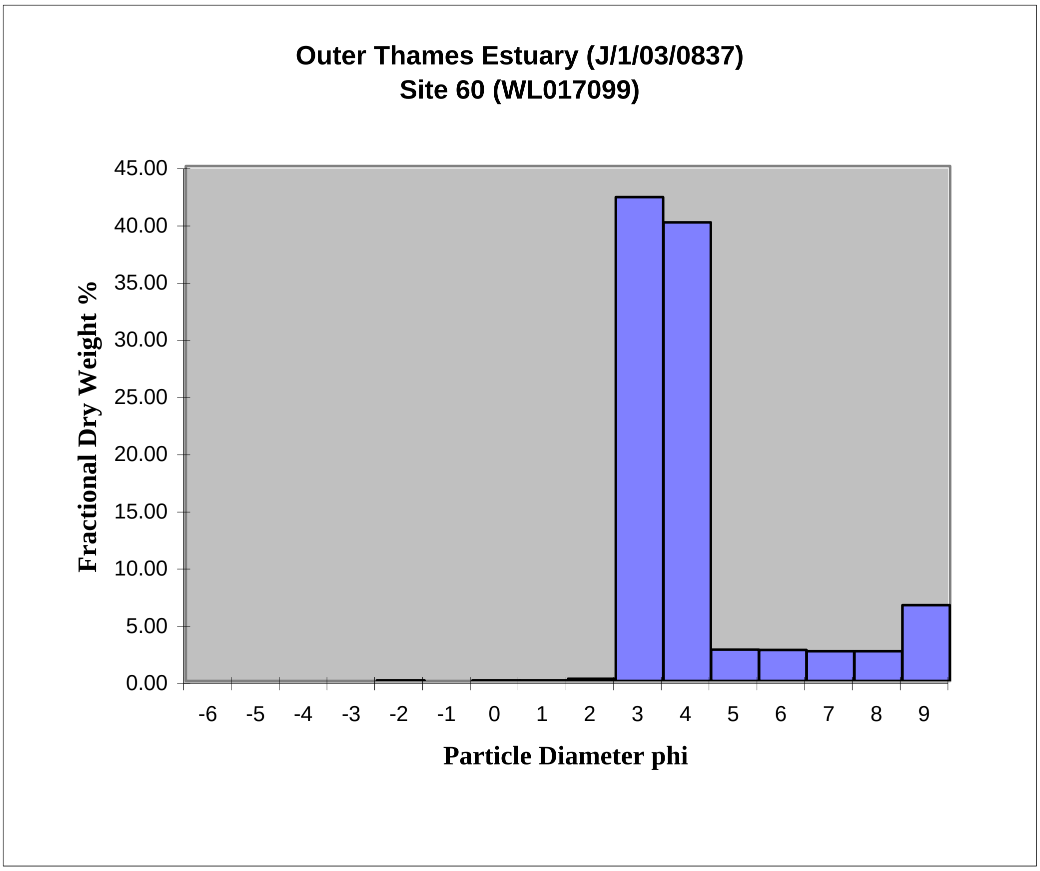
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.128	0.05	0.05
Coarse Sand	2	-1.0	0.023	0.01	0.06
	1	0.0	0.080	0.03	0.09
Medium Sand	0.5	1.0	0.146	0.06	0.14
	0.25	2.0	0.520	0.20	0.34
Fine Sand	0.125	3.0	110.126	42.30	42.64
	0.063	4.0	104.327	40.07	82.71
Silt	0.032	5.0	7.162	2.75	85.46
	0.0156	6.0	7.037	2.70	88.16
	0.0078	7.0	6.797	2.61	90.77
	0.0039	8.0	6.778	2.60	93.37
Clay	<0.0039	9.0	17.250	6.63	100.00
		Total Weight	260	100	

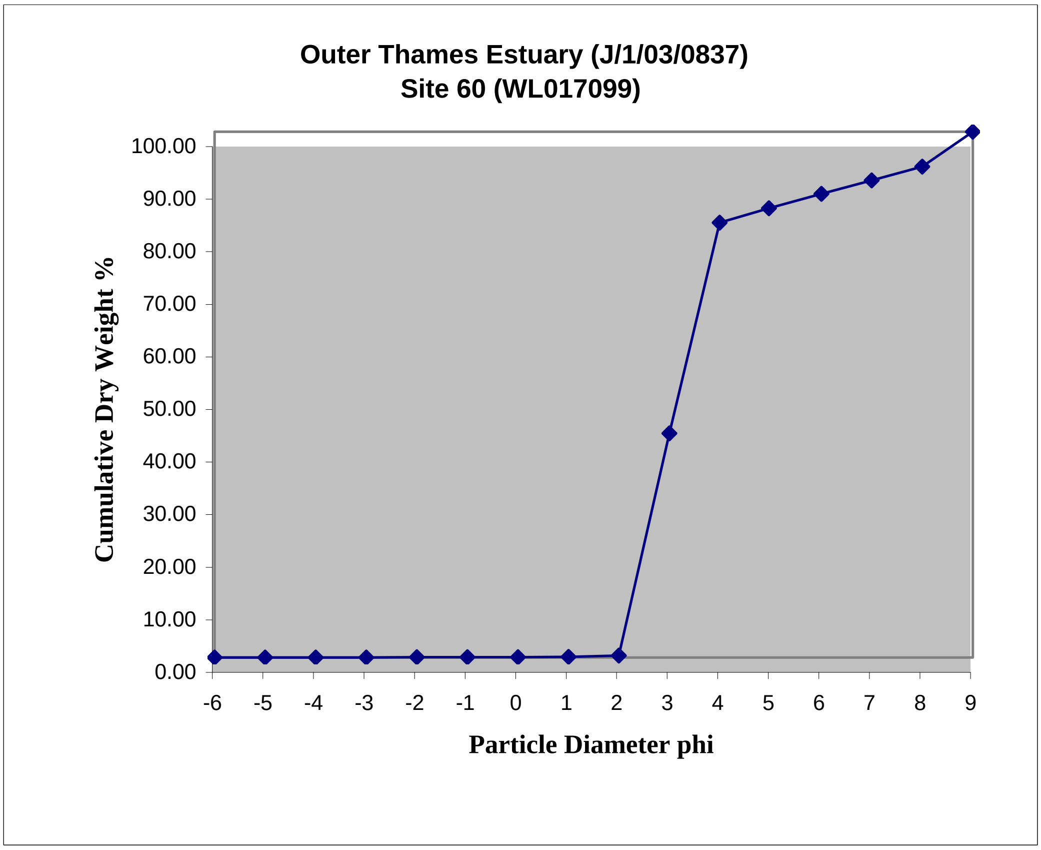
Mean mm	0.10
Md mm	0.11
Mean phi	3.33
Md phi	3.18
Sorting	1.41
Skq	0.43
Kurtosis	1.98

%Gravel	0.05
% Sand	82.66
% Fines	17.29
% Org C	1.361

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 60 (WL017099)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 60 (WL017099)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 61 (WL017100)

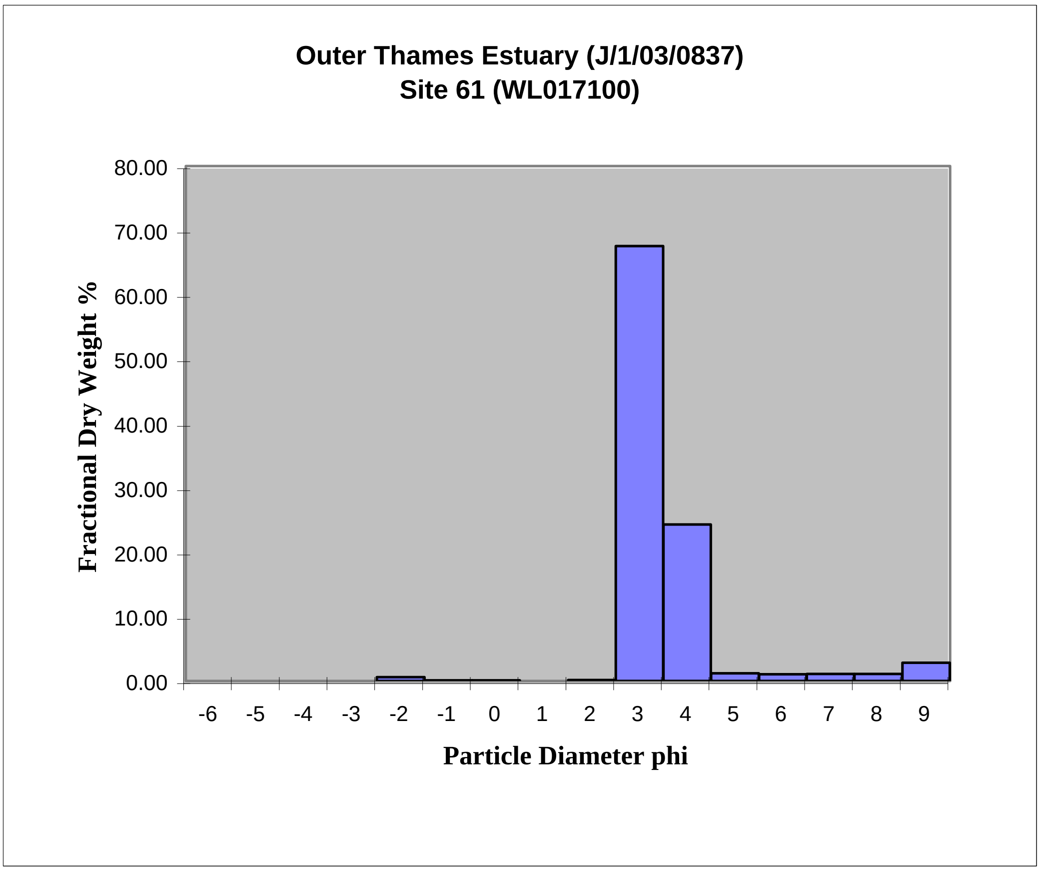
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	1.678	0.60	0.60
Coarse Sand	2	-1.0	0.247	0.09	0.69
	1	0.0	0.070	0.03	0.72
Medium Sand	0.5	1.0	0.040	0.01	0.73
	0.25	2.0	0.376	0.14	0.87
Fine Sand	0.125	3.0	187.651	67.57	68.44
	0.063	4.0	67.483	24.30	92.74
Silt	0.032	5.0	3.375	1.22	93.96
	0.0156	6.0	2.848	1.03	94.98
	0.0078	7.0	2.978	1.07	96.06
	0.0039	8.0	3.068	1.10	97.16
Clay	<0.0039	9.0	7.887	2.84	100.00
		Total Weight	278	100	

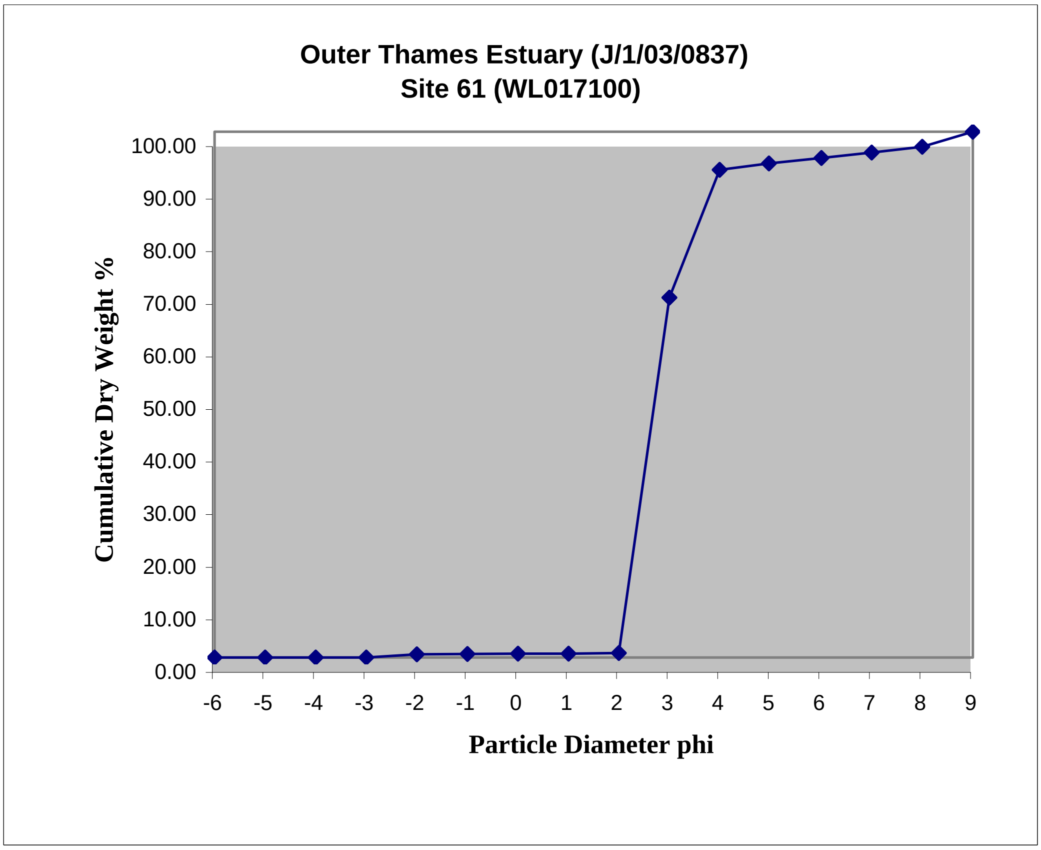
Mean mm	0.14
Md mm	0.15
Mean phi	2.86
Md phi	2.73
Sorting	0.95
Skq	0.47
Kurtosis	1.78

%Gravel	0.60
% Sand	92.14
% Fines	7.26
% Org C	0.765

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 61 (WL017100)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 61 (WL017100)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 62 H (WL017101)

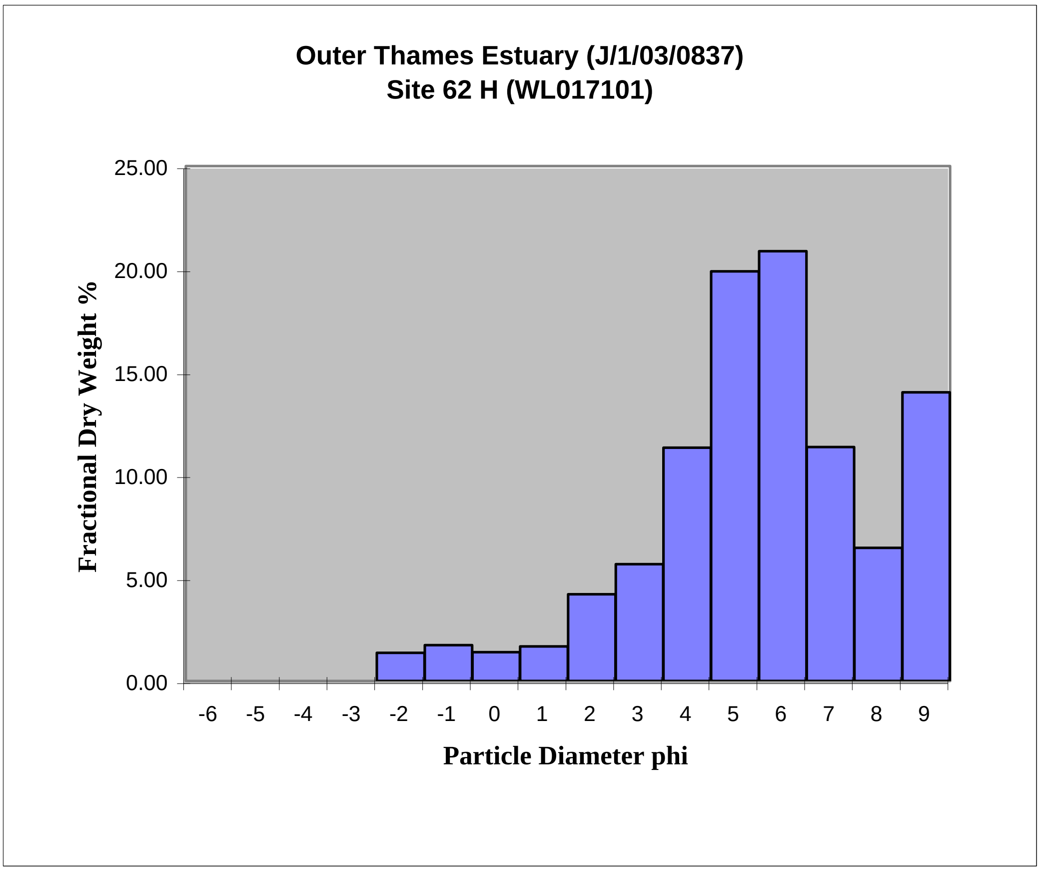
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	1.738	1.37	1.37
Coarse Sand	2	-1.0	2.205	1.74	3.12
	1	0.0	1.773	1.40	4.52
Medium Sand	0.5	1.0	2.124	1.68	6.20
	0.25	2.0	5.325	4.21	10.41
Fine Sand	0.125	3.0	7.179	5.67	16.08
	0.063	4.0	14.322	11.32	27.40
Silt	0.032	5.0	25.167	19.89	47.29
	0.0156	6.0	26.410	20.87	68.17
	0.0078	7.0	14.364	11.35	79.52
	0.0039	8.0	8.170	6.46	85.98
Clay	<0.0039	9.0	17.740	14.02	100.00
		Total Weight	127	100	

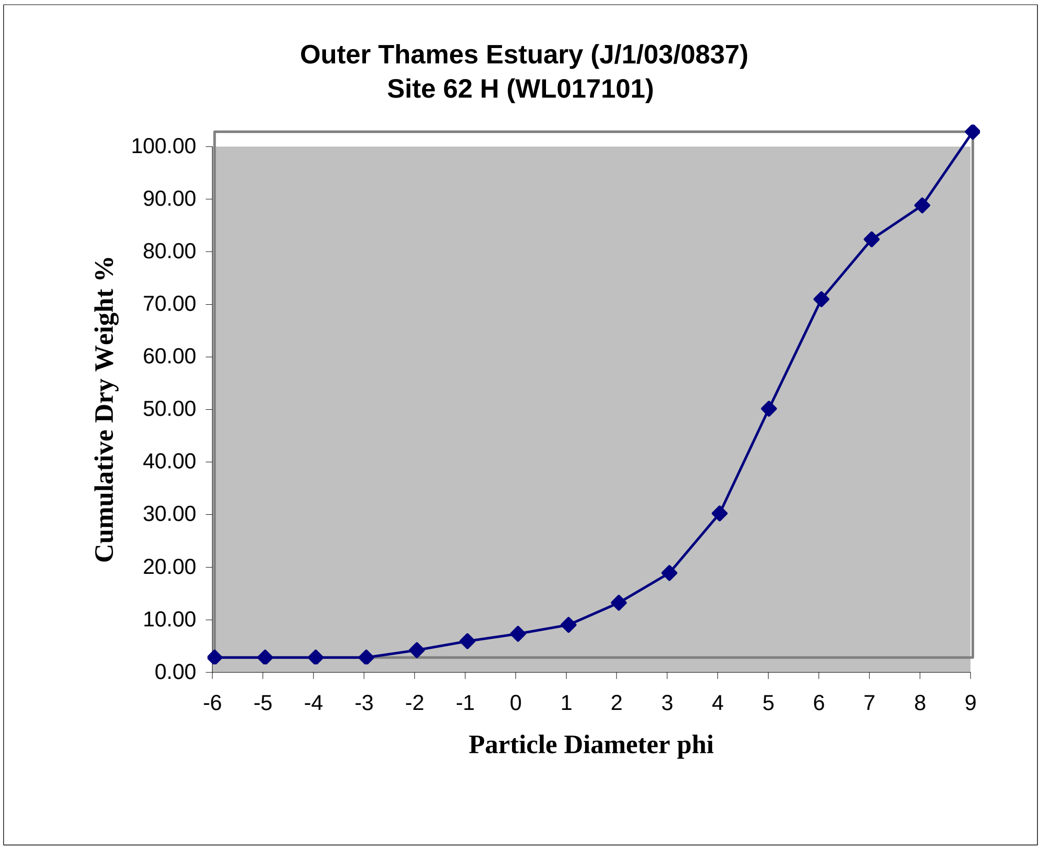
Mean mm	0.03
Md mm	0.03
Mean phi	5.26
Md phi	5.10
Sorting	2.33
Skq	-0.08
Kurtosis	1.10

%Gravel	1.37
% Sand	26.03
% Fines	72.60
% Org C	2.294

Sandy silt

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 62 H (WL017101)
Fractional Dry Weight %
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 62 H (WL017101)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 63 (WL017102)

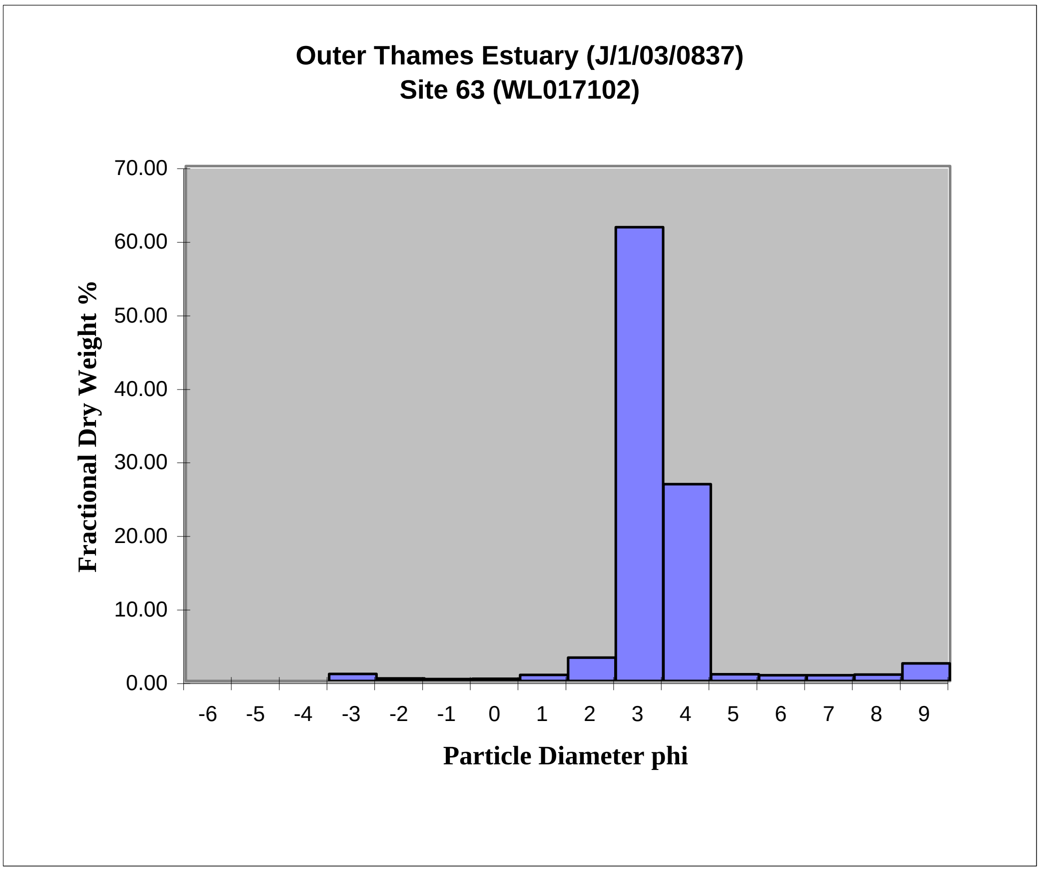
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	2.645	0.97	0.97
	4	-2.0	0.980	0.36	1.33
Coarse Sand	2	-1.0	0.672	0.25	1.58
	1	0.0	0.819	0.30	1.88
Medium Sand	0.5	1.0	2.228	0.82	2.69
	0.25	2.0	8.606	3.16	5.85
Fine Sand	0.125	3.0	168.165	61.68	67.53
	0.063	4.0	72.904	26.74	94.28
Silt	0.032	5.0	2.449	0.90	95.17
	0.0156	6.0	2.117	0.78	95.95
	0.0078	7.0	2.182	0.80	96.75
	0.0039	8.0	2.356	0.86	97.61
Clay	<0.0039	9.0	6.504	2.39	100.00
		Total Weight	273	100	

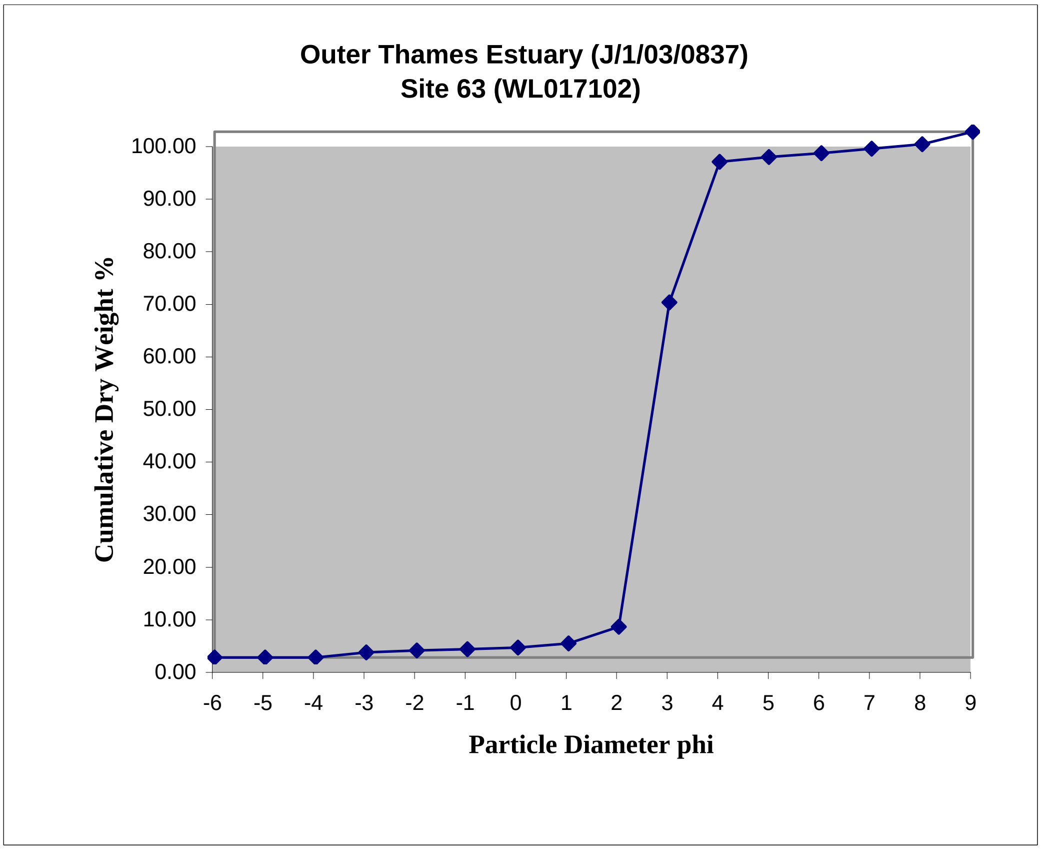
Mean mm	0.14
Md mm	0.15
Mean phi	2.83
Md phi	2.72
Sorting	0.82
Skq	0.29
Kurtosis	1.29

%Gravel	1.33
% Sand	92.95
% Fines	5.72
% Org C	0.764

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 63 (WL017102)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 63 (WL017102)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 64 (WL017103)

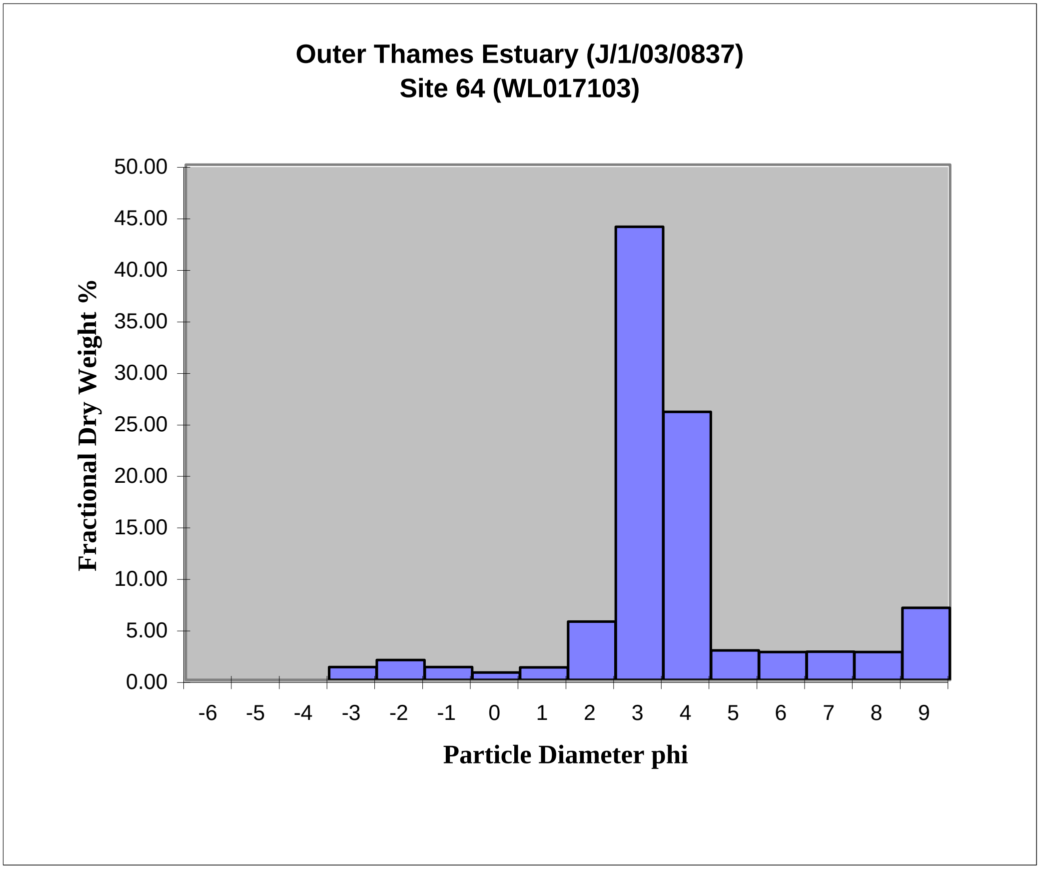
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	1.832	1.24	1.24
	4	-2.0	2.848	1.93	3.17
Coarse Sand	2	-1.0	1.852	1.25	4.42
	1	0.0	1.067	0.72	5.14
Medium Sand	0.5	1.0	1.787	1.21	6.35
	0.25	2.0	8.380	5.67	12.02
Fine Sand	0.125	3.0	65.021	43.98	55.99
	0.063	4.0	38.472	26.02	82.01
Silt	0.032	5.0	4.234	2.86	84.88
	0.0156	6.0	4.014	2.72	87.59
	0.0078	7.0	4.023	2.72	90.31
	0.0039	8.0	3.977	2.69	93.00
Clay	<0.0039	9.0	10.345	7.00	100.00
		Total Weight	148	100	

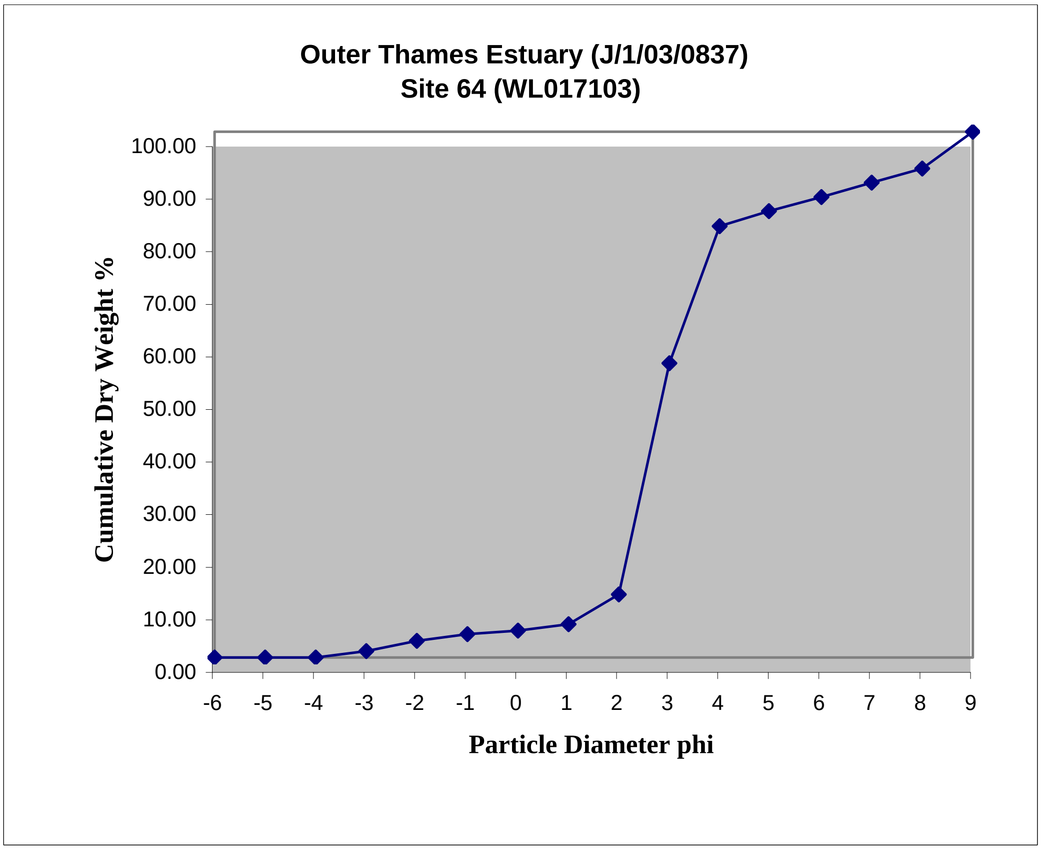
Mean mm	0.11
Md mm	0.14
Mean phi	3.21
Md phi	2.86
Sorting	1.88
Skq	0.33
Kurtosis	2.35

%Gravel	3.17
% Sand	78.85
% Fines	17.99
% Org C	1.420

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 64 (WL017103)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 64 (WL017103)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 65 (WL017104)

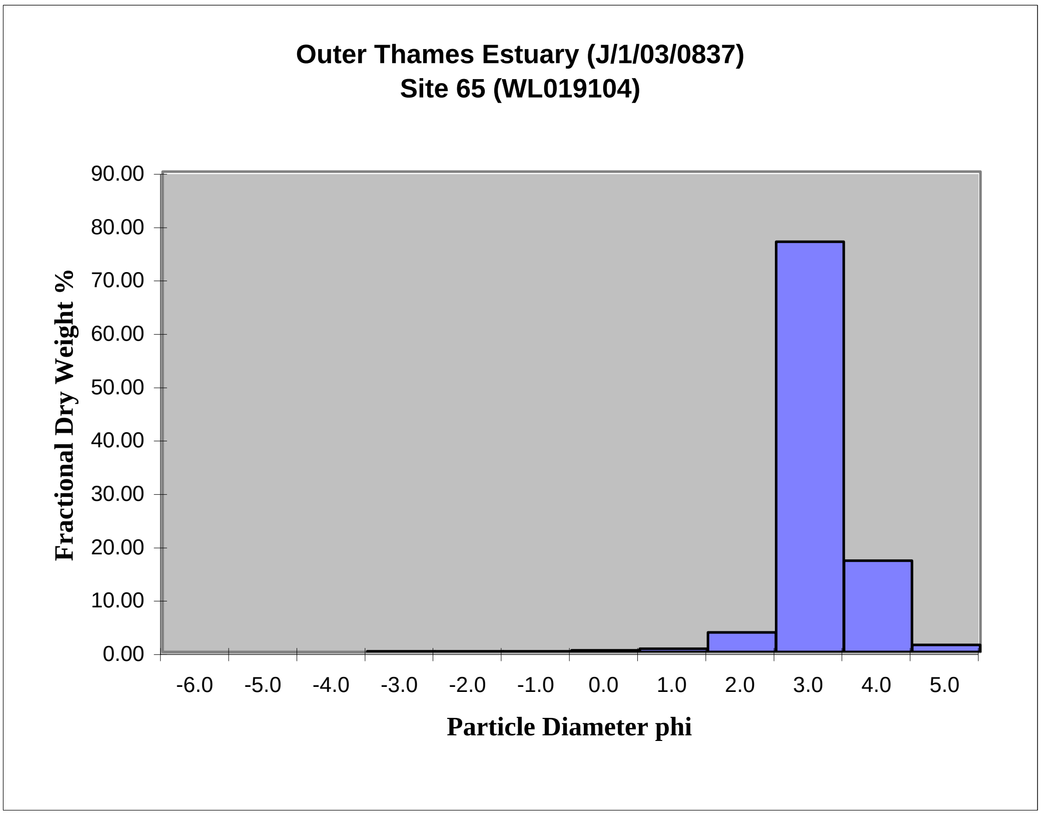
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.274	0.10	0.10
	4	-2.0	0.089	0.03	0.13
Coarse Sand	2	-1.0	0.258	0.09	0.23
	1	0.0	0.737	0.27	0.50
Medium Sand	0.5	1.0	1.553	0.57	1.07
	0.25	2.0	9.992	3.67	4.74
Fine Sand	0.125	3.0	209.032	76.86	81.60
	0.063	4.0	46.510	17.10	98.70
Silt/Clay	<0.063	5.0	3.525	1.30	100.00
		Total Weight	271.97	100.00	

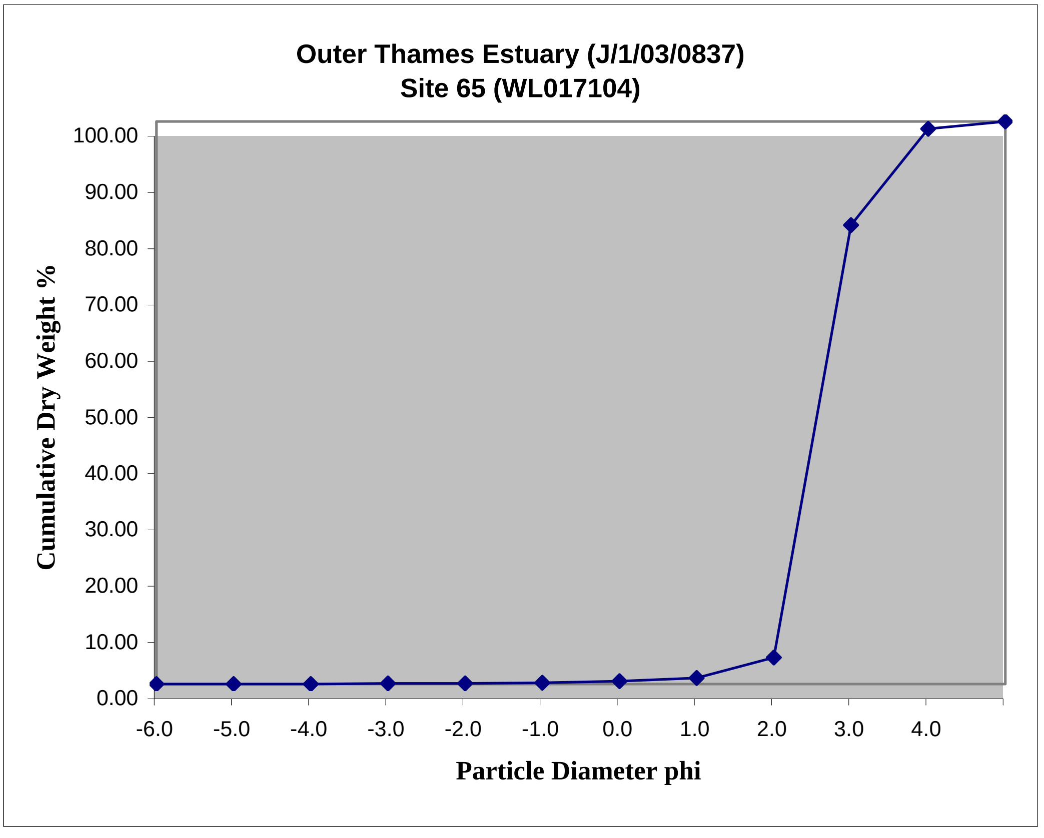
Mean mm	0.17
Md mm	0.17
Mean phi	2.57
Md phi	2.59
Sorting	0.33
Skq	-0.24
Kurtosis	0.52

%Gravel	0.13
% Sand	98.57
% Fines	1.30
% Org C	0.728

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 65 (WL019104)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 65 (WL017104)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 66 (WL017105)

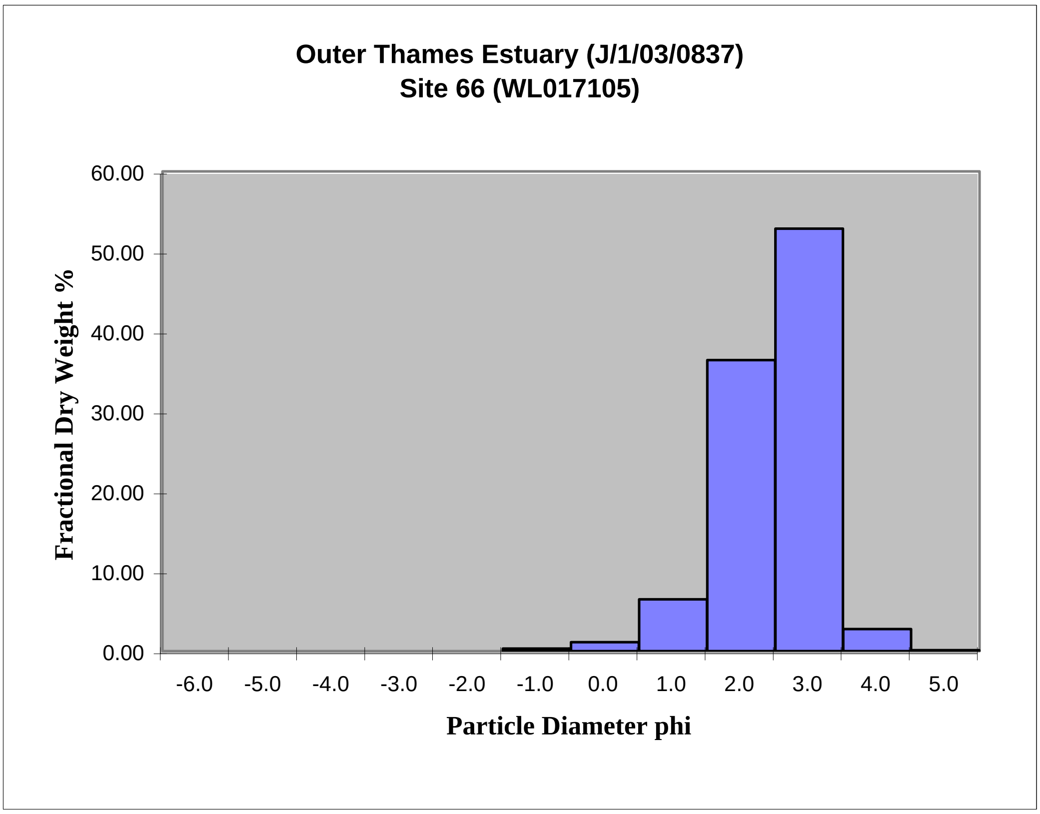
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.023	0.01	0.01
Coarse Sand	2	-1.0	0.878	0.33	0.34
	1	0.0	2.966	1.10	1.44
Medium Sand	0.5	1.0	17.417	6.48	7.92
	0.25	2.0	97.819	36.39	44.30
Fine Sand	0.125	3.0	142.076	52.85	97.15
	0.063	4.0	7.381	2.75	99.89
Silt/Clay	<0.063	5.0	0.284	0.11	100.00
		Total Weight	268.844	100.00	

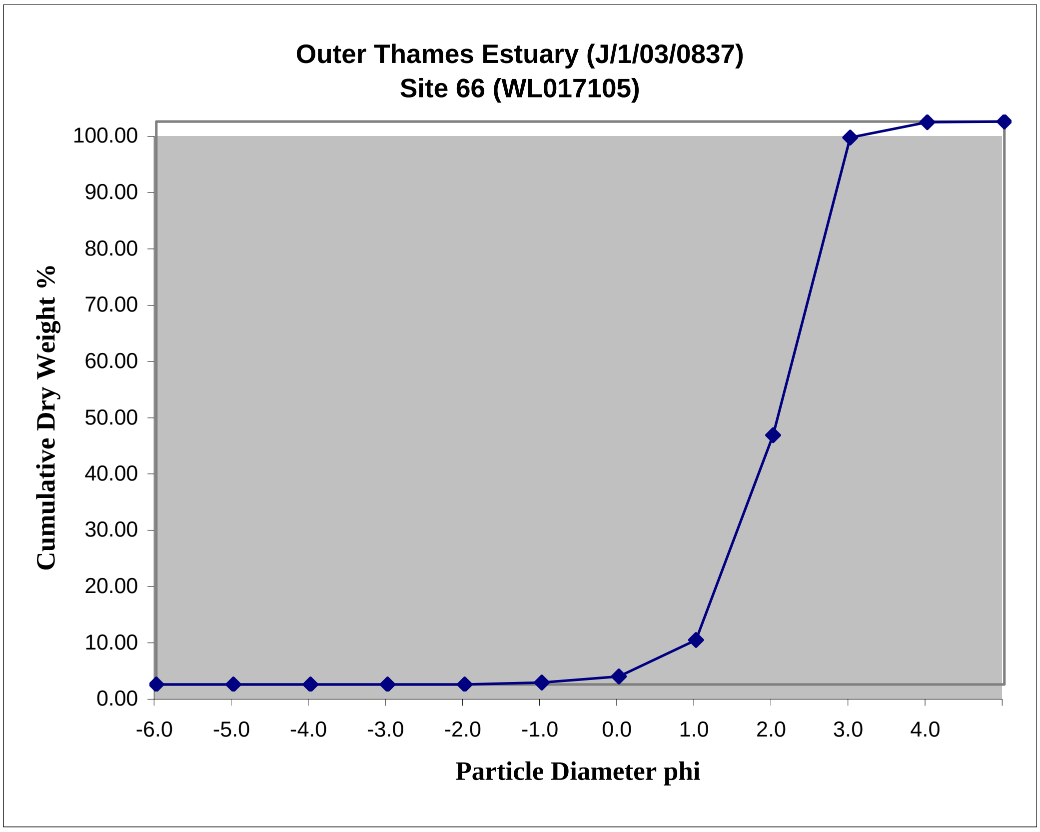
Mean mm	0.25
Md mm	0.23
Mean phi	2.03
Md phi	2.11
Sorting	0.75
Skq	-0.23
Kurtosis	0.89

%Gravel	0.01
% Sand	99.89
% Fines	0.11
% Org C	0.495

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 66 (WL017105)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 66 (WL017105)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 67 (WL017106)

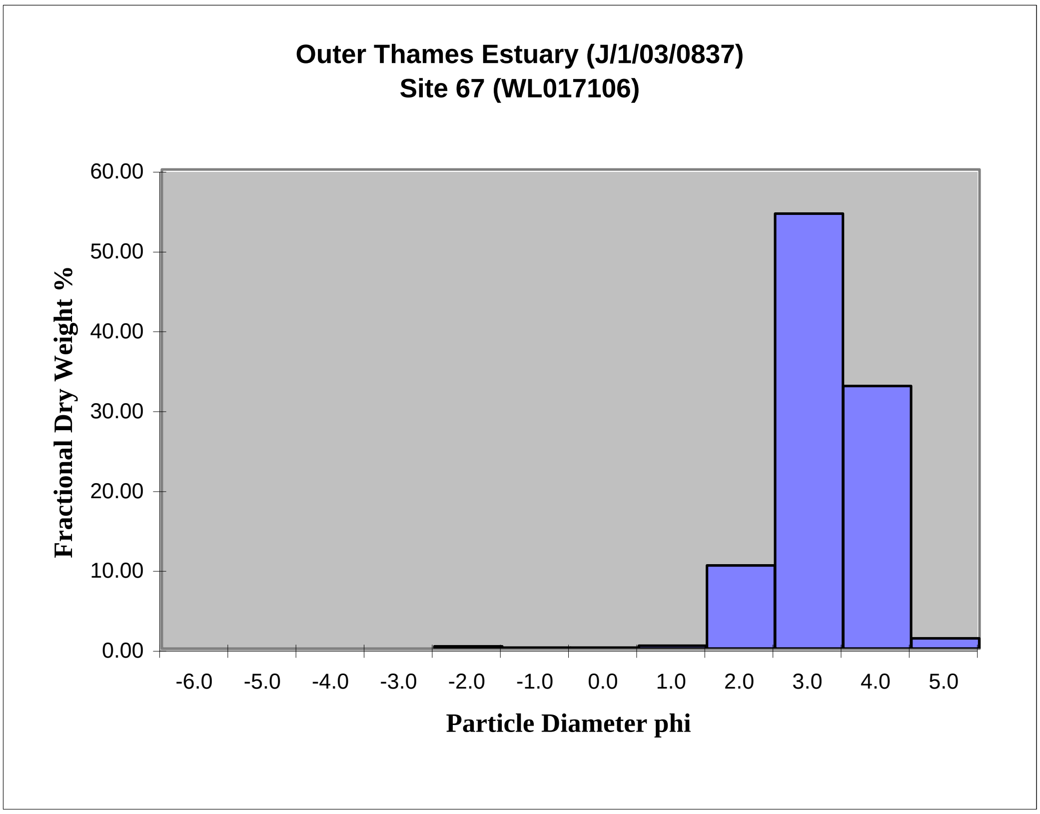
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.748	0.29	0.29
Coarse Sand	2	-1.0	0.312	0.12	0.41
	1	0.0	0.346	0.13	0.55
Medium Sand	0.5	1.0	0.951	0.37	0.92
	0.25	2.0	26.774	10.42	11.34
Fine Sand	0.125	3.0	139.976	54.49	65.83
	0.063	4.0	84.496	32.89	98.72
Silt/Clay	<0.063	5.0	3.300	1.28	100.00
		Total Weight	256.903	100.00	

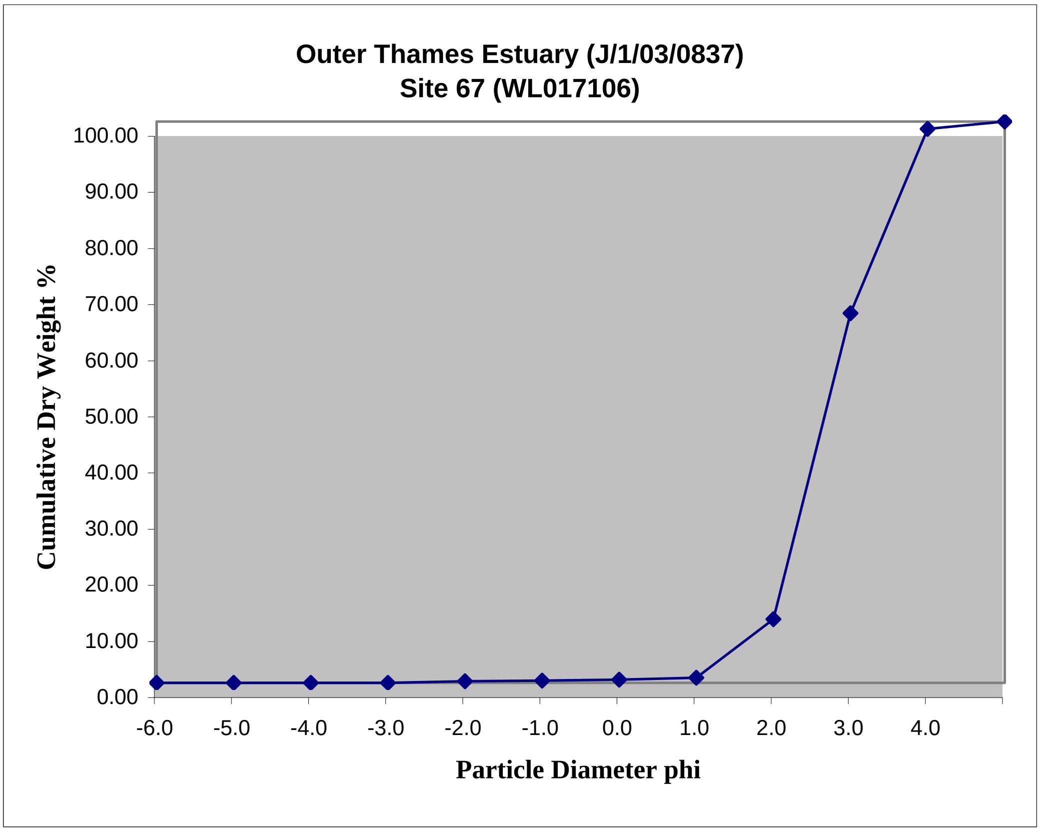
Mean mm	0.18
Md mm	0.15
Mean phi	2.51
Md phi	2.71
Sorting	0.34
Skq	-1.11
Kurtosis	0.78

%Gravel	0.29
% Sand	98.42
% Fines	1.28
% Org C	0.881

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 67 (WL017106)
Fractional Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 67 (WL017106)
Cumulative Dry Weight %
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 68 (WL017107)

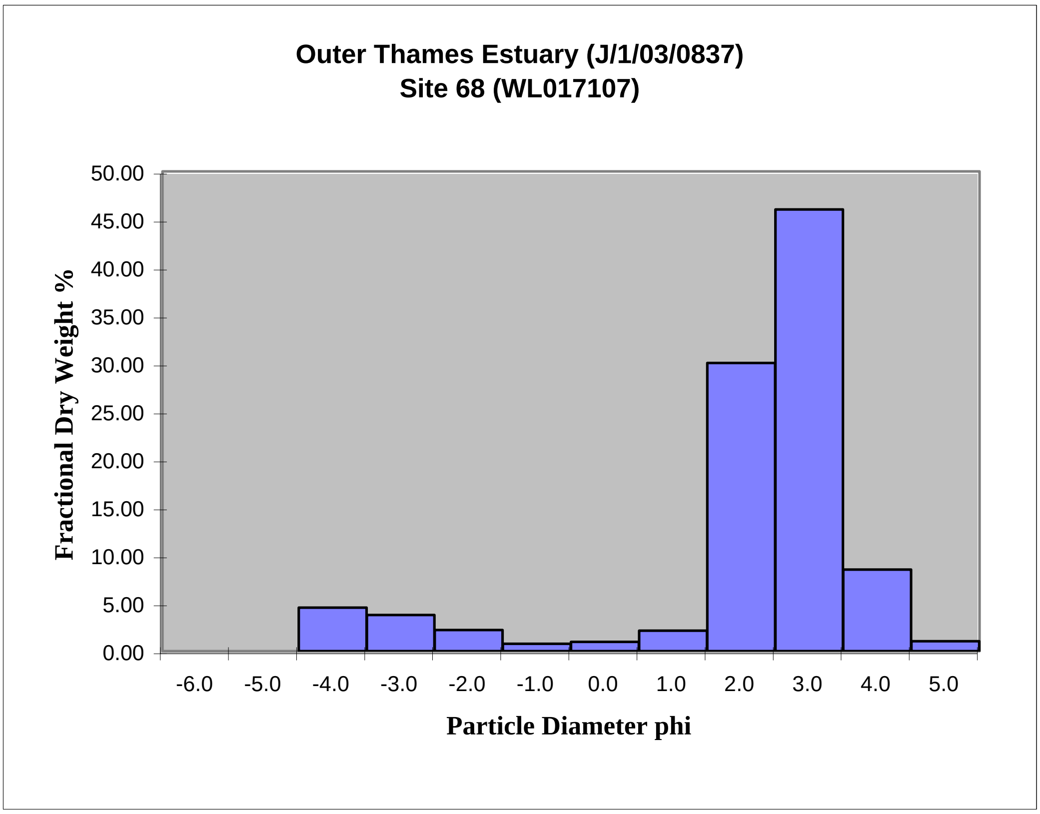
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	12.613	4.52	4.52
Gravel	8	-3.0	10.539	3.78	8.30
	4	-2.0	6.179	2.22	10.52
Coarse Sand	2	-1.0	2.163	0.78	11.30
	1	0.0	2.662	0.95	12.25
Medium Sand	0.5	1.0	5.920	2.12	14.37
	0.25	2.0	83.715	30.03	44.40
Fine Sand	0.125	3.0	128.386	46.05	90.45
	0.063	4.0	23.736	8.51	98.96
Silt/Clay	<0.063	5.0	2.903	1.04	100.00
		Total Weight	278.816	100.00	

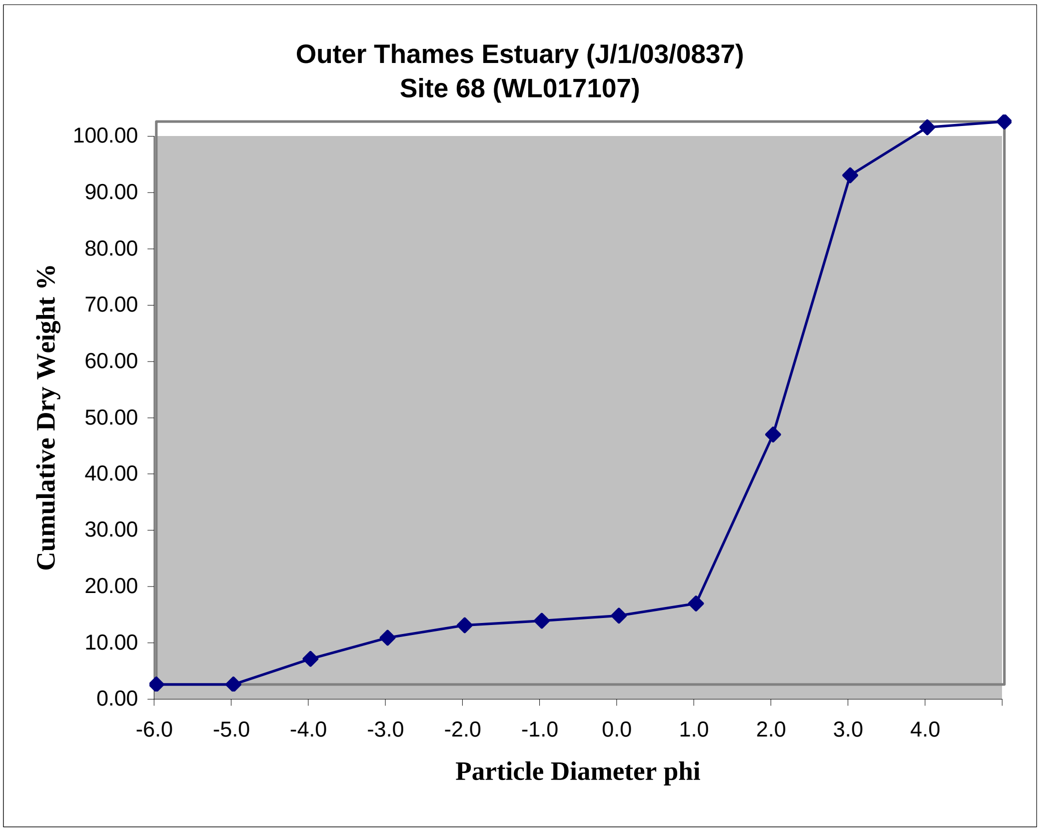
Mean mm	0.25
Md mm	0.23
Mean phi	2.01
Md phi	2.12
Sorting	1.49
Skq	-0.47
Kurtosis	2.13

%Gravel	10.52
% Sand	88.44
% Fines	1.04
% Org C	0.807

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 68 (WL017107)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 68 (WL017107)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 69 (WL017108)

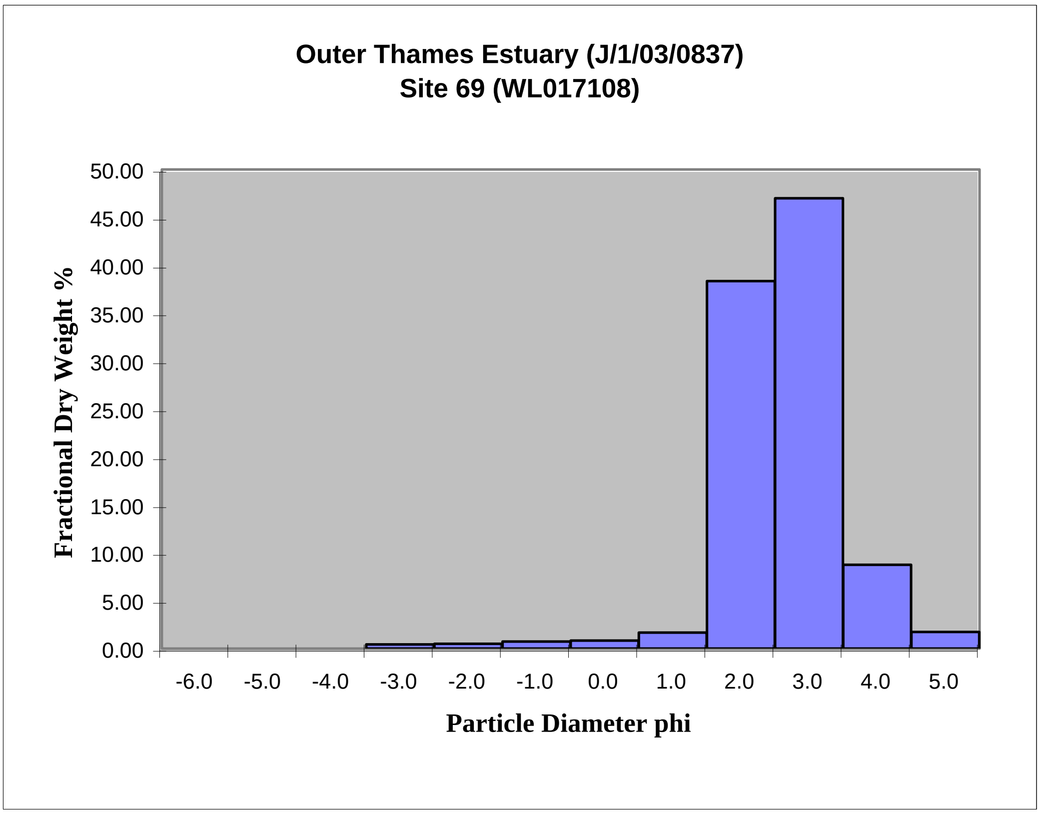
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.946	0.44	0.44
	4	-2.0	1.108	0.51	0.95
Coarse Sand	2	-1.0	1.547	0.72	1.67
	1	0.0	1.774	0.82	2.50
Medium Sand	0.5	1.0	3.599	1.67	4.17
	0.25	2.0	82.520	38.35	42.52
Fine Sand	0.125	3.0	101.100	46.99	89.51
	0.063	4.0	18.810	8.74	98.26
Silt/Clay	<0.063	5.0	3.752	1.74	100.00
		Total Weight	215.156	100.00	

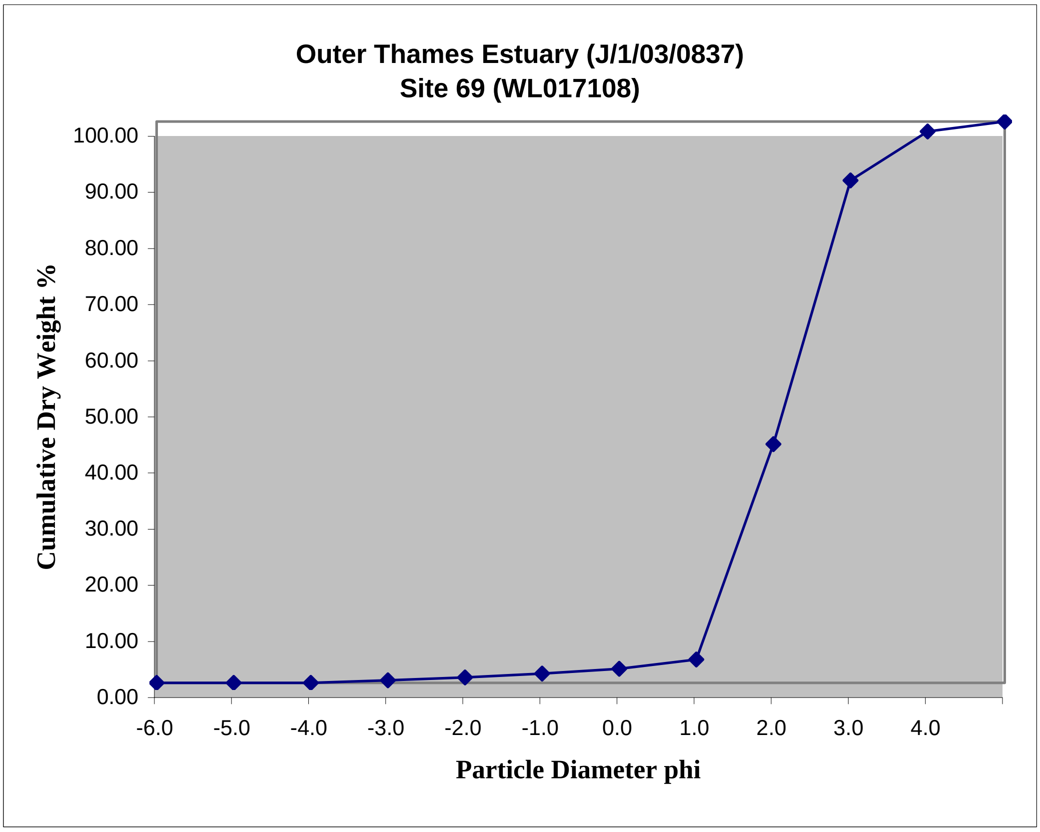
Mean mm	0.23
Md mm	0.22
Mean phi	2.12
Md phi	2.16
Sorting	0.68
Skq	-0.13
Kurtosis	0.68

%Gravel	0.95
% Sand	97.30
% Fines	1.74
% Org C	0.721

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 69 (WL017108)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 69 (WL017108)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 70 (WL017109)

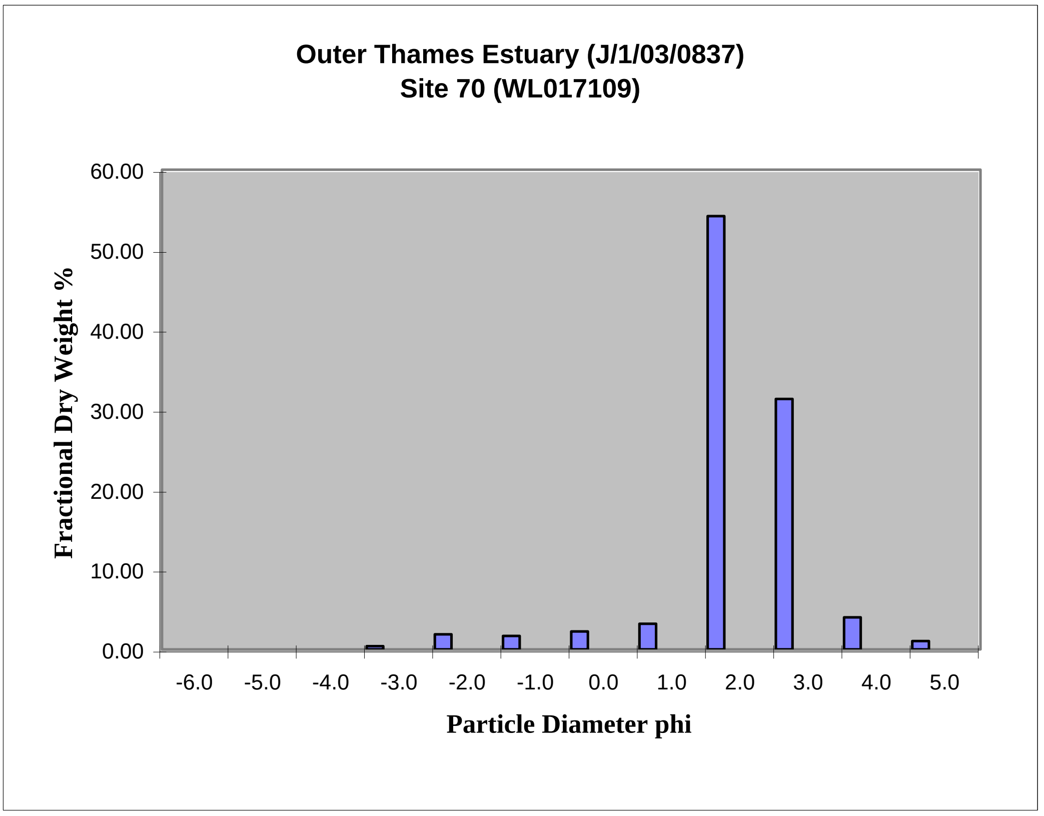
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	1.060	0.40	0.40
	4	-2.0	5.025	1.90	2.30
Coarse Sand	2	-1.0	4.399	1.66	3.96
	1	0.0	5.975	2.26	6.22
Medium Sand	0.5	1.0	8.454	3.20	9.42
	0.25	2.0	143.388	54.21	63.63
Fine Sand	0.125	3.0	82.837	31.32	94.94
	0.063	4.0	10.625	4.02	98.96
Silt/Clay	<0.063	5.0	2.751	1.04	100.00
		Total Weight	264.514	100.00	

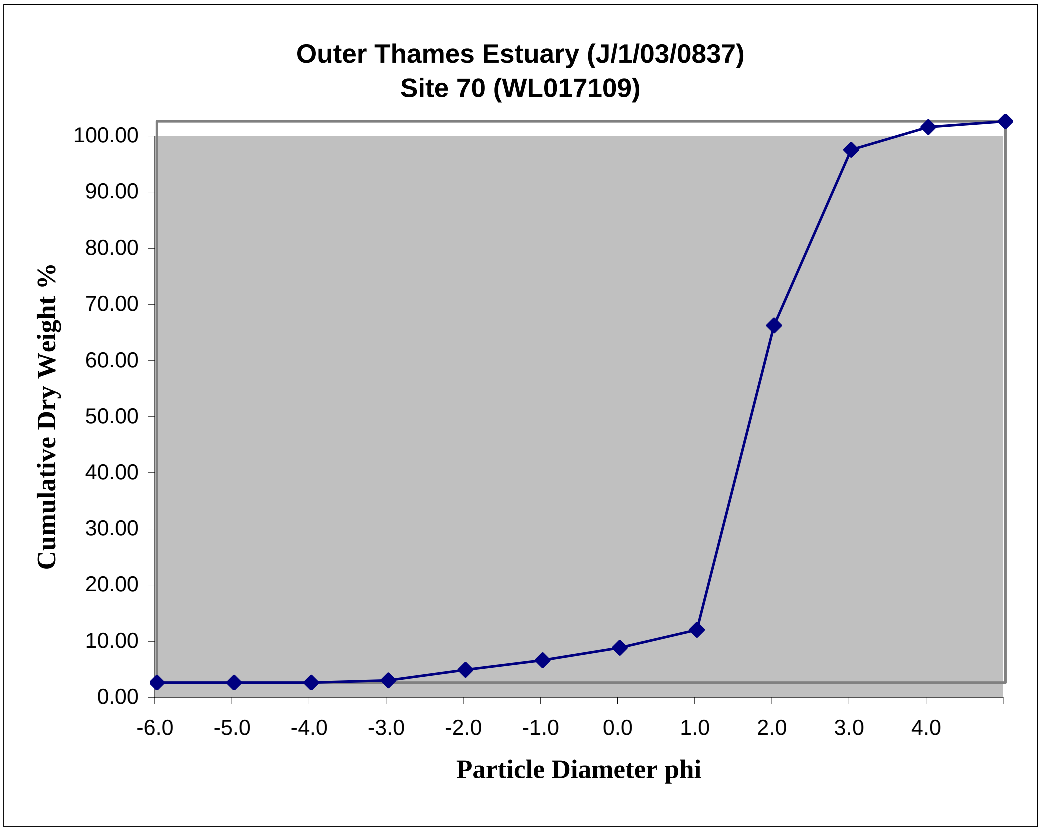
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.28
Md mm	0.30
Mean phi	1.84
Md phi	1.75
Sorting	0.92
Skq	-0.06
Kurtosis	1.35

%Gravel	2.30
% Sand	96.66
% Fines	1.04
% Org C	0.714

Sand


Outer Thames Estuary (J/1/03/0837)
Site 70 (WL017109)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 70 (WL017109)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 71 (WL017110)

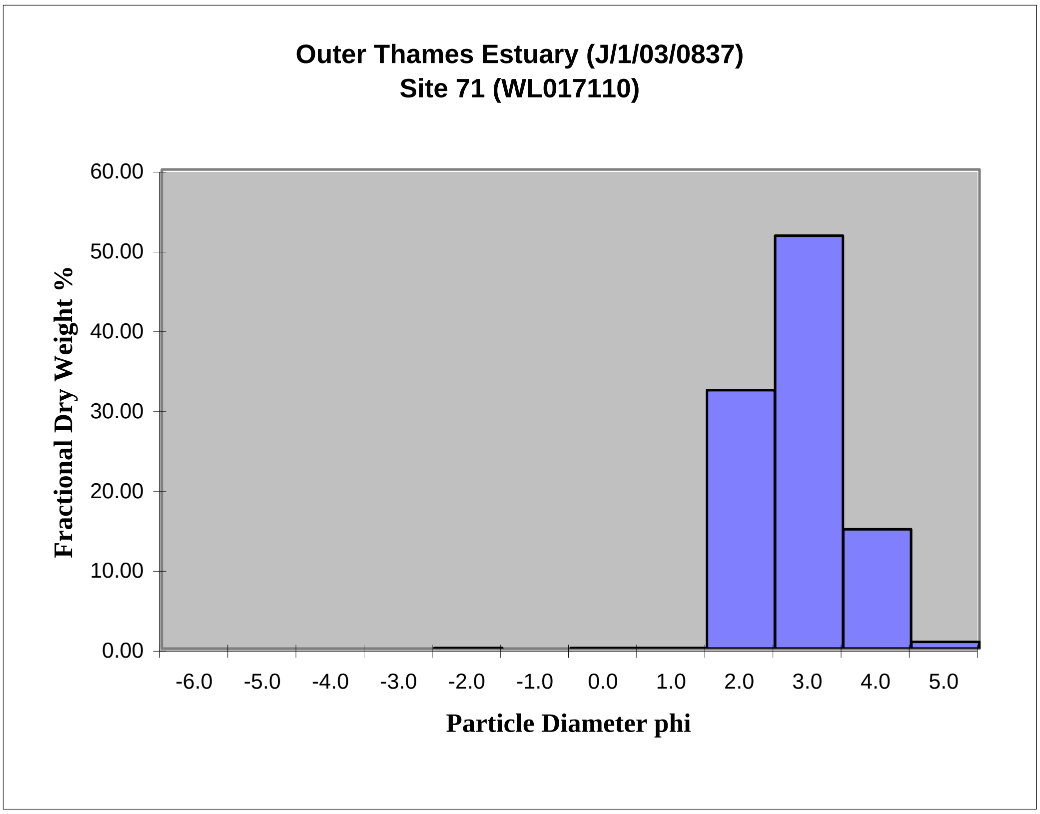
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.089	0.03	0.03
Coarse Sand	2	-1.0	0.036	0.01	0.04
	1	0.0	0.070	0.02	0.07
Medium Sand	0.5	1.0	0.248	0.09	0.16
	0.25	2.0	91.308	32.37	32.53
Fine Sand	0.125	3.0	145.837	51.70	84.23
	0.063	4.0	42.136	14.94	99.17
Silt/Clay	<0.063	5.0	2.335	0.83	100.00
		Total Weight	282.059	100.00	

Mean mm	0.21
Md mm	0.20
Mean phi	2.27
Md phi	2.34
Sorting	0.64
Skq	-0.25
Kurtosis	0.67

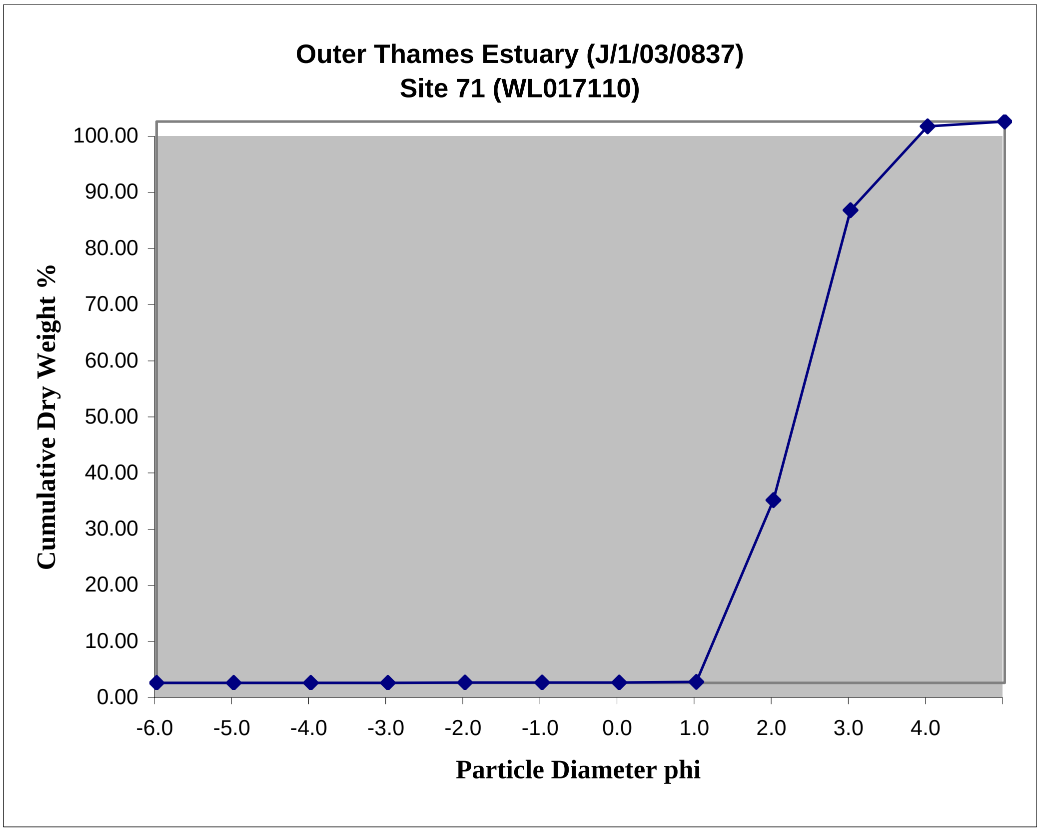
%Gravel	0.03
% Sand	99.14
% Fines	0.83
% Org C	0.650

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.



Outer Thames Estuary (J/1/03/0837)
Site 71 (WL017110)
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Fractional Dry Weight %
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi



Outer Thames Estuary (J/1/03/0837)
Site 71 (WL017110)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Cumulative Dry Weight %
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 71 H (WL017297)

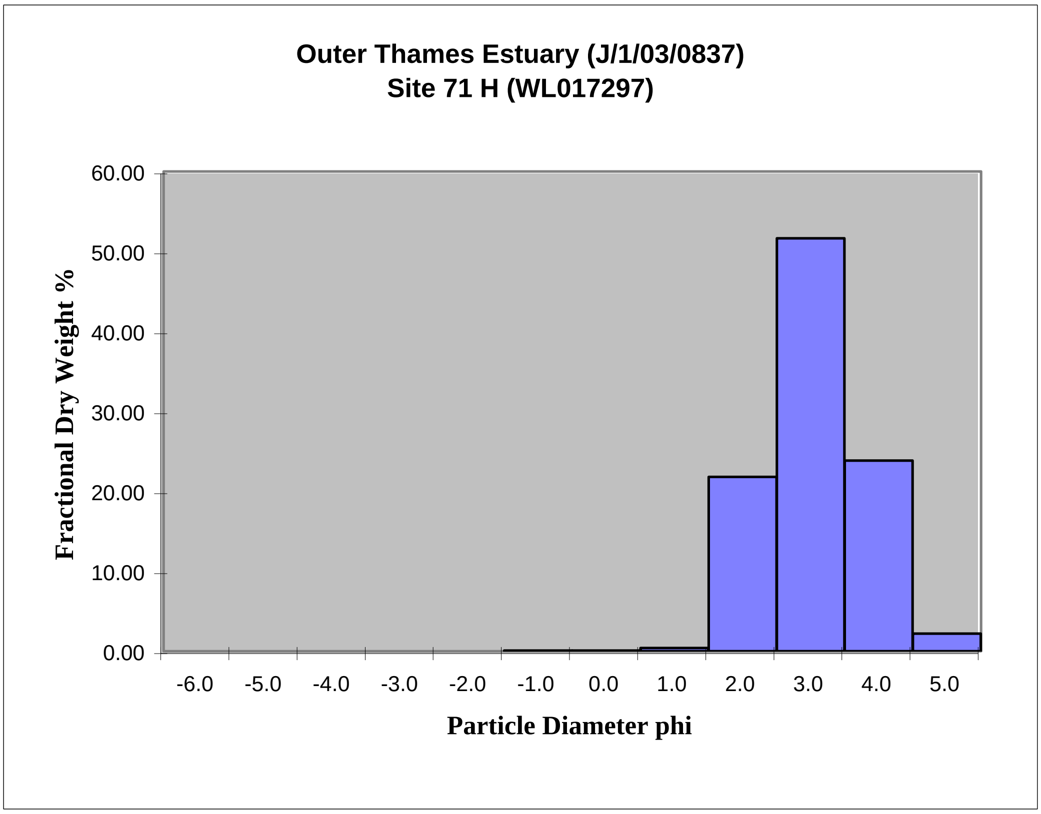
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.012	0.00	0.00
Coarse Sand	2	-1.0	0.115	0.04	0.05
	1	0.0	0.157	0.06	0.11
Medium Sand	0.5	1.0	1.067	0.41	0.52
	0.25	2.0	57.122	21.81	22.33
Fine Sand	0.125	3.0	135.275	51.66	73.99
	0.063	4.0	62.381	23.82	97.81
Silt/Clay	<0.063	5.0	5.737	2.19	100.00
		Total Weight	261.866	100.00	

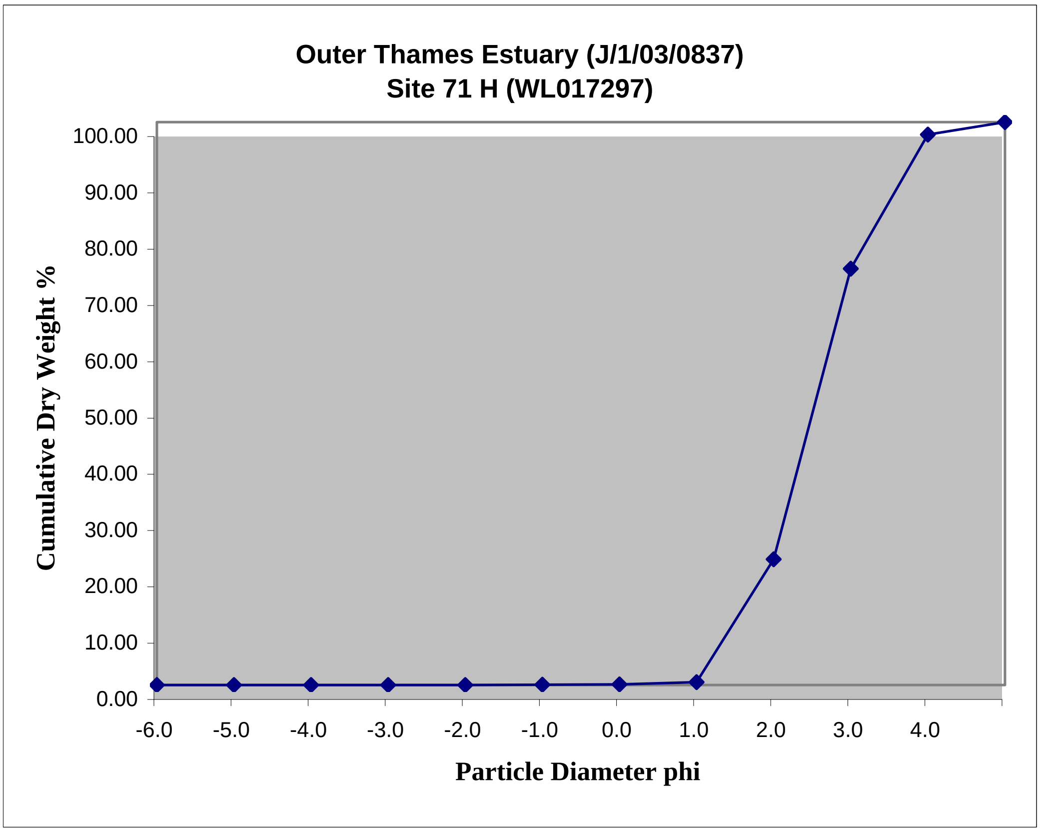
Mean mm	0.19
Md mm	0.17
Mean phi	2.37
Md phi	2.54
Sorting	0.52
Skq	-0.60
Kurtosis	0.66

%Gravel	0.00
% Sand	97.80
% Fines	2.19
% Org C	0.964

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 71 H (WL017297)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 71 H (WL017297)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 72 (WL017111)

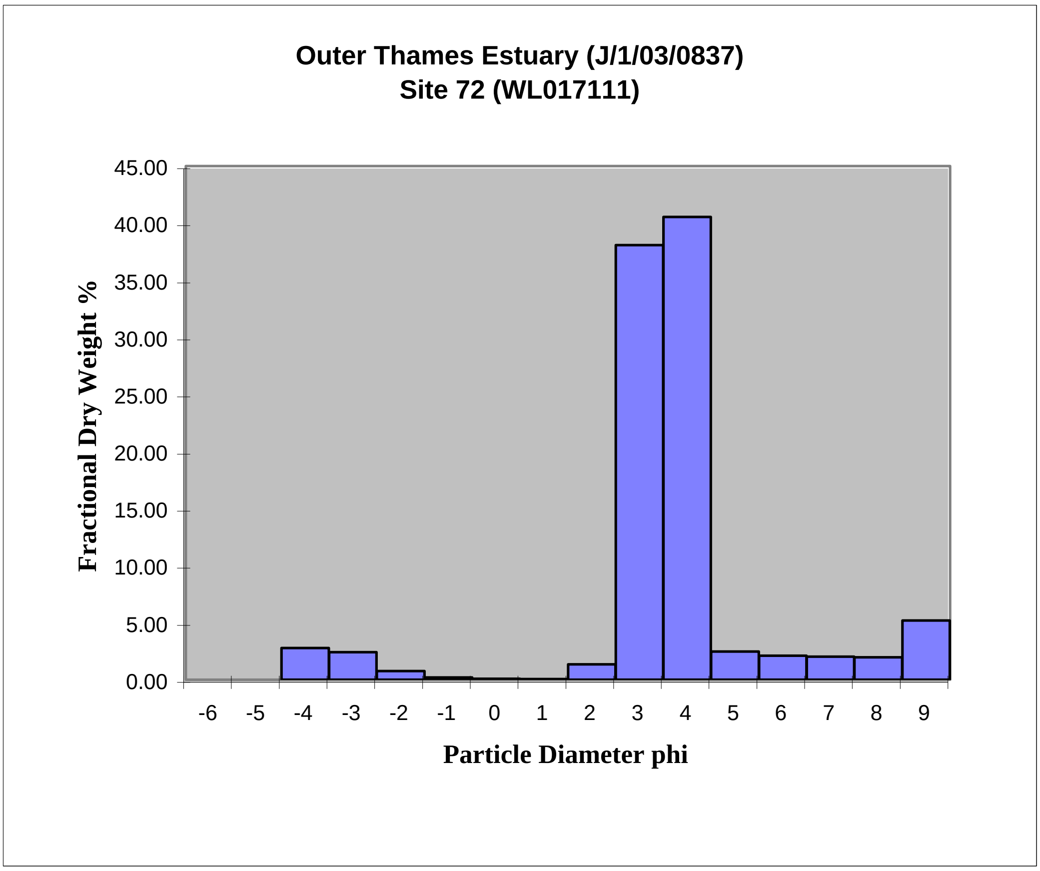
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	7.663	2.77	2.77
Gravel	8	-3.0	6.704	2.42	5.19
	4	-2.0	2.128	0.77	5.96
Coarse Sand	2	-1.0	0.576	0.21	6.17
	1	0.0	0.261	0.09	6.26
Medium Sand	0.5	1.0	0.137	0.05	6.31
	0.25	2.0	3.699	1.34	7.65
Fine Sand	0.125	3.0	105.438	38.09	45.73
	0.063	4.0	112.222	40.54	86.27
Silt	0.032	5.0	6.831	2.47	88.74
	0.0156	6.0	5.791	2.09	90.83
	0.0078	7.0	5.605	2.02	92.85
	0.0039	8.0	5.431	1.96	94.81
Clay	<0.0039	9.0	14.357	5.19	100.00
		Total Weight	277	100	

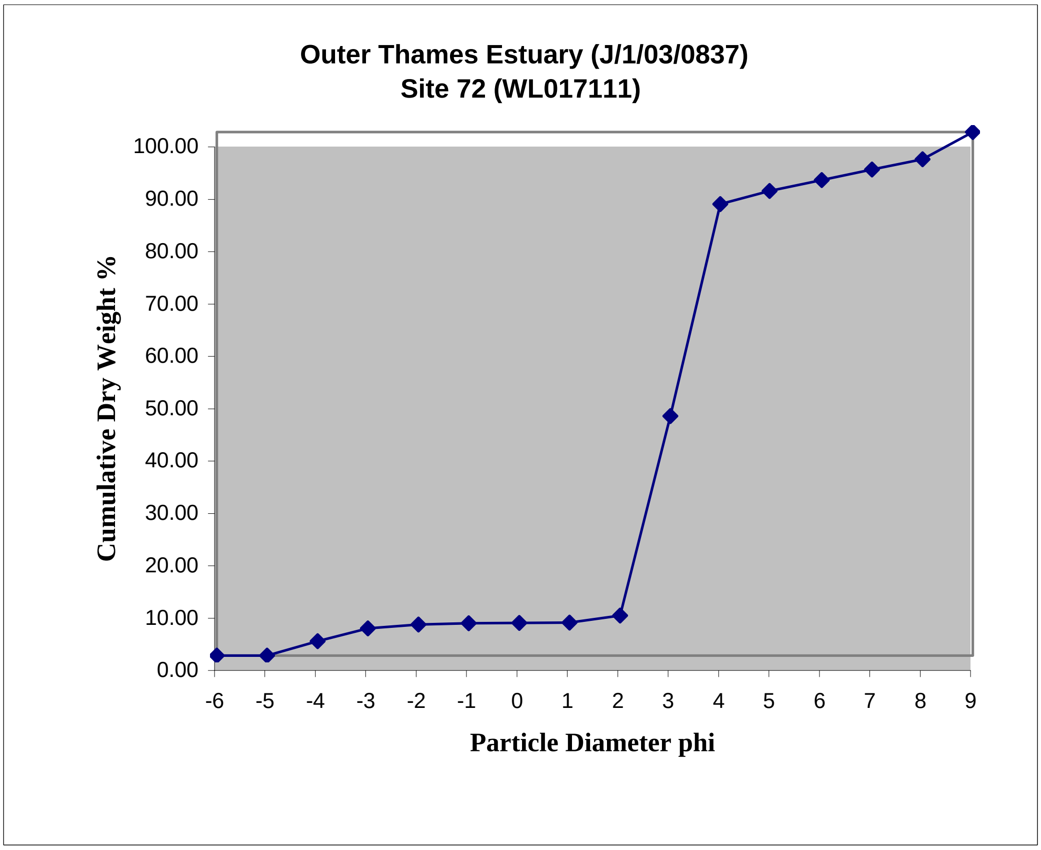
Mean mm	0.12
Md mm	0.12
Mean phi	3.09
Md phi	3.10
Sorting	2.11
Skq	-0.07
Kurtosis	3.61

%Gravel	5.96
% Sand	80.31
% Fines	13.73
% Org C	2.100

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 72 (WL017111)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 72 (WL017111)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 73 H (WL017112)

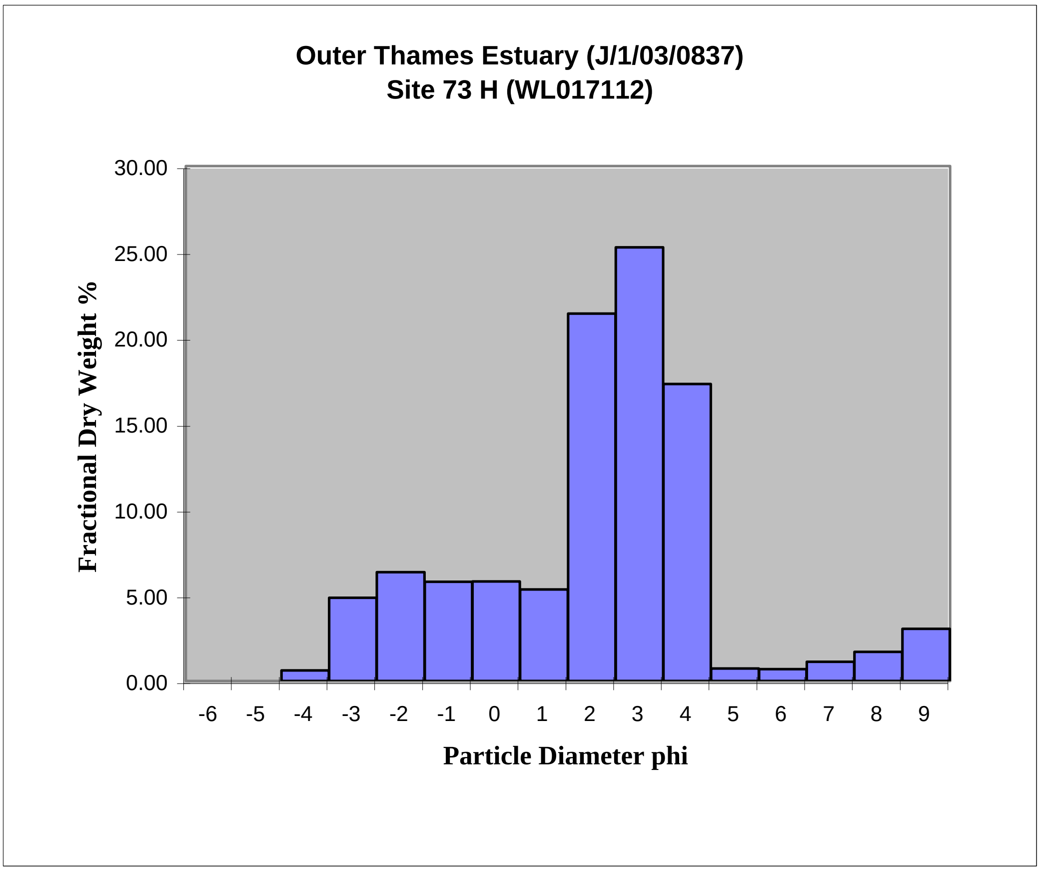
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	2.041	0.62	0.62
Gravel	8	-3.0	15.933	4.85	5.48
	4	-2.0	20.783	6.33	11.81
Coarse Sand	2	-1.0	18.970	5.78	17.58
	1	0.0	19.064	5.81	23.39
Medium Sand	0.5	1.0	17.514	5.34	28.73
	0.25	2.0	70.251	21.40	50.13
Fine Sand	0.125	3.0	82.958	25.27	75.40
	0.063	4.0	56.798	17.30	92.70
Silt	0.032	5.0	2.414	0.74	93.43
	0.0156	6.0	2.269	0.69	94.13
	0.0078	7.0	3.701	1.13	95.25
	0.0039	8.0	5.597	1.70	96.96
Clay	<0.0039	9.0	9.986	3.04	100.00
		Total Weight	328	100	

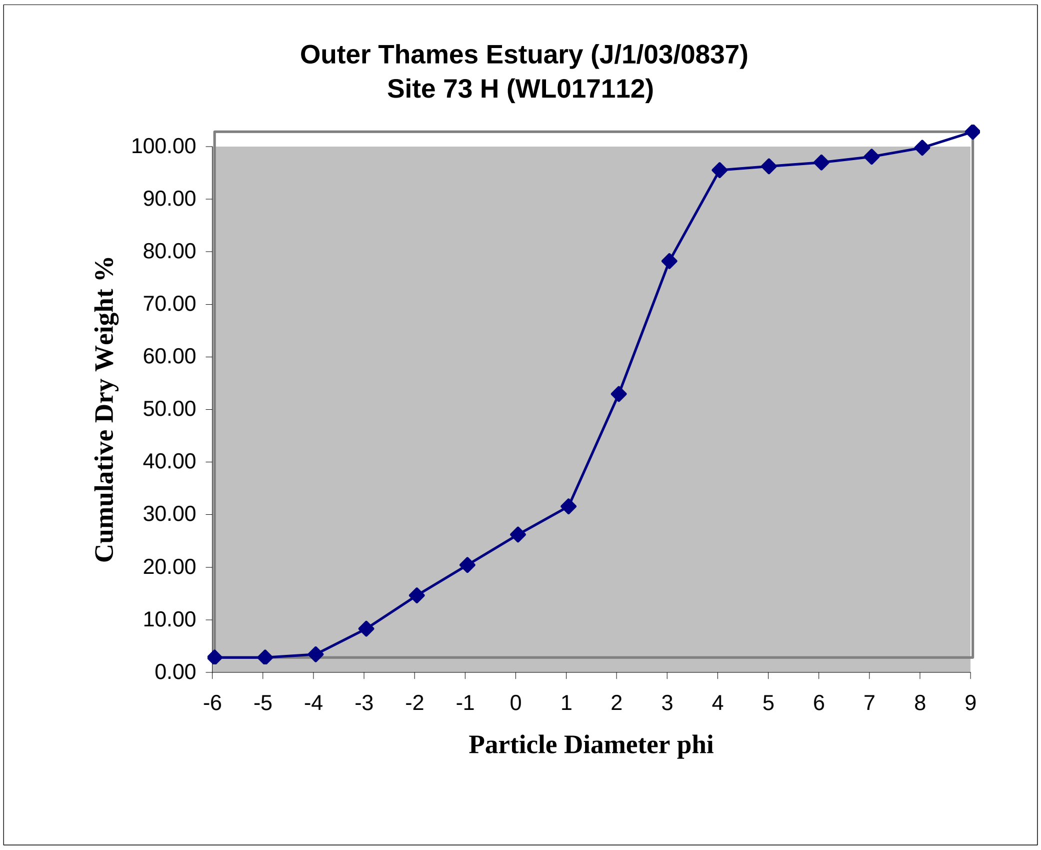
Mean mm	0.38
Md mm	0.25
Mean phi	1.40
Md phi	1.99
Sorting	2.69
Skq	-0.20
Kurtosis	1.51

%Gravel	11.81
% Sand	80.89
% Fines	7.30
% Org C	1.313

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 73 H (WL017112)
Fractional Dry Weight %
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 73 H (WL017112)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 74 H (WL017113)

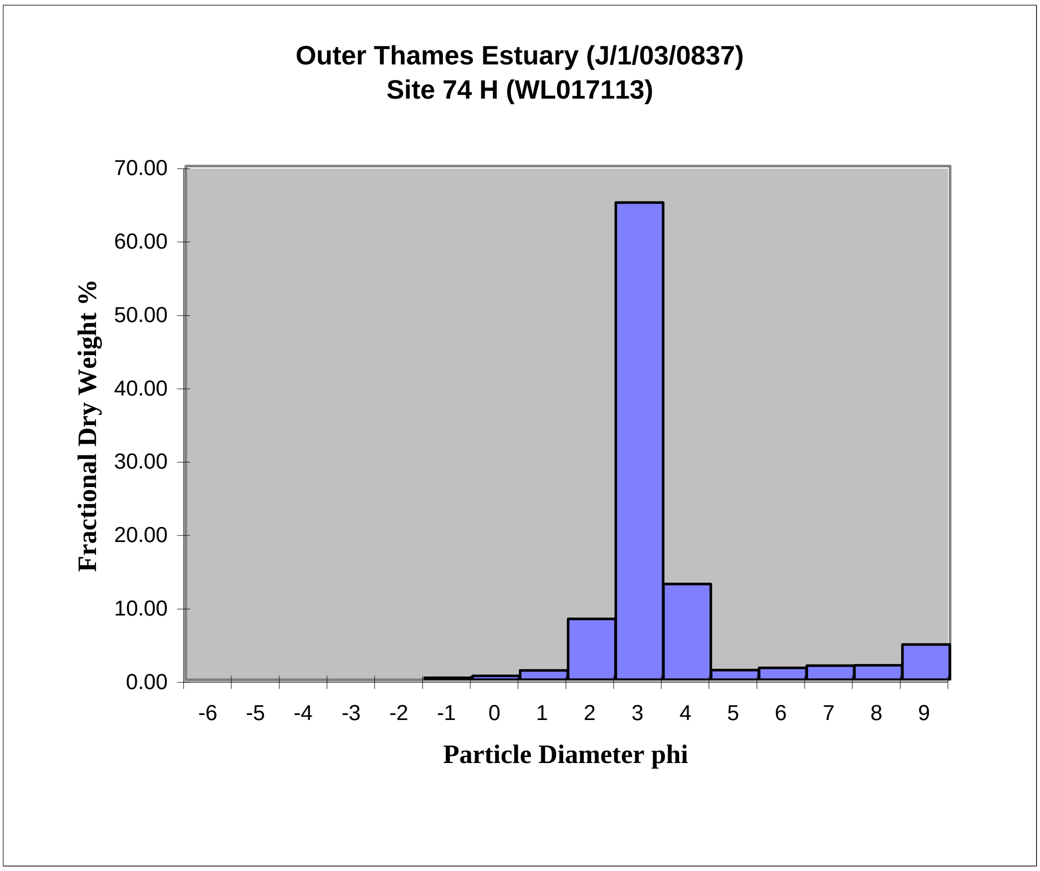
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.641	0.25	0.25
	1	0.0	1.369	0.54	0.79
Medium Sand	0.5	1.0	3.253	1.28	2.07
	0.25	2.0	21.053	8.27	10.34
Fine Sand	0.125	3.0	165.584	65.05	75.38
	0.063	4.0	33.144	13.02	88.40
Silt	0.032	5.0	3.354	1.32	89.72
	0.0156	6.0	4.135	1.62	91.35
	0.0078	7.0	4.858	1.91	93.25
	0.0039	8.0	4.947	1.94	95.20
Clay	<0.0039	9.0	12.228	4.80	100.00
		Total Weight	255	100	

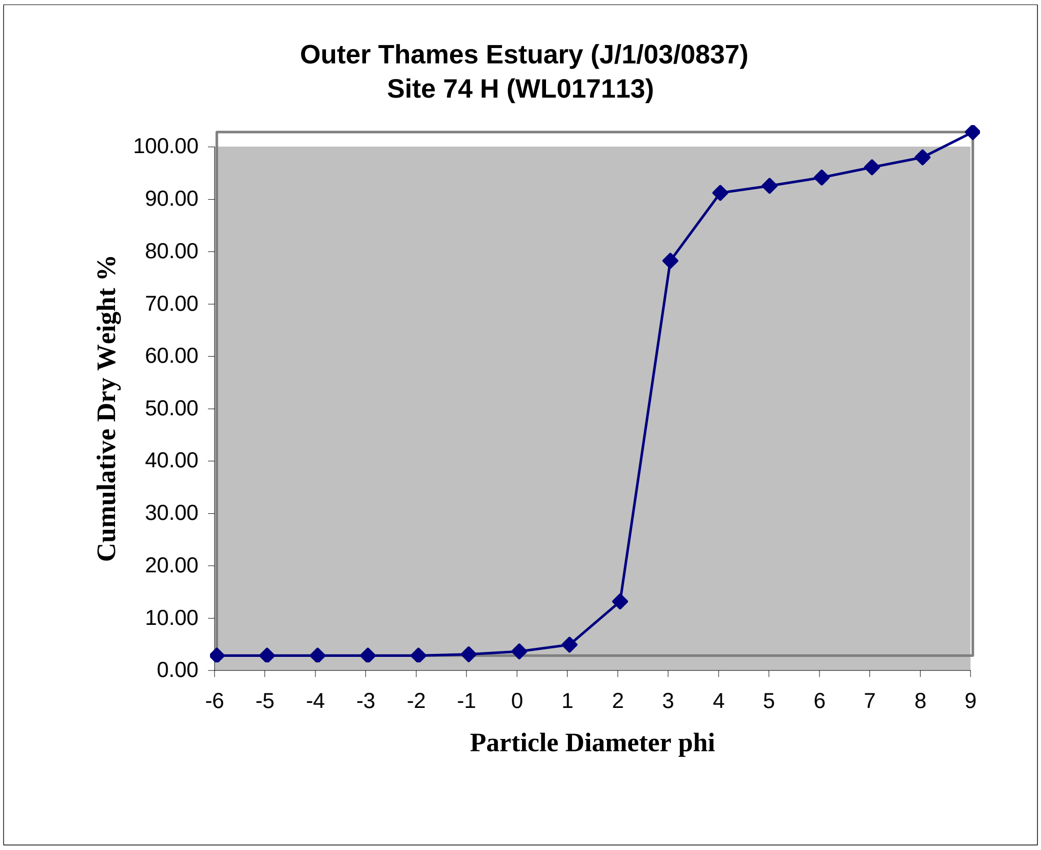
Mean mm	0.15
Md mm	0.16
Mean phi	2.78
Md phi	2.61
Sorting	1.38
Skq	0.47
Kurtosis	3.49

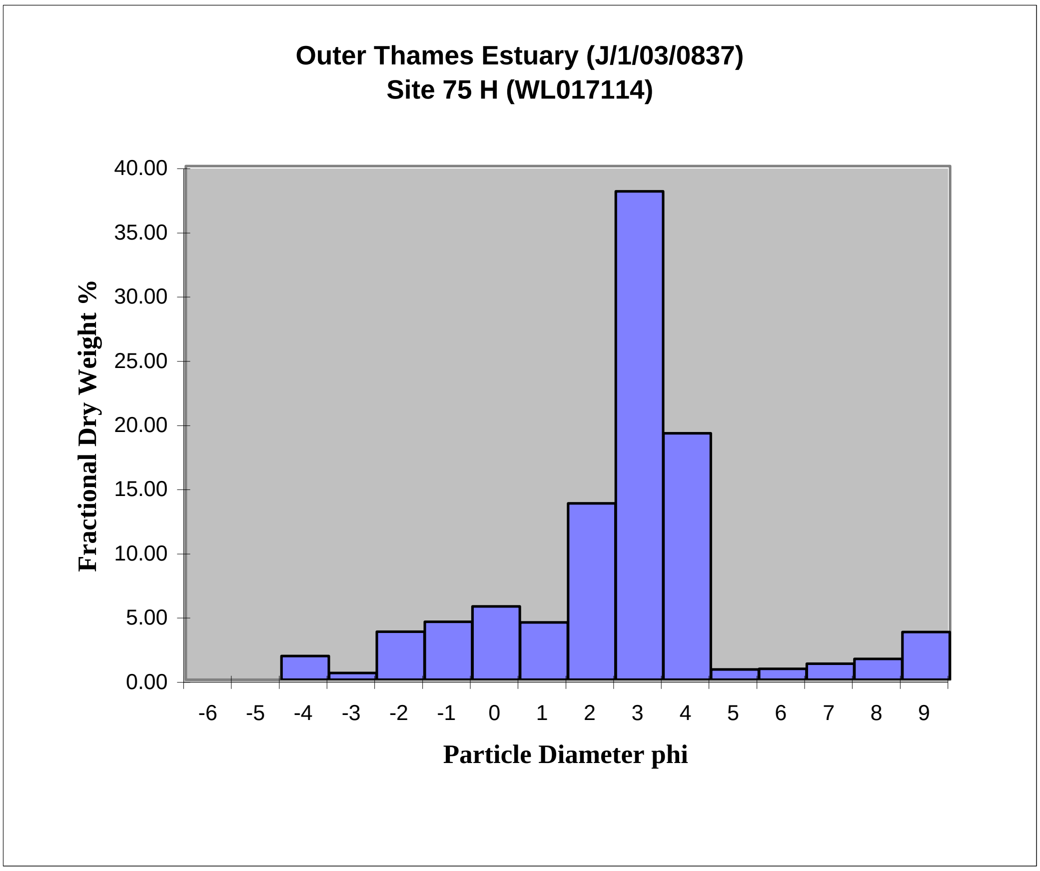
%Gravel	0.00
% Sand	88.40
% Fines	11.60
% Org C	1.310

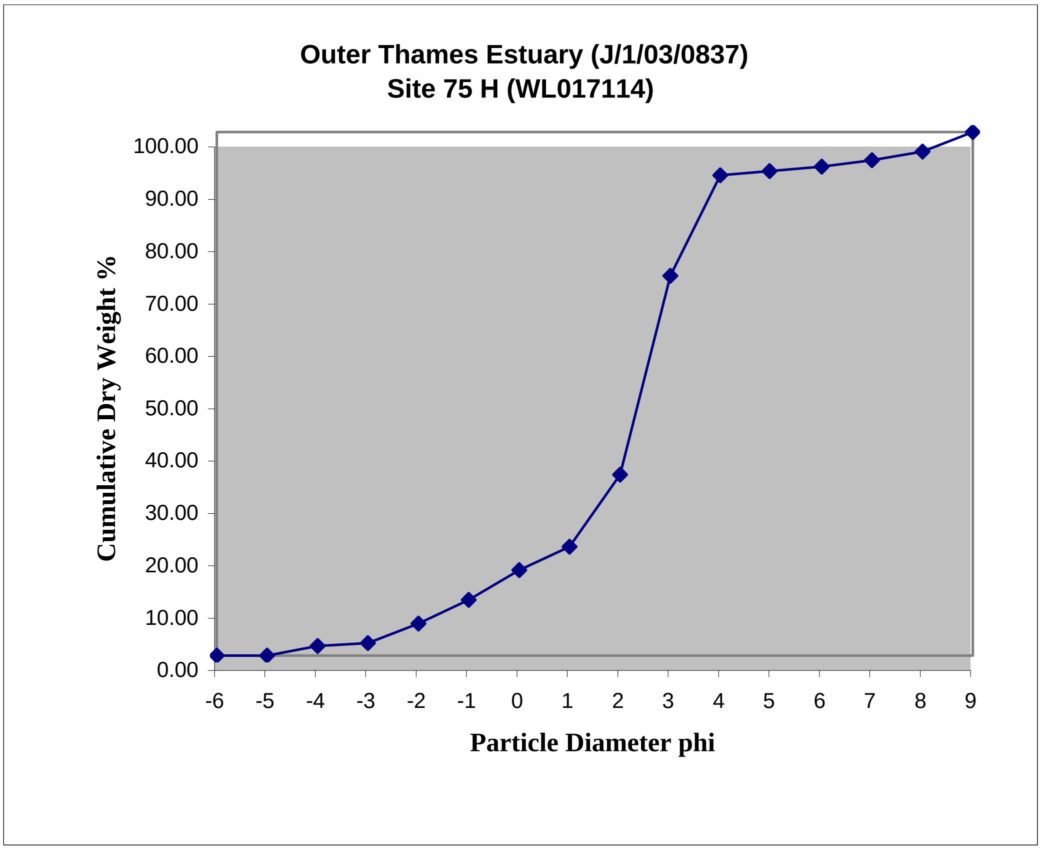
Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 74 H (WL017113)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 74 H (WL017113)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 75 H (WL017114)
Fractional Dry Weight %
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 75 H (WL017114)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 75 H (WL017114)

*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	5.596	1.85	1.85
Gravel	8	-3.0	1.567	0.52	2.37
	4	-2.0	11.290	3.74	6.11
Coarse Sand	2	-1.0	13.616	4.51	10.62
	1	0.0	17.242	5.71	16.33
Medium Sand	0.5	1.0	13.490	4.47	20.80
	0.25	2.0	41.465	13.73	34.53
Fine Sand	0.125	3.0	114.854	38.04	72.57
	0.063	4.0	57.953	19.19	91.76
Silt	0.032	5.0	2.376	0.79	92.54
	0.0156	6.0	2.592	0.86	93.40
	0.0078	7.0	3.755	1.24	94.65
	0.0039	8.0	4.929	1.63	96.28
Clay	<0.0039	9.0	11.237	3.72	100.00
		Total Weight	302	100	

Mean mm	0.25
Md mm	0.19
Mean phi	1.98
Md phi	2.41
Sorting	2.35
Skq	-0.17
Kurtosis	2.14

%Gravel	6.11
% Sand	85.65
% Fines	8.24
% Org C	1.338

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Outer Thames Estuary (J/1/03/0837)
Site 76 (WL017115)

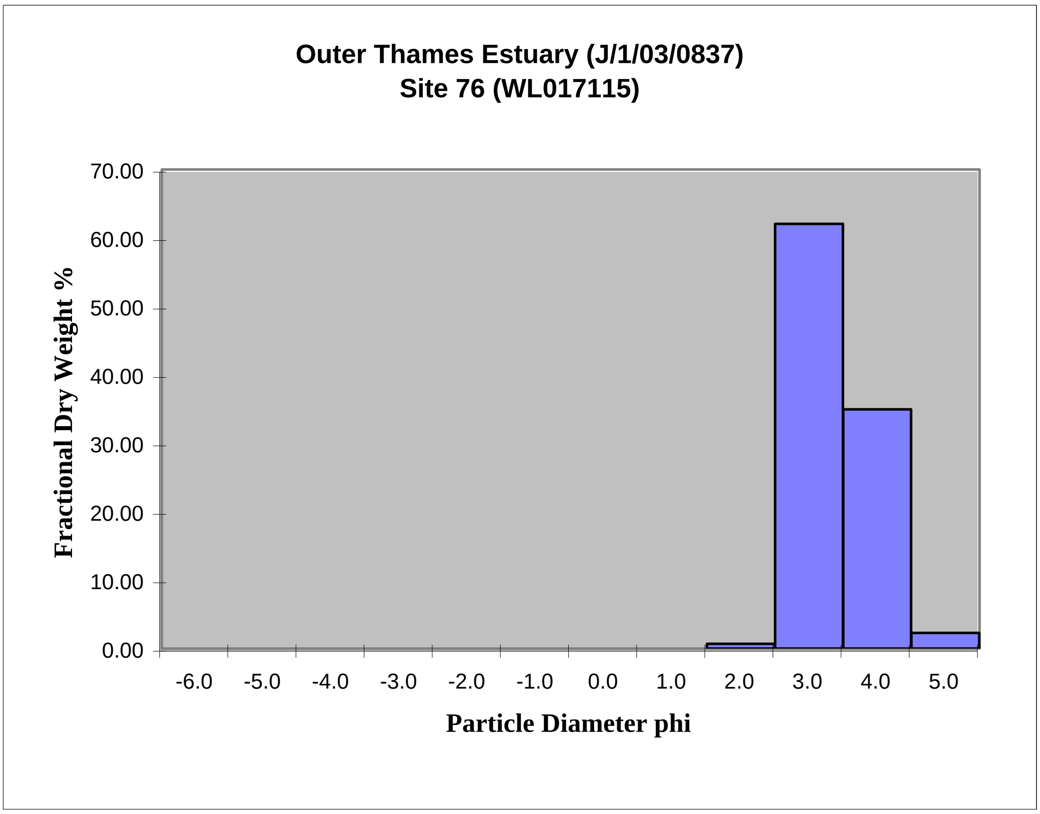
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.000	0.00	0.00
	0.25	2.0	1.727	0.70	0.70
Fine Sand	0.125	3.0	153.456	62.07	62.77
	0.063	4.0	86.388	34.94	97.71
Silt/Clay	<0.063	5.0	5.654	2.29	100.00
		Total Weight	247.225	100.00	

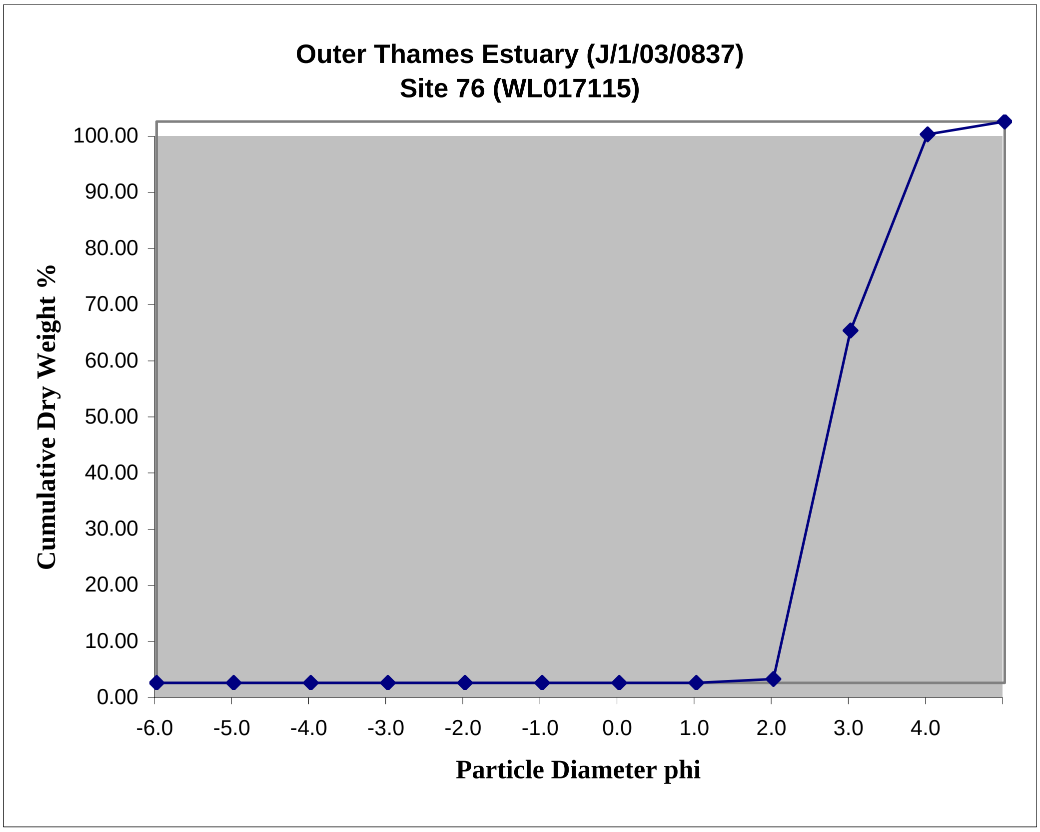
Mean mm	0.17
Md mm	0.14
Mean phi	2.57
Md phi	2.79
Sorting	0.17
Skq	-2.06
Kurtosis	0.41

%Gravel	0.00
% Sand	97.71
% Fines	2.29
% Org C	0.625

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 76 (WL017115)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 76 (WL017115)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 77 (WL017116)

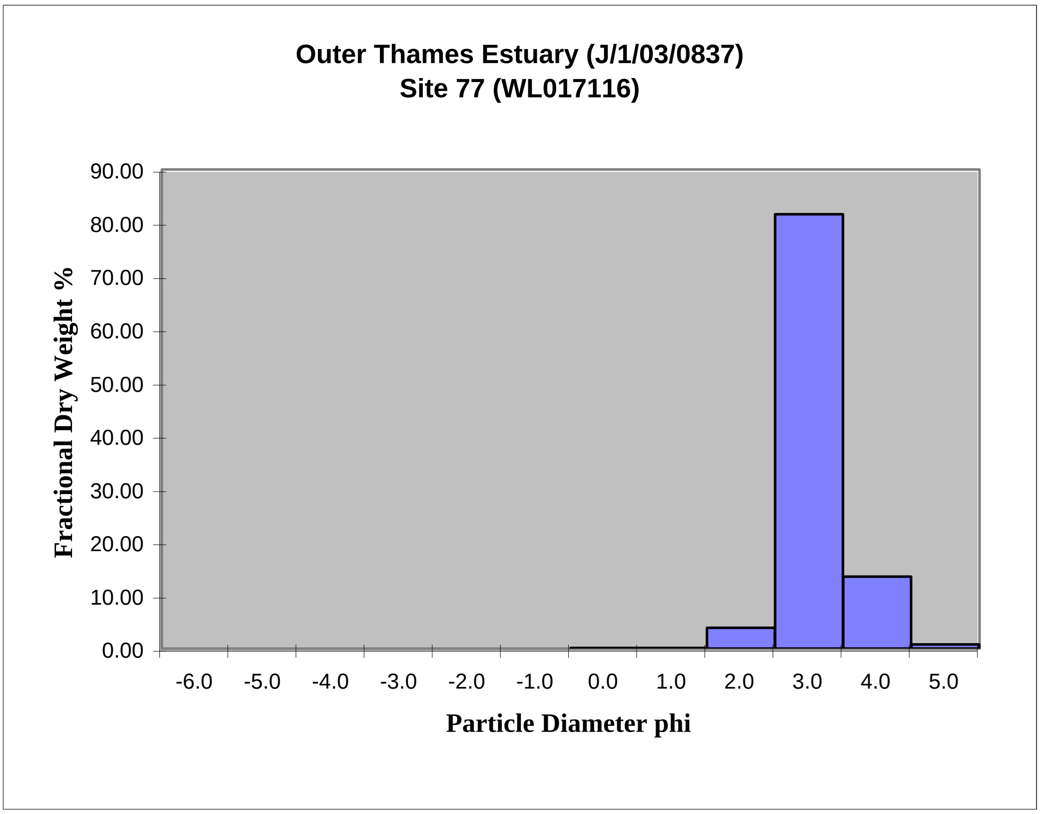
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.043	0.02	0.02
	1	0.0	0.077	0.03	0.05
Medium Sand	0.5	1.0	0.267	0.11	0.16
	0.25	2.0	9.522	3.89	4.05
Fine Sand	0.125	3.0	199.712	81.61	85.66
	0.063	4.0	33.128	13.54	99.19
Silt/Clay	<0.063	5.0	1.976	0.81	100.00
		Total Weight	244.725	100.00	

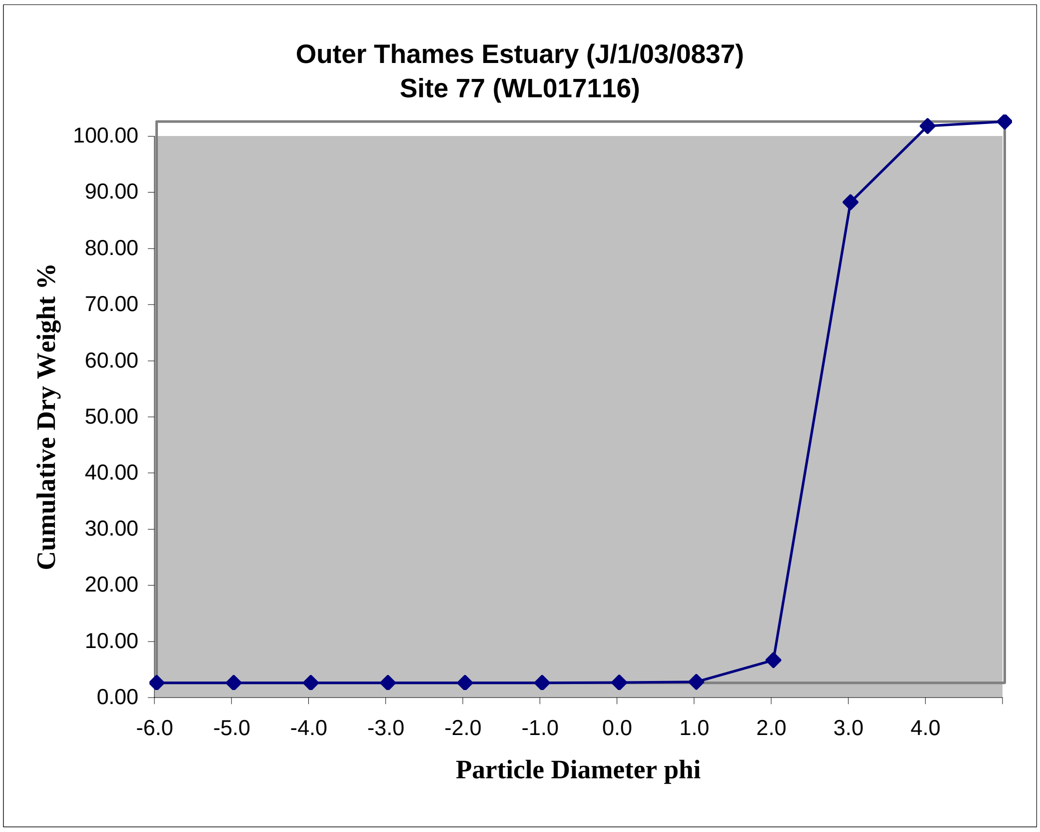
Mean mm	0.17
Md mm	0.17
Mean phi	2.56
Md phi	2.56
Sorting	0.34
Skq	-0.13
Kurtosis	0.59

%Gravel	0.00
% Sand	99.19
% Fines	0.81
% Org C	0.798

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 77 (WL017116)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 77 (WL017116)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 78 (WL017117)

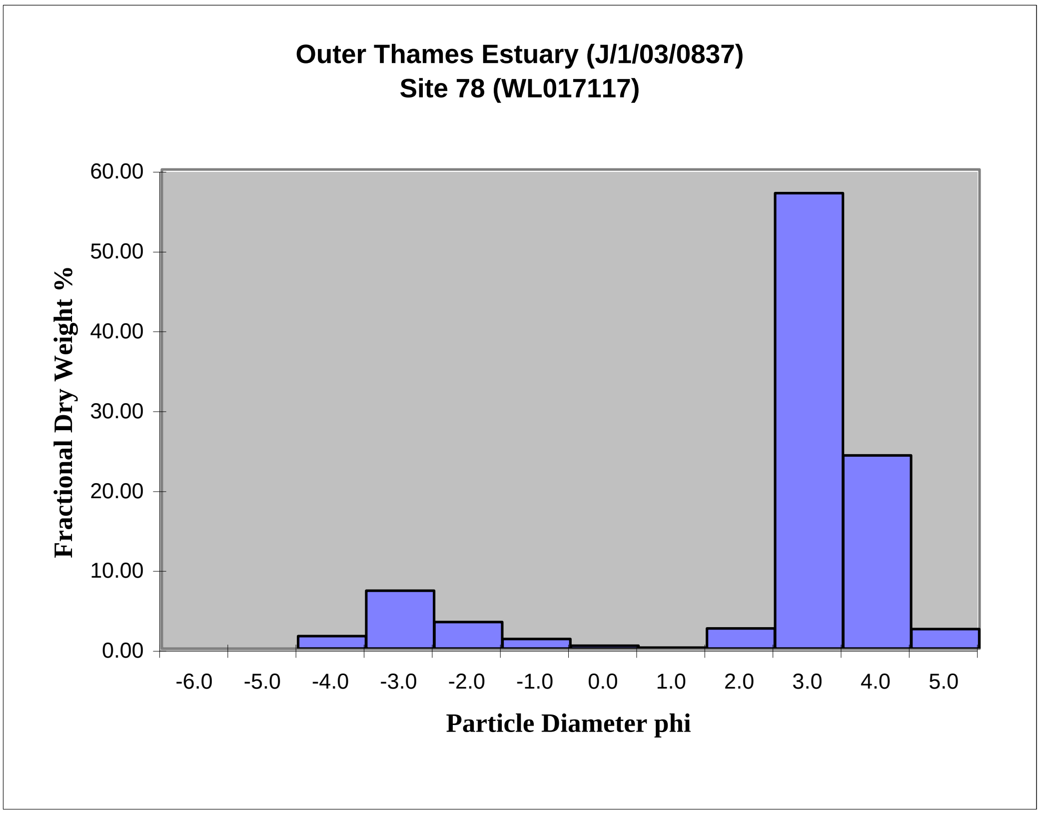
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	4.580	1.54	1.54
Gravel	8	-3.0	21.466	7.24	8.78
	4	-2.0	9.878	3.33	12.11
Coarse Sand	2	-1.0	3.600	1.21	13.32
	1	0.0	1.028	0.35	13.67
Medium Sand	0.5	1.0	0.404	0.14	13.81
	0.25	2.0	7.502	2.53	16.34
Fine Sand	0.125	3.0	169.236	57.05	73.39
	0.063	4.0	71.729	24.18	97.57
Silt/Clay	<0.063	5.0	7.204	2.43	100.00
		Total Weight	296.627	100.00	

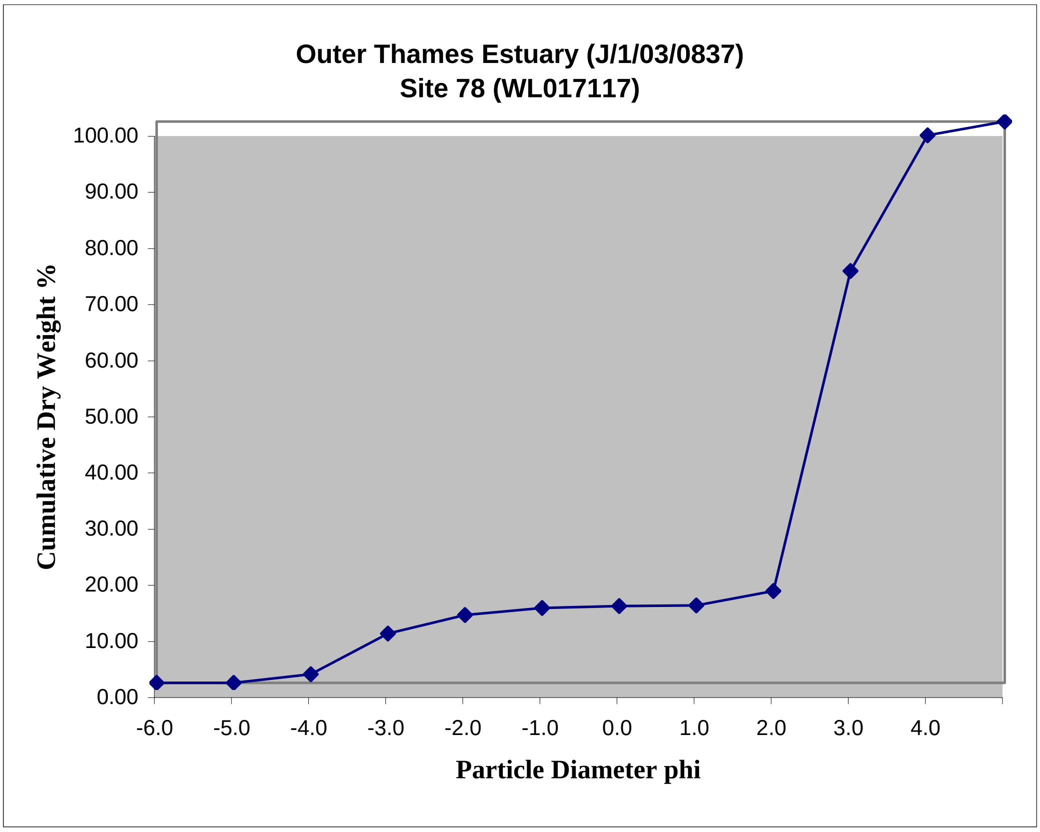
Mean mm	0.18
Md mm	0.17
Mean phi	2.44
Md phi	2.59
Sorting	1.19
Skq	-0.71
Kurtosis	3.09

%Gravel	12.11
% Sand	85.46
% Fines	2.43
% Org C	0.711

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 78 (WL017117)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 78 (WL017117)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 79 (WL017118)

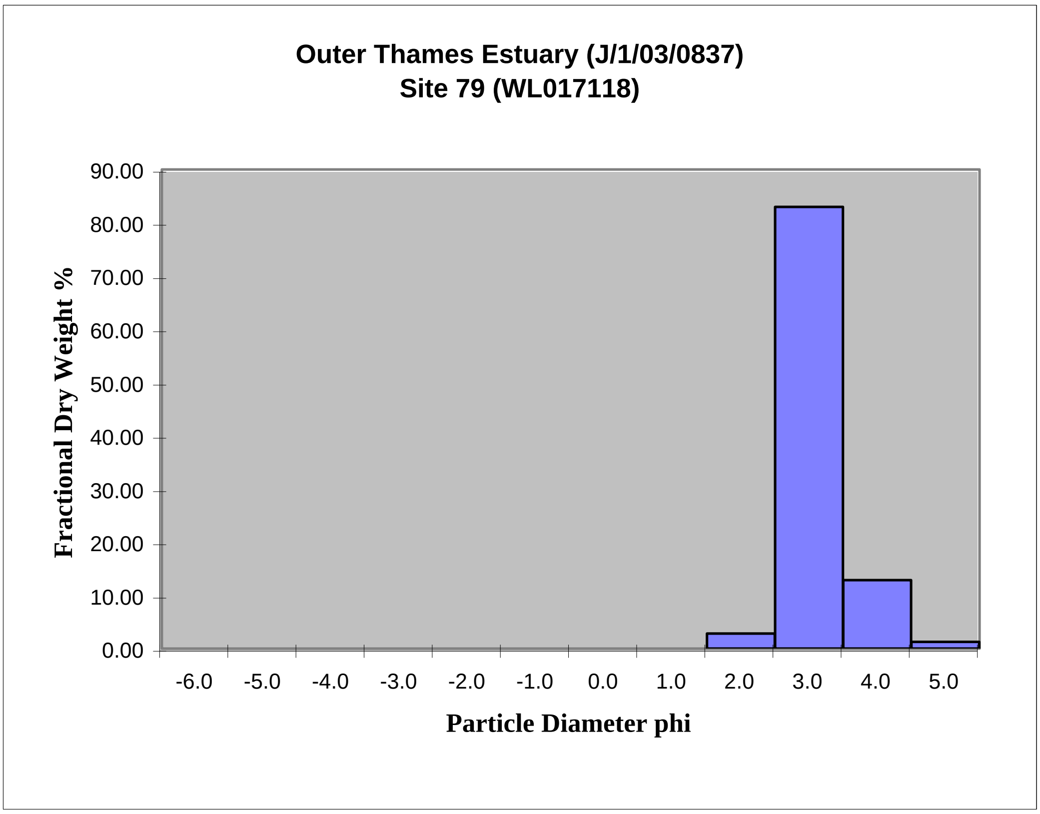
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.079	0.03	0.03
	1	0.0	0.057	0.02	0.05
Medium Sand	0.5	1.0	0.061	0.02	0.07
	0.25	2.0	7.741	2.80	2.87
Fine Sand	0.125	3.0	229.753	82.97	85.84
	0.063	4.0	35.664	12.88	98.72
Silt/Clay	<0.063	5.0	3.550	1.28	100.00
		Total Weight	276.905	100.00	

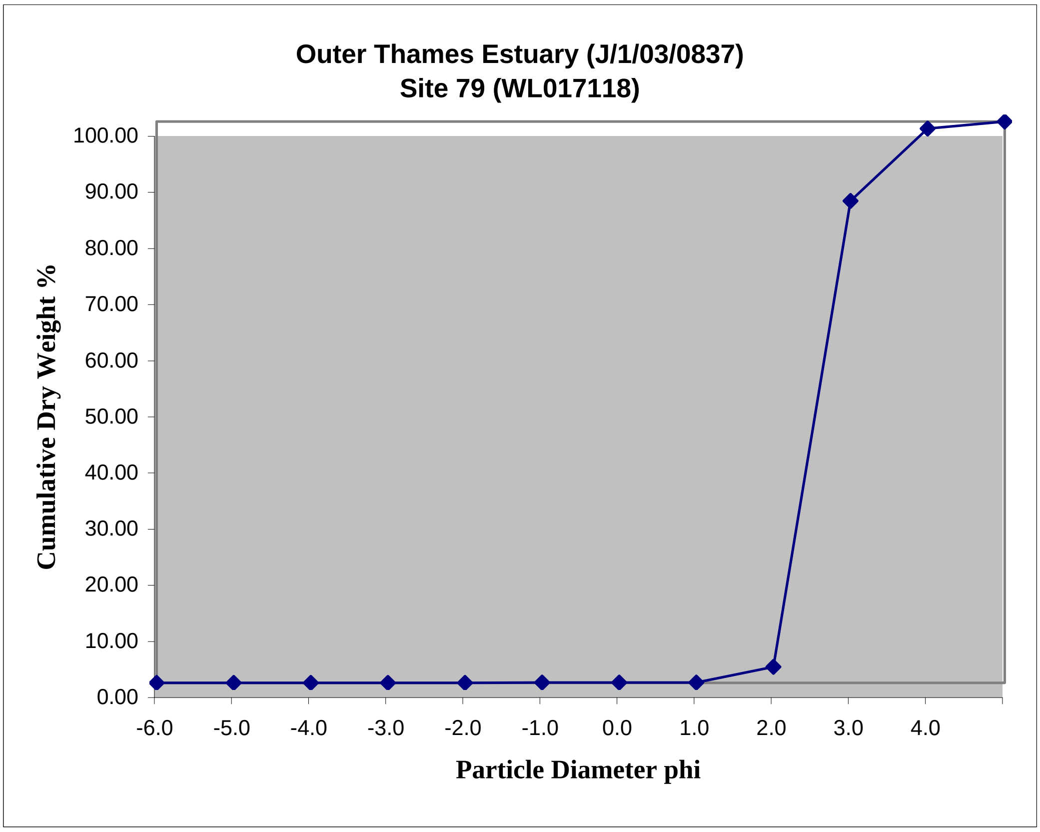
Mean mm	0.17
Md mm	0.17
Mean phi	2.57
Md phi	2.57
Sorting	0.34
Skq	-0.13
Kurtosis	0.59

%Gravel	0.00
% Sand	98.72
% Fines	1.28
% Org C	0.678

Sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 79 (WL017118)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 79 (WL017118)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 80 (WL017119)

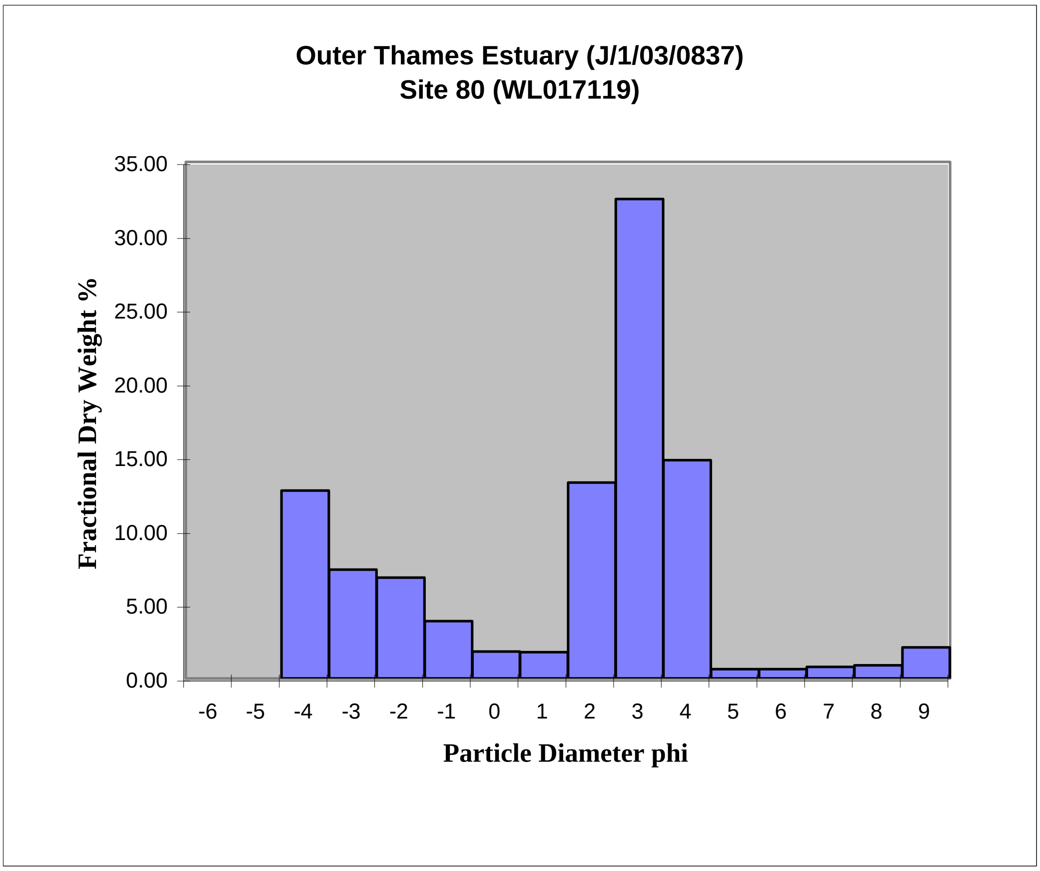
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	40.396	12.73	12.73
Gravel	8	-3.0	23.373	7.37	20.10
	4	-2.0	21.680	6.83	26.94
Coarse Sand	2	-1.0	12.286	3.87	30.81
	1	0.0	5.745	1.81	32.62
Medium Sand	0.5	1.0	5.659	1.78	34.40
	0.25	2.0	42.109	13.27	47.68
Fine Sand	0.125	3.0	103.067	32.49	80.17
	0.063	4.0	46.933	14.79	94.96
Silt	0.032	5.0	1.972	0.62	95.58
	0.0156	6.0	2.021	0.64	96.22
	0.0078	7.0	2.482	0.78	97.00
	0.0039	8.0	2.842	0.90	97.90
Clay	<0.0039	9.0	6.663	2.10	100.00
		Total Weight	317	100	

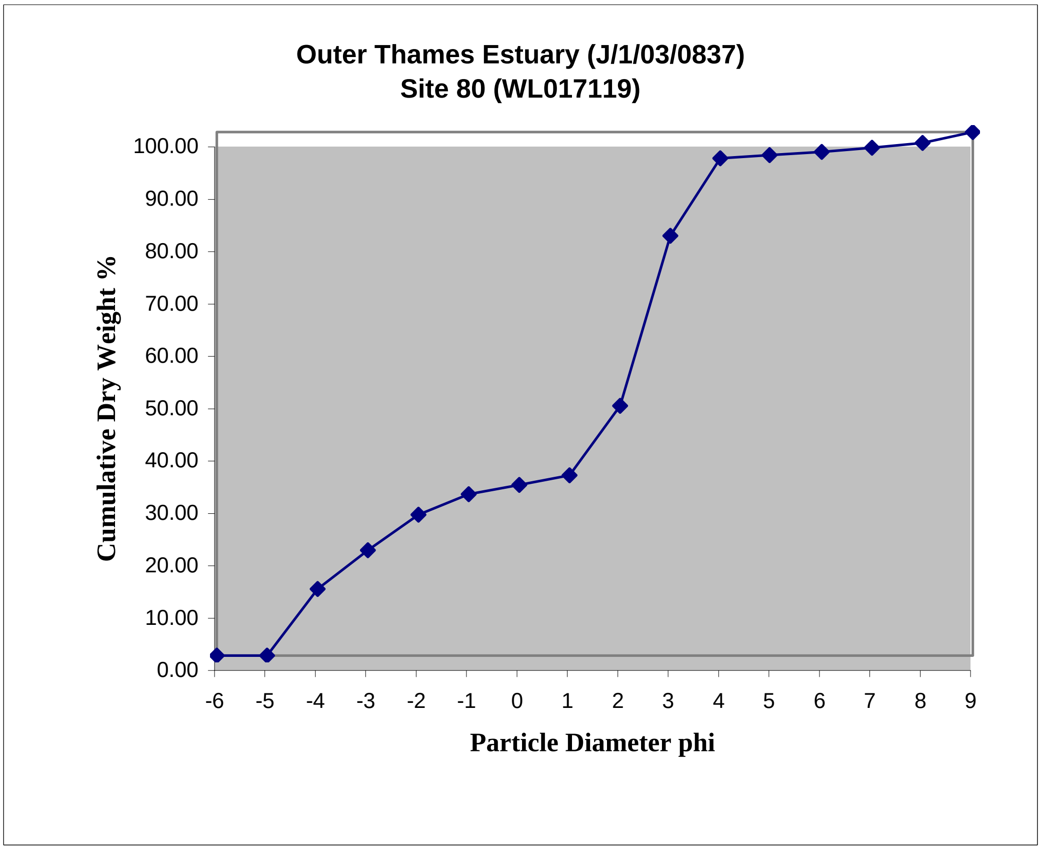
Mean mm	0.66
Md mm	0.24
Mean phi	0.59
Md phi	2.07
Sorting	3.01
Skq	-0.60
Kurtosis	0.69

%Gravel	26.94
% Sand	68.03
% Fines	5.04
% Org C	0.747

Gravelly Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 80 (WL017119)
Fractional Dry Weight %
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 80 (WL017119)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 81 (WL017120)

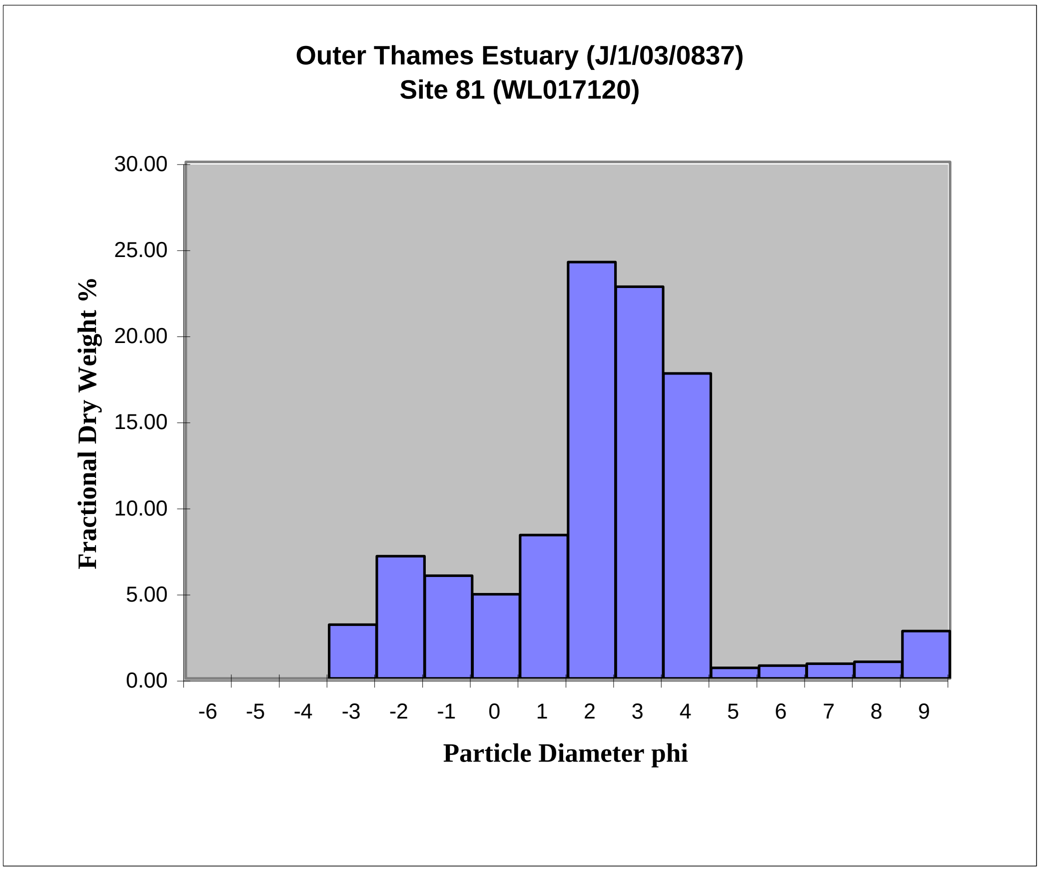
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	9.085	3.13	3.13
	4	-2.0	20.590	7.10	10.23
Coarse Sand	2	-1.0	17.318	5.97	16.20
	1	0.0	14.160	4.88	21.08
Medium Sand	0.5	1.0	24.173	8.33	29.41
	0.25	2.0	70.125	24.17	53.59
Fine Sand	0.125	3.0	66.026	22.76	76.35
	0.063	4.0	51.411	17.72	94.07
Silt	0.032	5.0	1.798	0.62	94.69
	0.0156	6.0	2.138	0.74	95.43
	0.0078	7.0	2.488	0.86	96.28
	0.0039	8.0	2.826	0.97	97.26
Clay	<0.0039	9.0	7.955	2.74	100.00
		Total Weight	290	100	

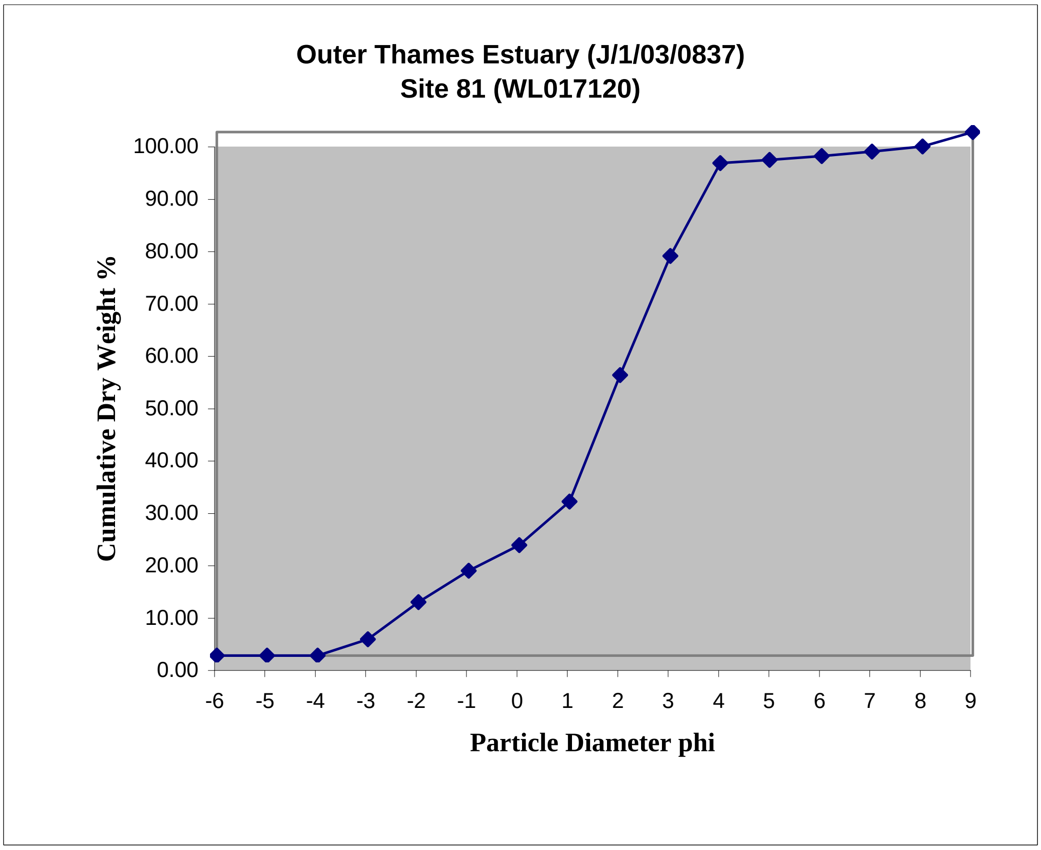
Mean mm	0.37
Md mm	0.28
Mean phi	1.42
Md phi	1.85
Sorting	2.35
Skq	-0.21
Kurtosis	1.35

%Gravel	10.23
% Sand	83.84
% Fines	5.93
% Org C	0.916

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 81 (WL017120)
Fractional Dry Weight %
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 81 (WL017120)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 82 H (WL017121)

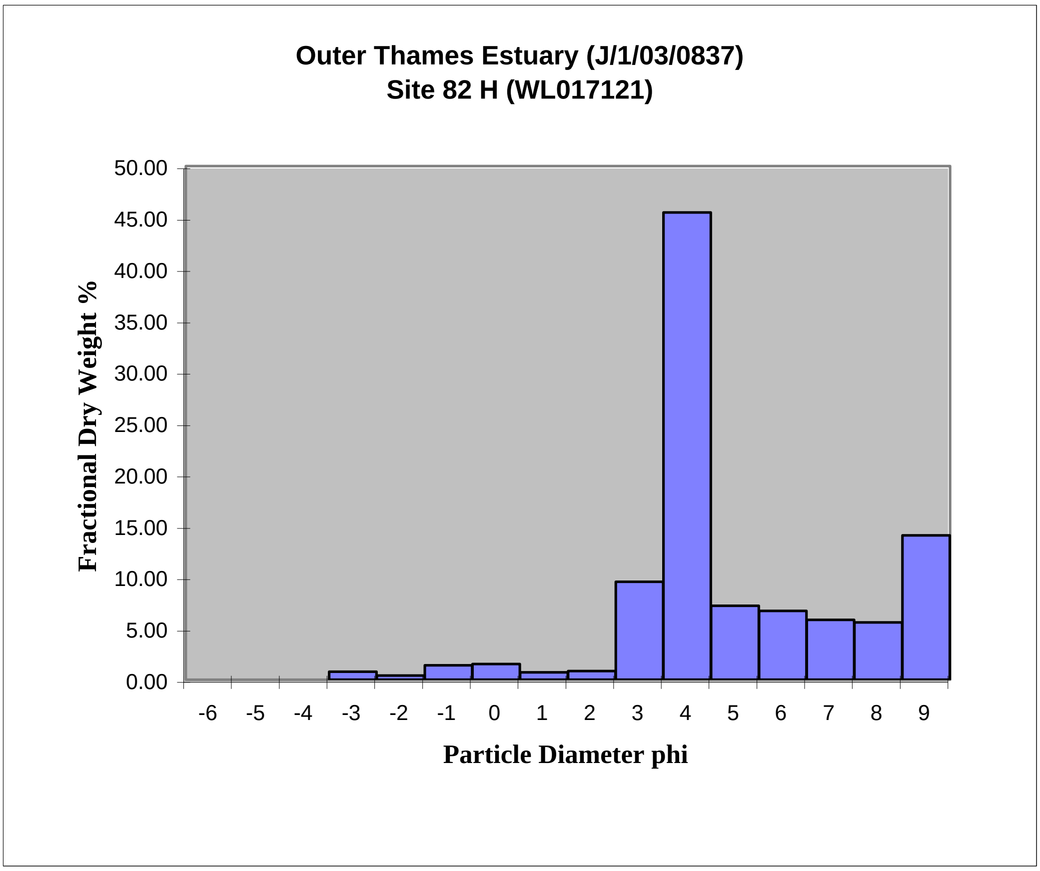
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	1.123	0.79	0.79
	4	-2.0	0.575	0.41	1.20
Coarse Sand	2	-1.0	1.984	1.40	2.60
	1	0.0	2.164	1.53	4.12
Medium Sand	0.5	1.0	1.028	0.72	4.85
	0.25	2.0	1.175	0.83	5.68
Fine Sand	0.125	3.0	13.503	9.52	15.20
	0.063	4.0	64.484	45.47	60.67
Silt	0.032	5.0	10.184	7.18	67.85
	0.0156	6.0	9.487	6.69	74.54
	0.0078	7.0	8.267	5.83	80.37
	0.0039	8.0	7.904	5.57	85.94
Clay	<0.0039	9.0	19.933	14.06	100.00
		Total Weight	142	100	

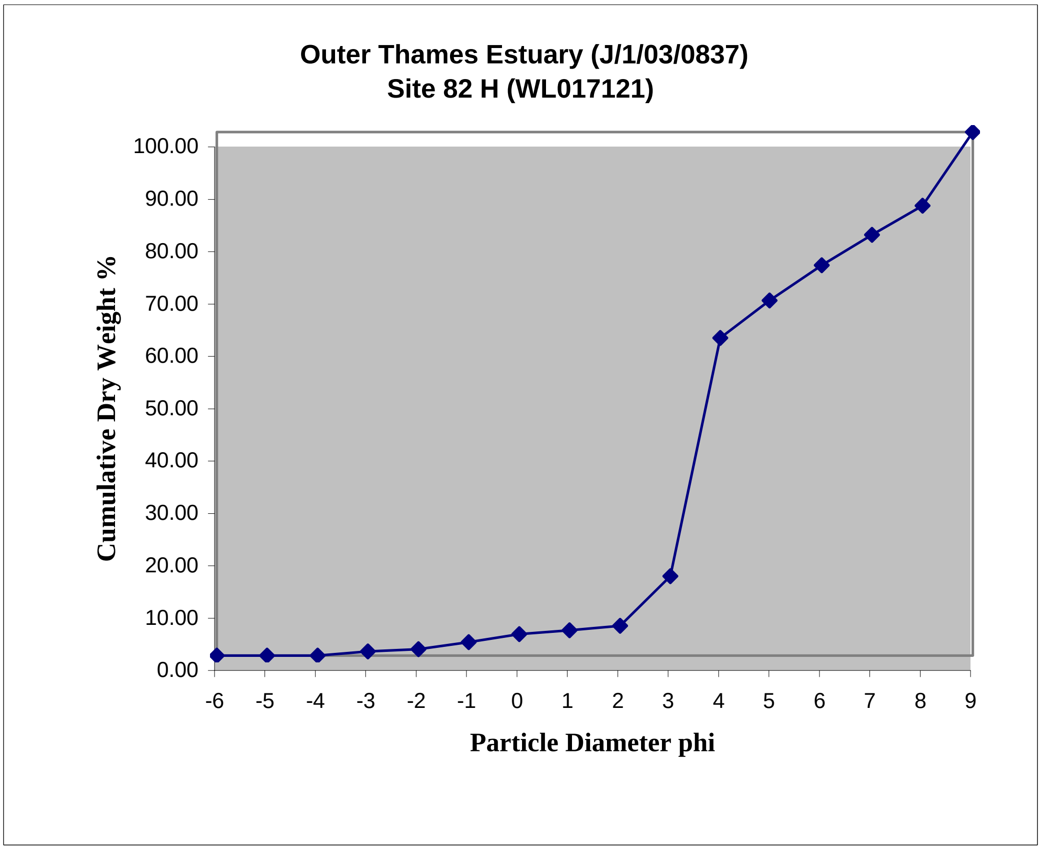
Mean mm	0.04
Md mm	0.07
Mean phi	4.81
Md phi	3.76
Sorting	2.18
Skq	0.46
Kurtosis	0.96

%Gravel	1.20
% Sand	59.47
% Fines	39.33
% Org C	1.608

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 82 H (WL017121)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 82 H (WL017121)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 83 (WL017122)

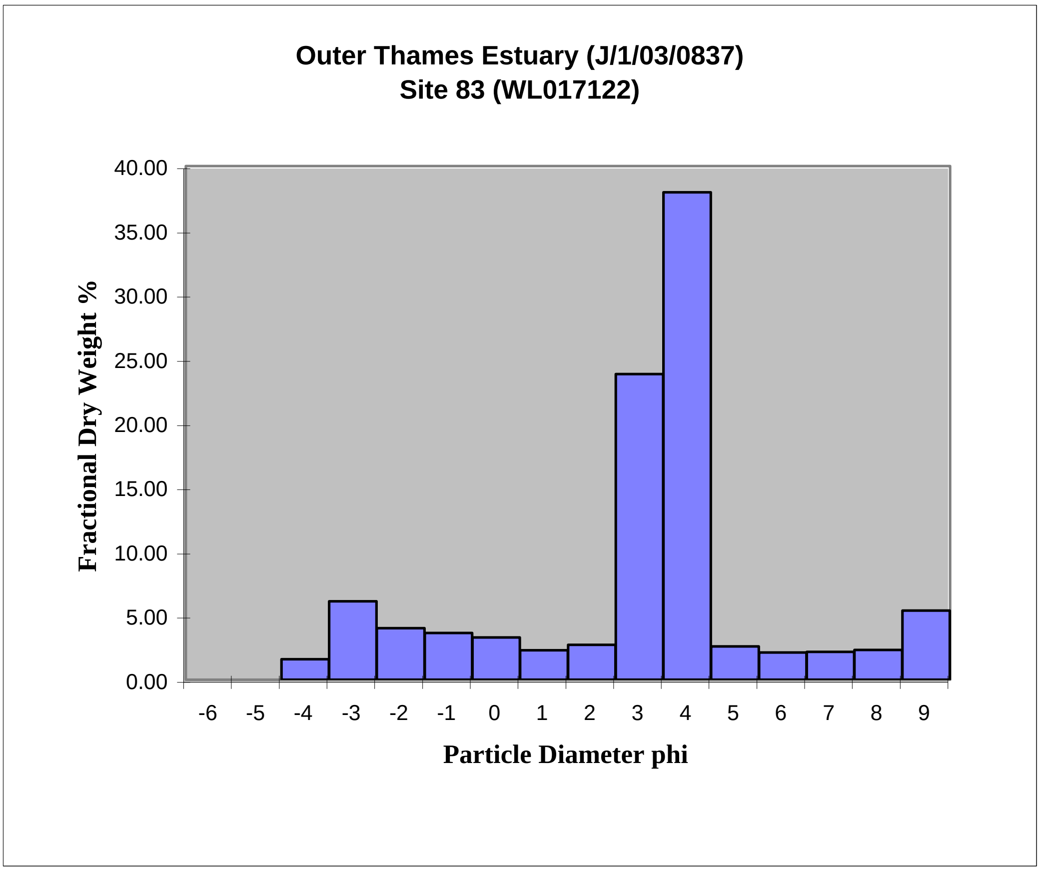
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	3.879	1.60	1.60
Gravel	8	-3.0	14.839	6.12	7.71
	4	-2.0	9.752	4.02	11.73
Coarse Sand	2	-1.0	8.848	3.65	15.38
	1	0.0	7.962	3.28	18.66
Medium Sand	0.5	1.0	5.567	2.29	20.96
	0.25	2.0	6.599	2.72	23.68
Fine Sand	0.125	3.0	57.766	23.81	47.48
	0.063	4.0	92.079	37.95	85.43
Silt	0.032	5.0	6.264	2.58	88.02
	0.0156	6.0	5.132	2.12	90.13
	0.0078	7.0	5.267	2.17	92.30
	0.0039	8.0	5.628	2.32	94.62
Clay	<0.0039	9.0	13.051	5.38	100.00
		Total Weight	243	100	

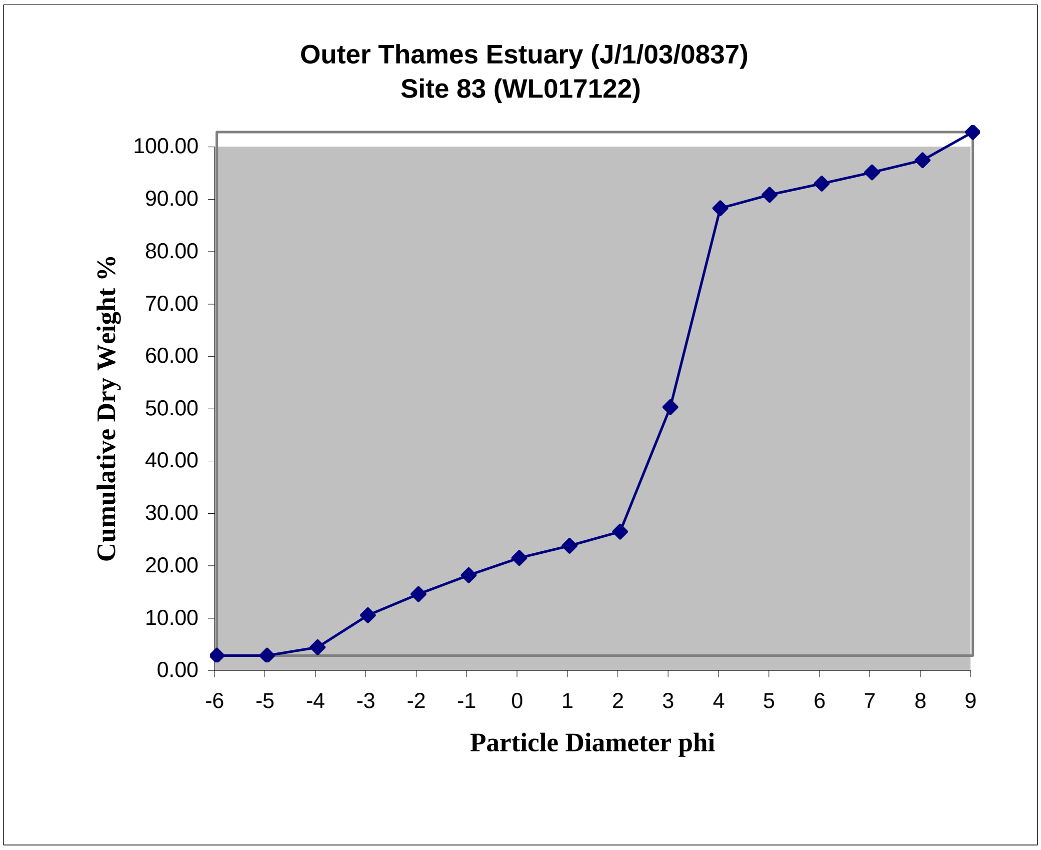
Mean mm	0.24
Md mm	0.12
Mean phi	2.07
Md phi	3.07
Sorting	2.92
Skq	-0.38
Kurtosis	2.82

%Gravel	11.73
% Sand	73.70
% Fines	14.57
% Org C	1.520

Silty gravelly sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 83 (WL017122)
Fractional Dry Weight %
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 83 (WL017122)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 84 (WL017123)

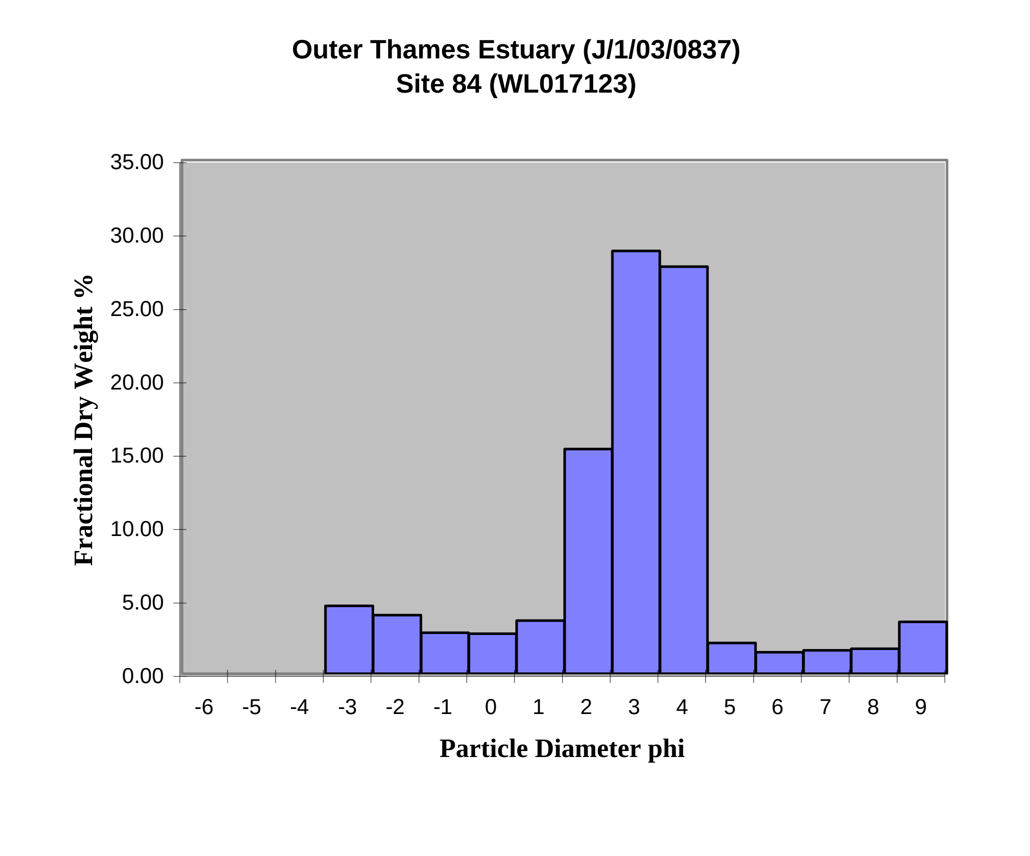
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	9.620	4.63	4.63
	4	-2.0	8.297	3.99	8.62
Coarse Sand	2	-1.0	5.809	2.79	11.41
	1	0.0	5.650	2.72	14.13
Medium Sand	0.5	1.0	7.531	3.62	17.75
	0.25	2.0	31.842	15.31	33.06
Fine Sand	0.125	3.0	59.918	28.81	61.87
	0.063	4.0	57.694	27.74	89.62
Silt	0.032	5.0	4.337	2.09	91.70
	0.0156	6.0	3.054	1.47	93.17
	0.0078	7.0	3.301	1.59	94.76
	0.0039	8.0	3.557	1.71	96.47
Clay	<0.0039	9.0	7.342	3.53	100.00
		Total Weight	208	100	

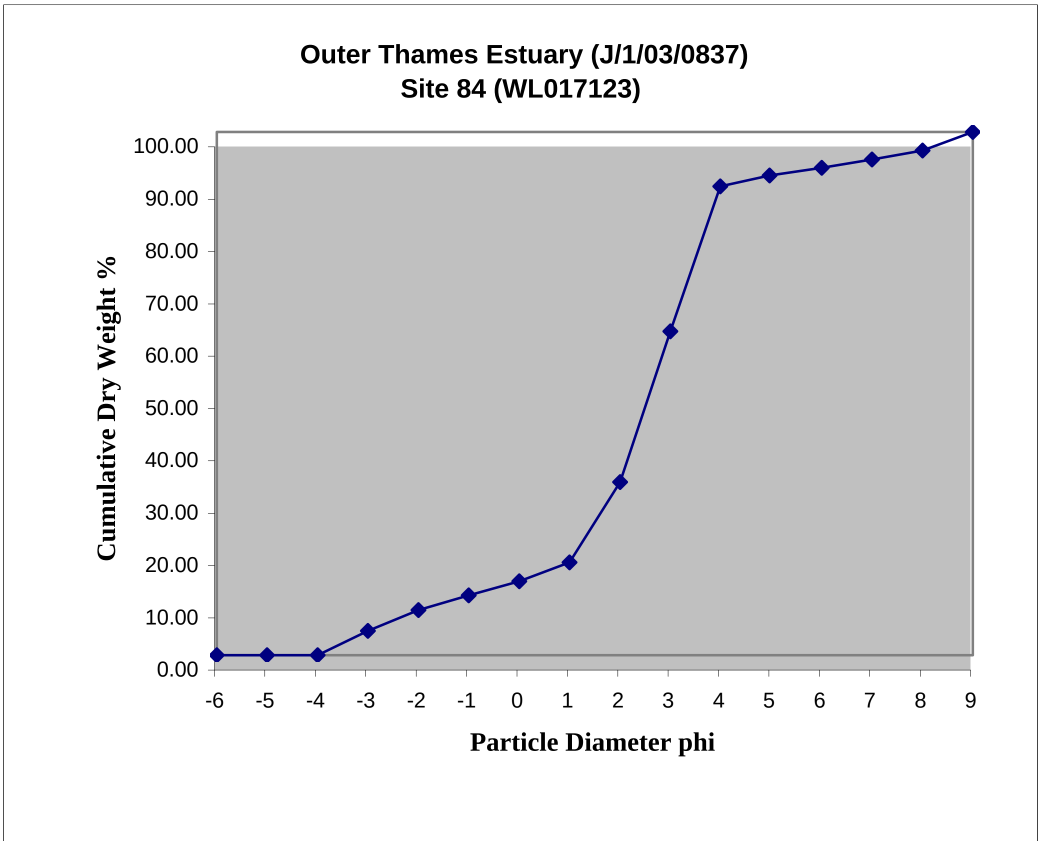
Mean mm	0.20
Md mm	0.17
Mean phi	2.30
Md phi	2.59
Sorting	2.34
Skq	-0.18
Kurtosis	2.07

%Gravel	8.62
% Sand	81.00
% Fines	10.38
% Org C	0.935

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 84 (WL017123)
Fractional Dry Weight %
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 84 (WL017123)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 85 H (WL017124)

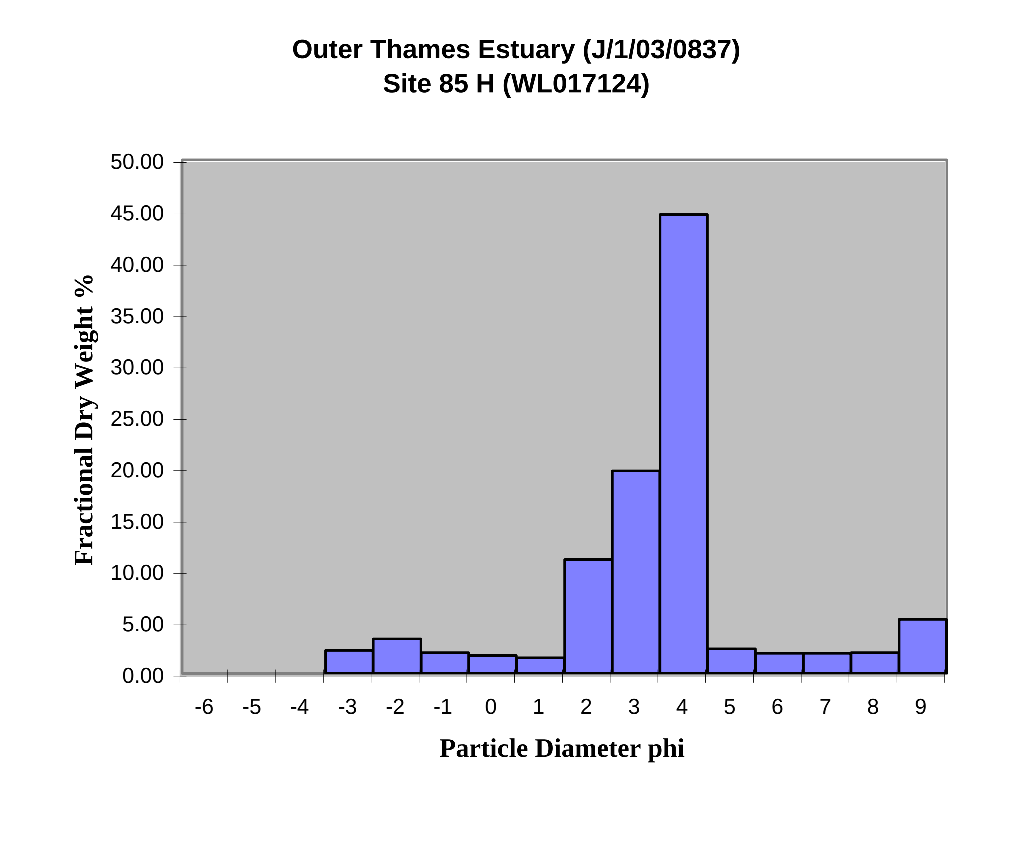
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	5.035	2.26	2.26
	4	-2.0	7.521	3.37	5.63
Coarse Sand	2	-1.0	4.503	2.02	7.65
	1	0.0	3.881	1.74	9.39
Medium Sand	0.5	1.0	3.421	1.53	10.93
	0.25	2.0	24.727	11.09	22.02
Fine Sand	0.125	3.0	43.953	19.71	41.73
	0.063	4.0	99.608	44.68	86.41
Silt	0.032	5.0	5.330	2.39	88.80
	0.0156	6.0	4.354	1.95	90.75
	0.0078	7.0	4.380	1.96	92.72
	0.0039	8.0	4.531	2.03	94.75
Clay	<0.0039	9.0	11.708	5.25	100.00
		Total Weight	223	100	

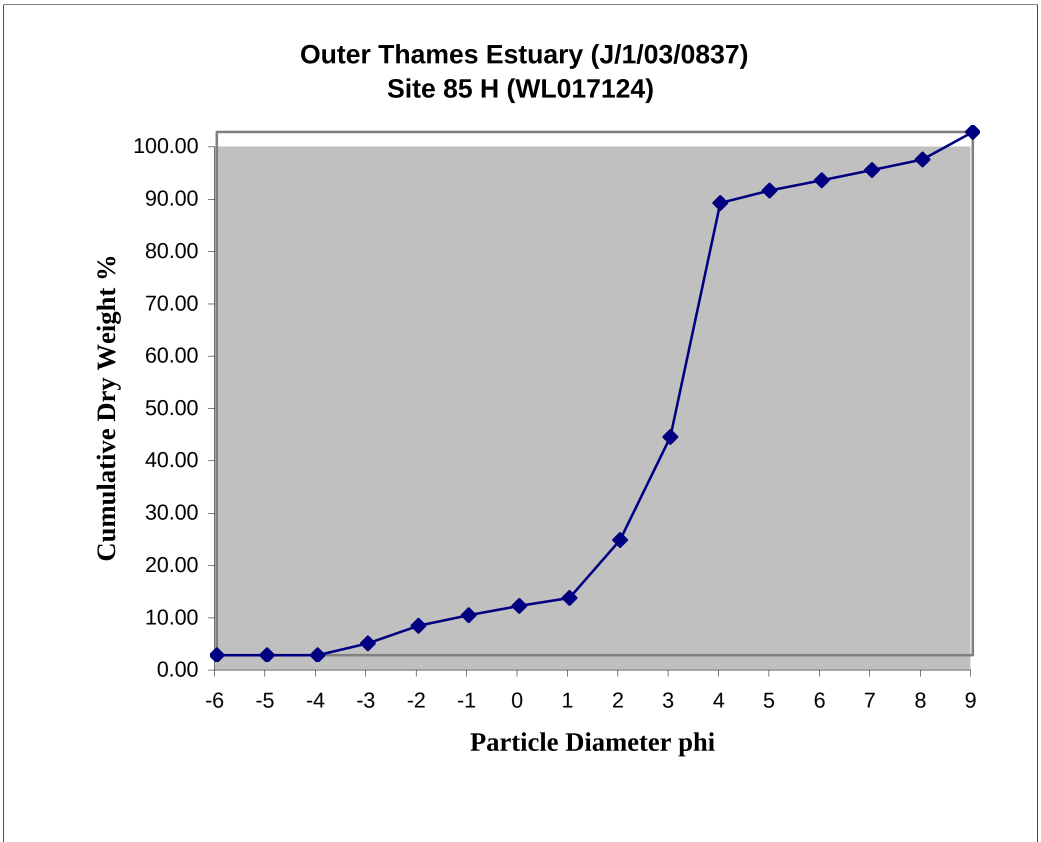
Mean mm	0.14
Md mm	0.11
Mean phi	2.86
Md phi	3.18
Sorting	2.16
Skq	-0.22
Kurtosis	2.63

%Gravel	5.63
% Sand	80.78
% Fines	13.59
% Org C	1.459

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 85 H (WL017124)
Fractional Dry Weight %
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 85 H (WL017124)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 86 (WL017125)

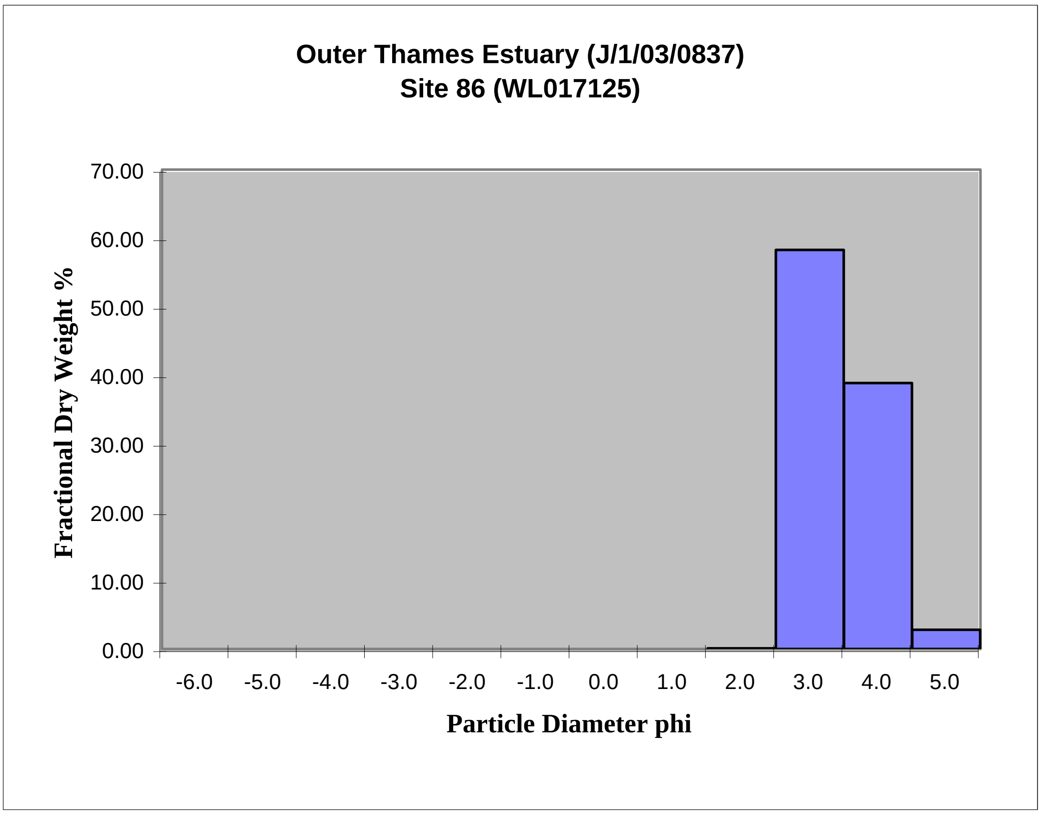
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.011	0.00	0.00
	0.25	2.0	0.239	0.09	0.09
Fine Sand	0.125	3.0	155.631	58.26	58.35
	0.063	4.0	103.774	38.85	97.20
Silt/Clay	<0.063	5.0	7.489	2.80	100.00
		Total Weight	267.144	100.00	

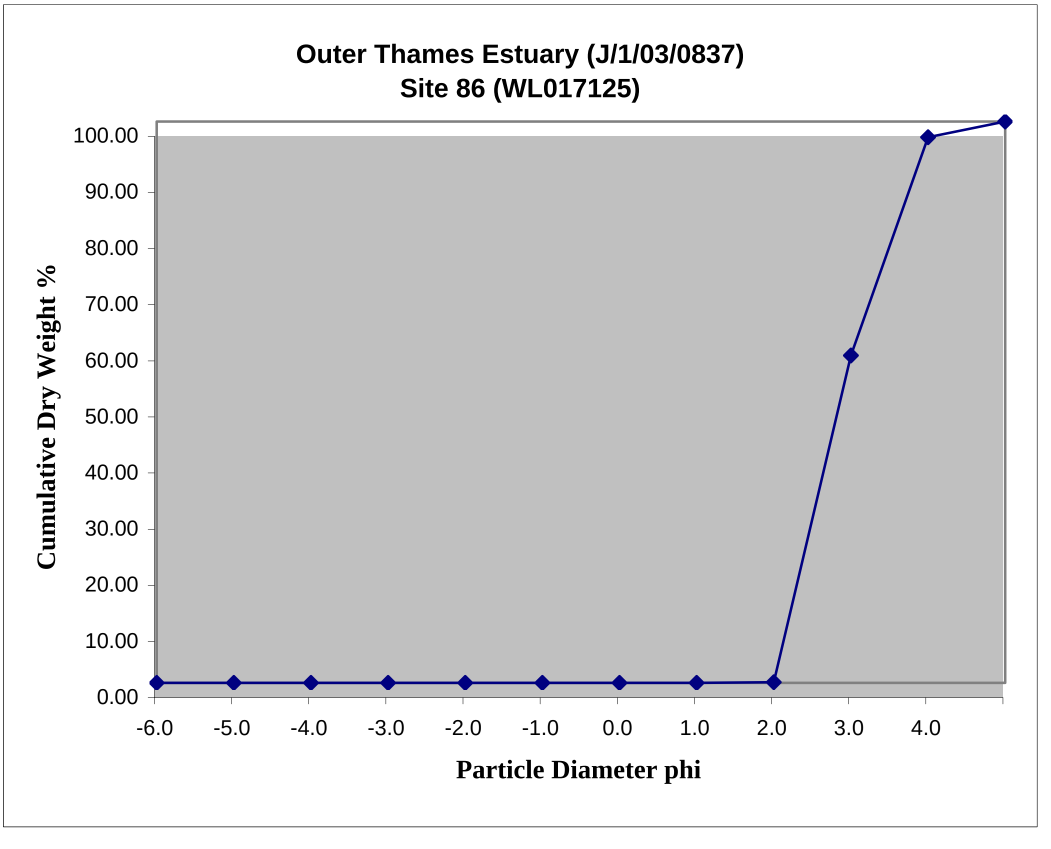
Mean mm	0.17
Md mm	0.14
Mean phi	2.56
Md phi	2.86
Sorting	0.12
Skq	-3.72
Kurtosis	0.41

%Gravel	0.00
% Sand	97.20
% Fines	2.80
% Org C	0.678

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 86 (WL017125)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 86 (WL017125)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 87 (WL017126)

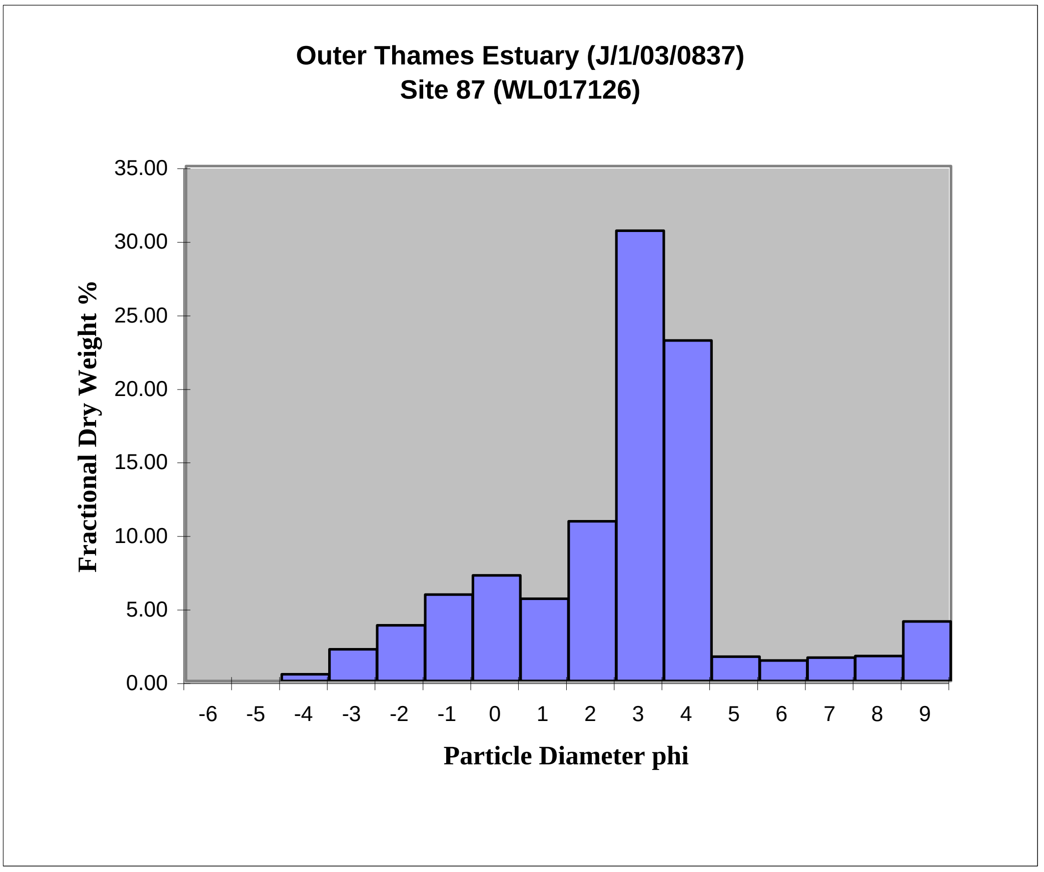
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	1.291	0.45	0.45
Gravel	8	-3.0	6.102	2.14	2.60
	4	-2.0	10.788	3.79	6.39
Coarse Sand	2	-1.0	16.722	5.87	12.26
	1	0.0	20.414	7.17	19.43
Medium Sand	0.5	1.0	15.933	5.60	25.02
	0.25	2.0	30.927	10.86	35.88
Fine Sand	0.125	3.0	87.170	30.61	66.50
	0.063	4.0	65.904	23.14	89.64
Silt	0.032	5.0	4.704	1.65	91.29
	0.0156	6.0	3.946	1.39	92.68
	0.0078	7.0	4.494	1.58	94.26
	0.0039	8.0	4.833	1.70	95.96
Clay	<0.0039	9.0	11.518	4.04	100.00
		Total Weight	285	100	

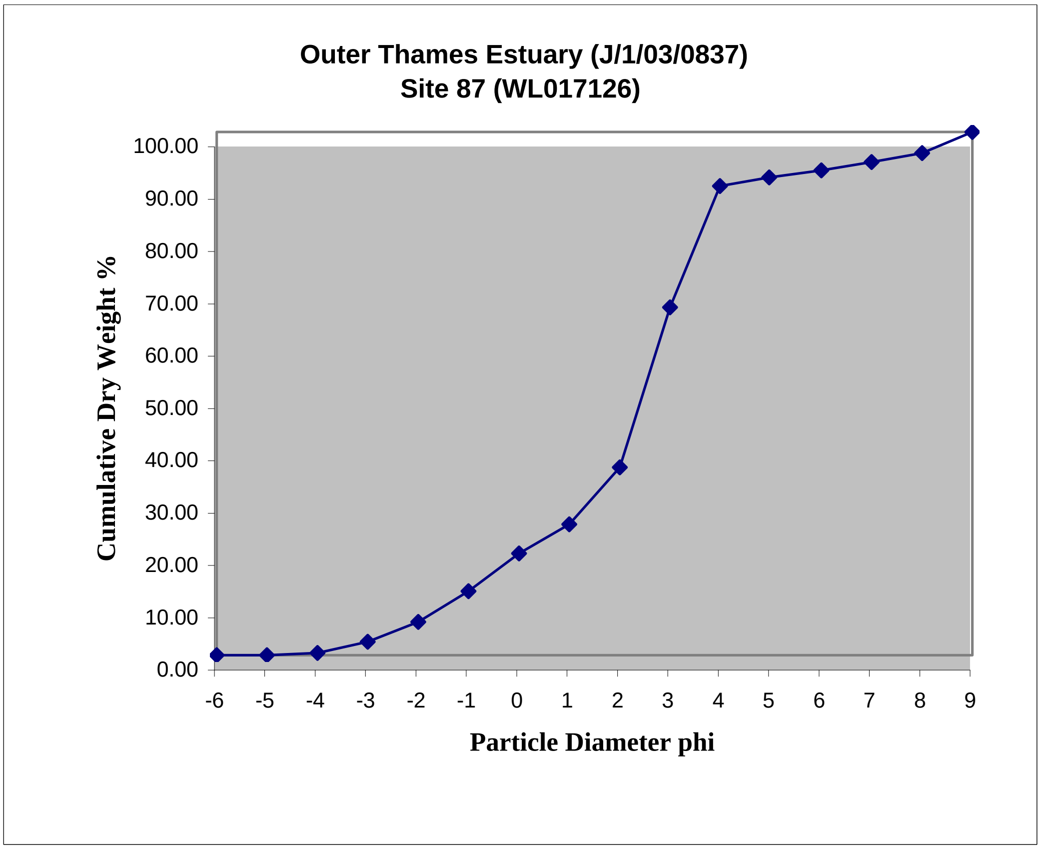
Mean mm	0.27
Md mm	0.18
Mean phi	1.91
Md phi	2.46
Sorting	2.54
Skq	-0.19
Kurtosis	1.70

%Gravel	6.39
% Sand	83.26
% Fines	10.36
% Org C	1.620

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 87 (WL017126)
Fractional Dry Weight %
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 87 (WL017126)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 88 (WL017127)

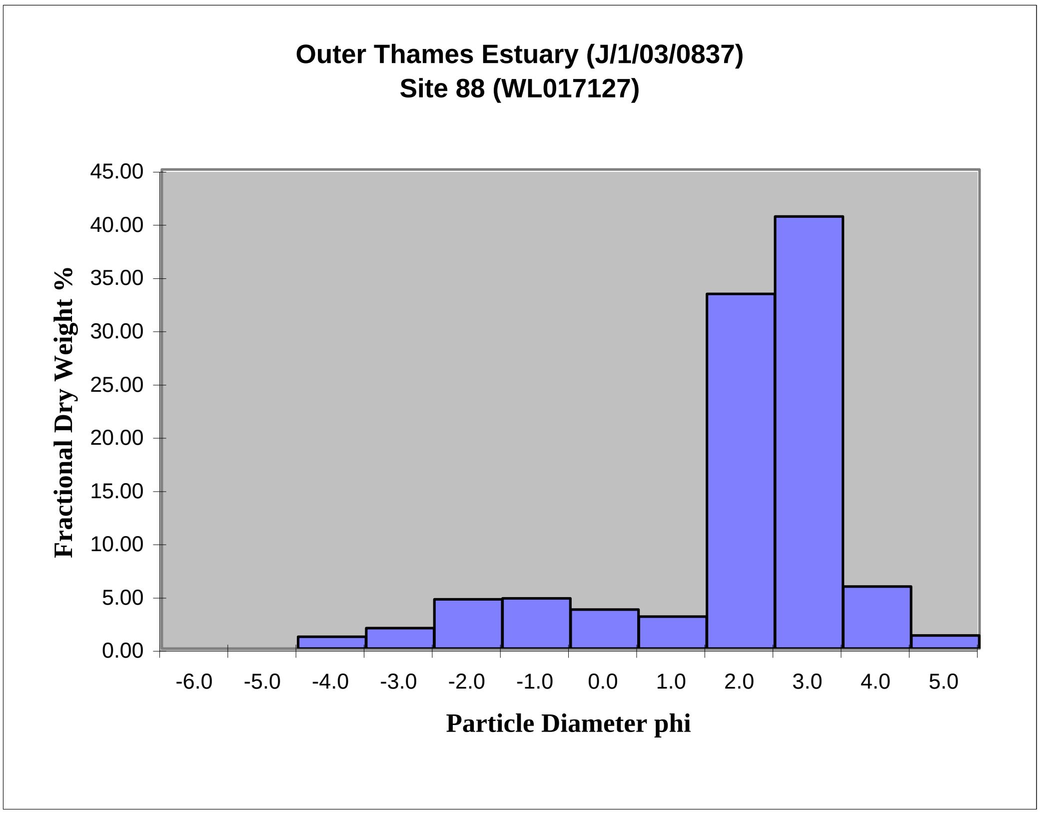
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	3.681	1.12	1.12
Gravel	8	-3.0	6.311	1.93	3.05
	4	-2.0	15.187	4.63	7.68
Coarse Sand	2	-1.0	15.461	4.72	12.40
	1	0.0	11.969	3.65	16.05
Medium Sand	0.5	1.0	9.880	3.01	19.07
	0.25	2.0	109.141	33.30	52.37
Fine Sand	0.125	3.0	132.964	40.57	92.94
	0.063	4.0	19.104	5.83	98.77
Silt/Clay	<0.063	5.0	4.026	1.23	100.00
		Total Weight	327.724	100.00	

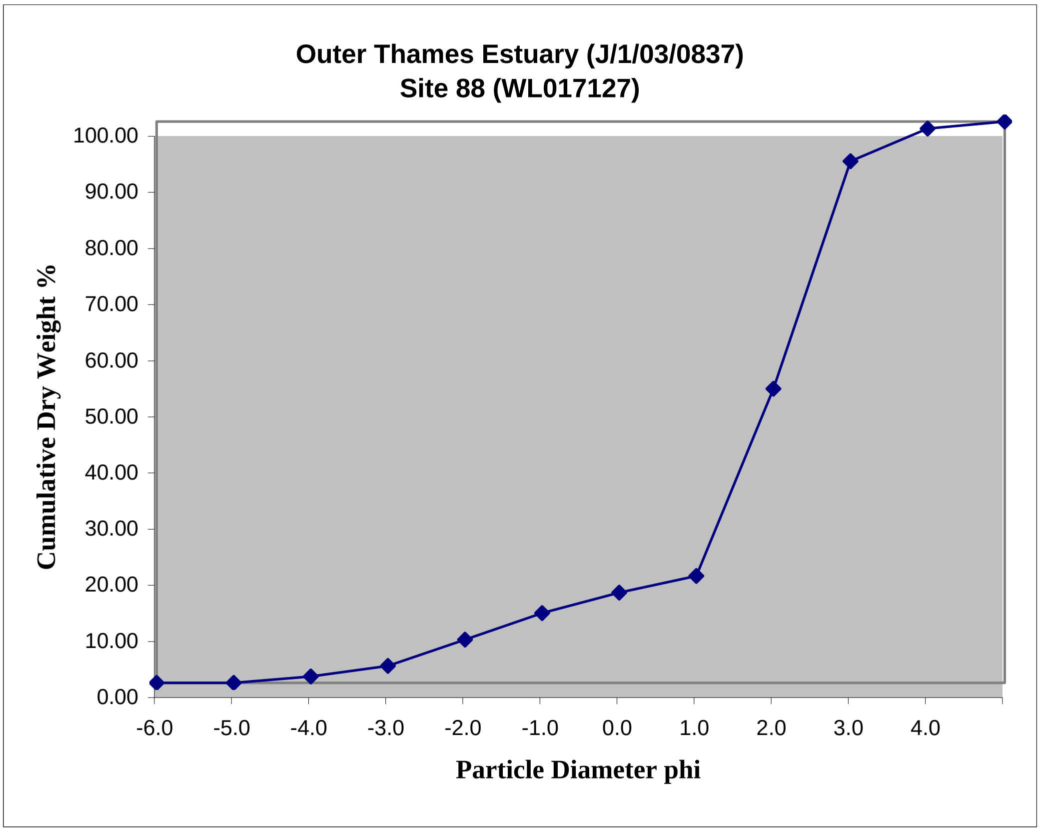
Mean mm	0.34
Md mm	0.26
Mean phi	1.56
Md phi	1.93
Sorting	1.54
Skq	-0.51
Kurtosis	1.65

%Gravel	7.68
% Sand	91.09
% Fines	1.23
% Org C	1.294

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 88 (WL017127)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 88 (WL017127)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

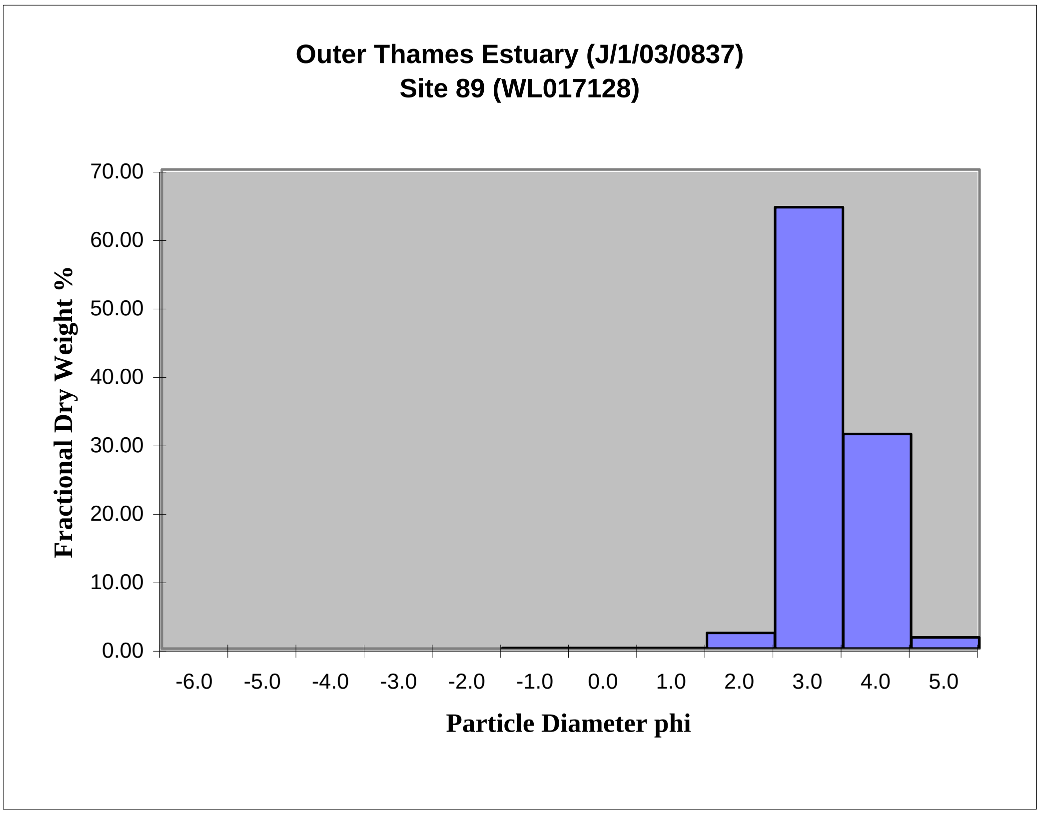
Outer Thames Estuary (J/1/03/0837)
Site 89 (WL017128)

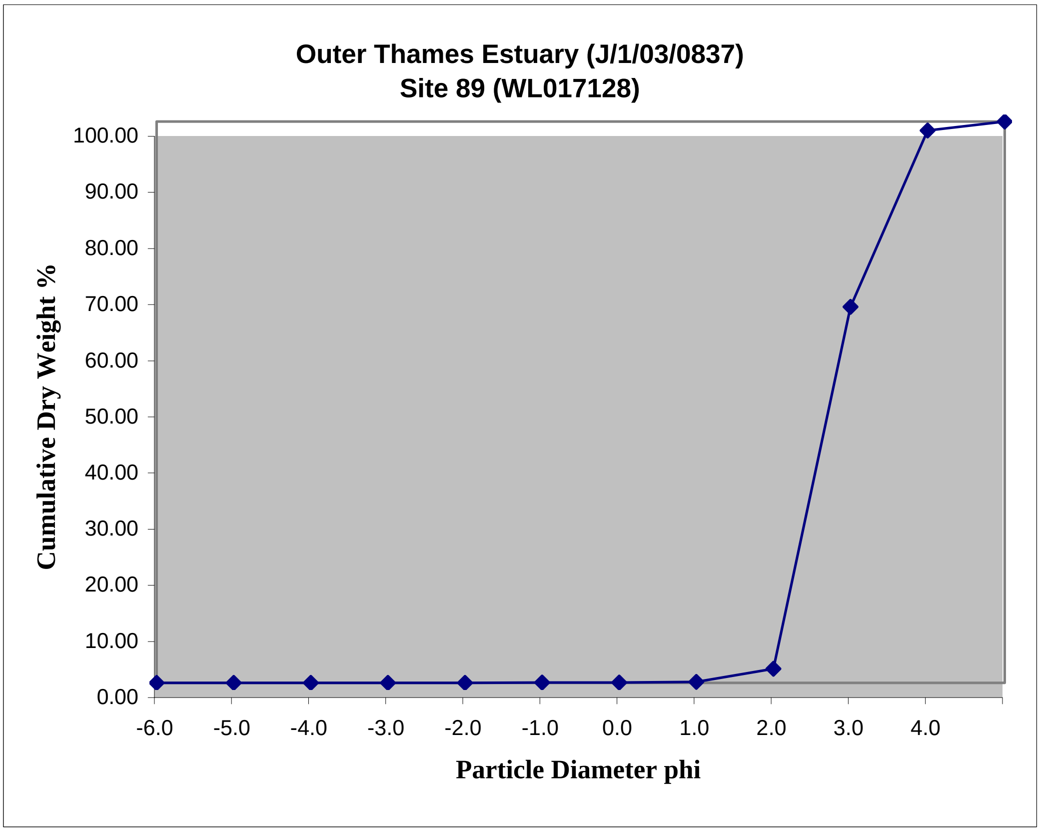
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.084	0.03	0.03
	1	0.0	0.139	0.05	0.09
Medium Sand	0.5	1.0	0.297	0.11	0.20
	0.25	2.0	6.035	2.31	2.51
Fine Sand	0.125	3.0	168.442	64.49	67.00
	0.063	4.0	81.953	31.38	98.38
Silt/Clay	<0.063	5.0	4.236	1.62	100.00
		Total Weight	261.186	100.00	

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.15
Mean phi	2.56
Md phi	2.74
Sorting	0.22
Skq	-1.27
Kurtosis	0.42

%Gravel	0.00
% Sand	98.38
% Fines	1.62
% Org C	0.603


Outer Thames Estuary (J/1/03/0837)
Site 89 (WL017128)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 89 (WL017128)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 90 (WL017129)

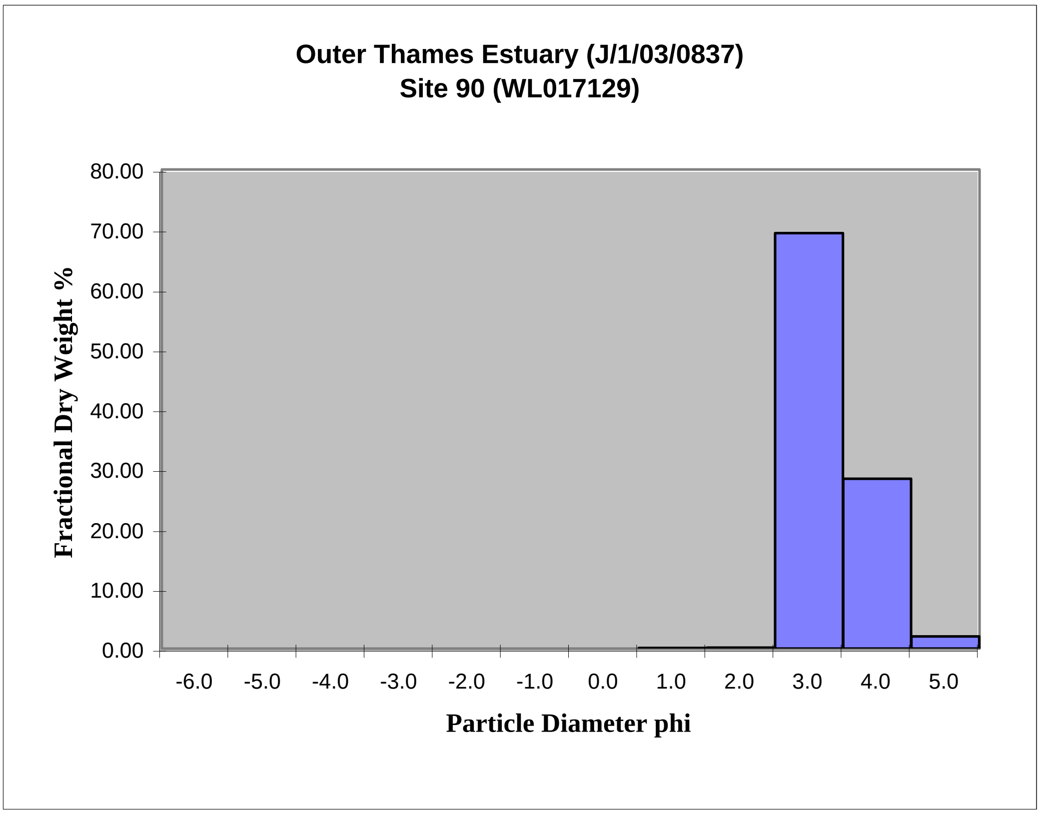
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.022	0.01	0.01
	1	0.0	0.018	0.01	0.01
Medium Sand	0.5	1.0	0.098	0.04	0.05
	0.25	2.0	0.475	0.17	0.22
Fine Sand	0.125	3.0	189.765	69.39	69.62
	0.063	4.0	77.582	28.37	97.99
Silt/Clay	<0.063	5.0	5.500	2.01	100.00
		Total Weight	273.46	100.00	

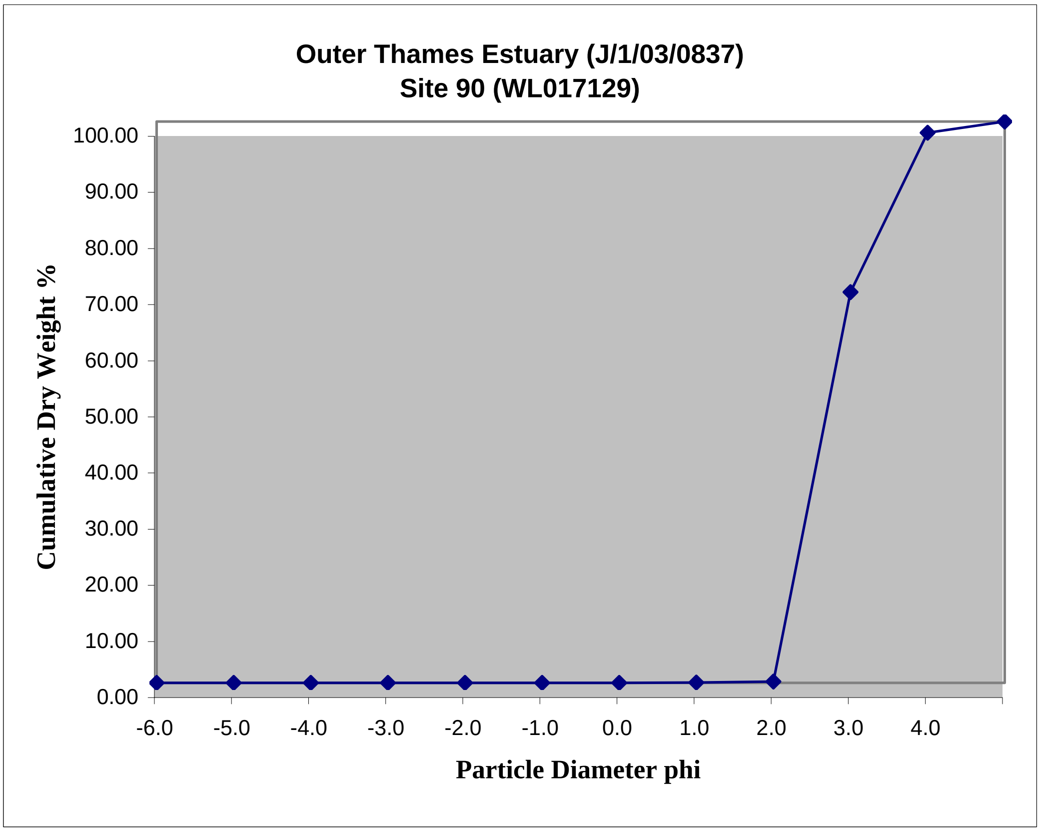
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.15
Mean phi	2.58
Md phi	2.72
Sorting	0.23
Skq	-1.01
Kurtosis	0.41

%Gravel	0.00
% Sand	97.99
% Fines	2.01
% Org C	1.572

Sand


Outer Thames Estuary (J/1/03/0837)
Site 90 (WL017129)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 90 (WL017129)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 91 (WL017130)

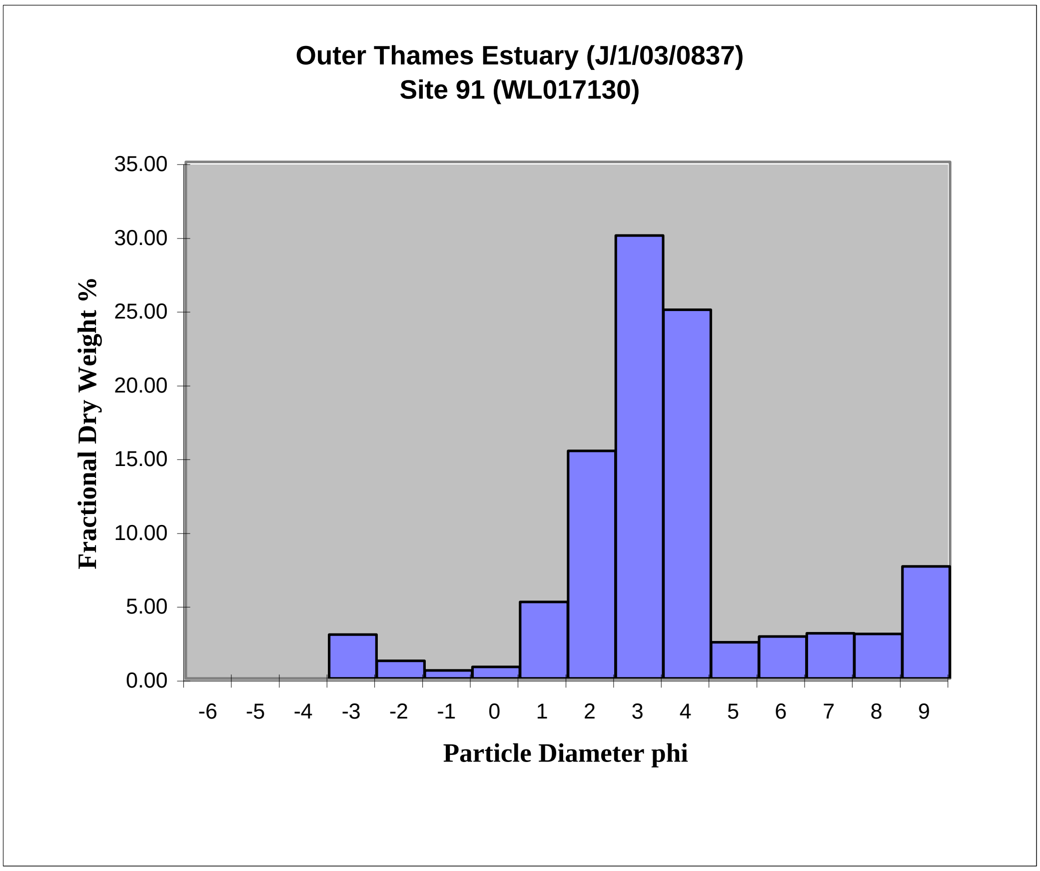
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	7.907	2.98	2.98
	4	-2.0	3.178	1.20	4.18
Coarse Sand	2	-1.0	1.457	0.55	4.73
	1	0.0	2.049	0.77	5.50
Medium Sand	0.5	1.0	13.759	5.18	10.68
	0.25	2.0	40.896	15.41	26.09
Fine Sand	0.125	3.0	79.658	30.01	56.10
	0.063	4.0	66.274	24.97	81.07
Silt	0.032	5.0	6.483	2.44	83.52
	0.0156	6.0	7.525	2.84	86.35
	0.0078	7.0	8.097	3.05	89.40
	0.0039	8.0	7.980	3.01	92.41
Clay	<0.0039	9.0	20.146	7.59	100.00
		Total Weight	265	100	

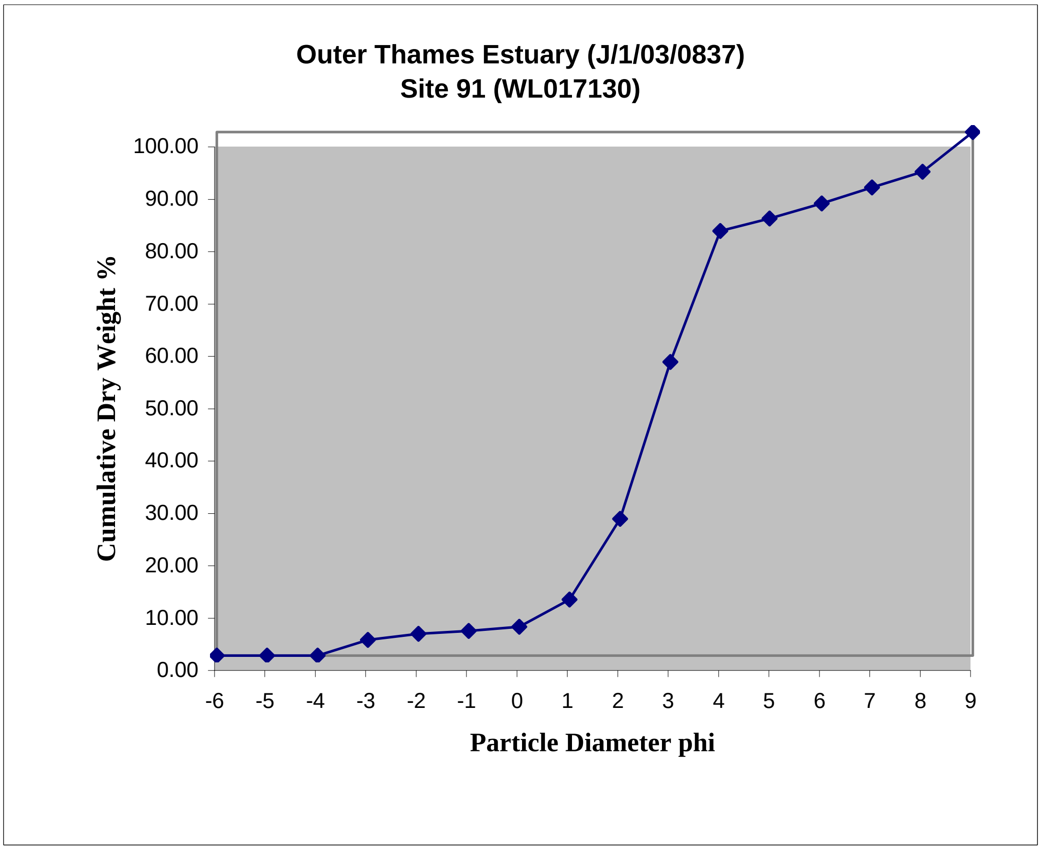
Mean mm	0.12
Md mm	0.14
Mean phi	3.09
Md phi	2.80
Sorting	2.26
Skq	0.22
Kurtosis	1.94

%Gravel	4.18
% Sand	76.90
% Fines	18.93
% Org C	1.572

Silty sand

* Based on Connor *et al* , 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 91 (WL017130)
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Fractional Dry Weight %
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 91 (WL017130)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Cumulative Dry Weight %
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 92 H (WL017131)

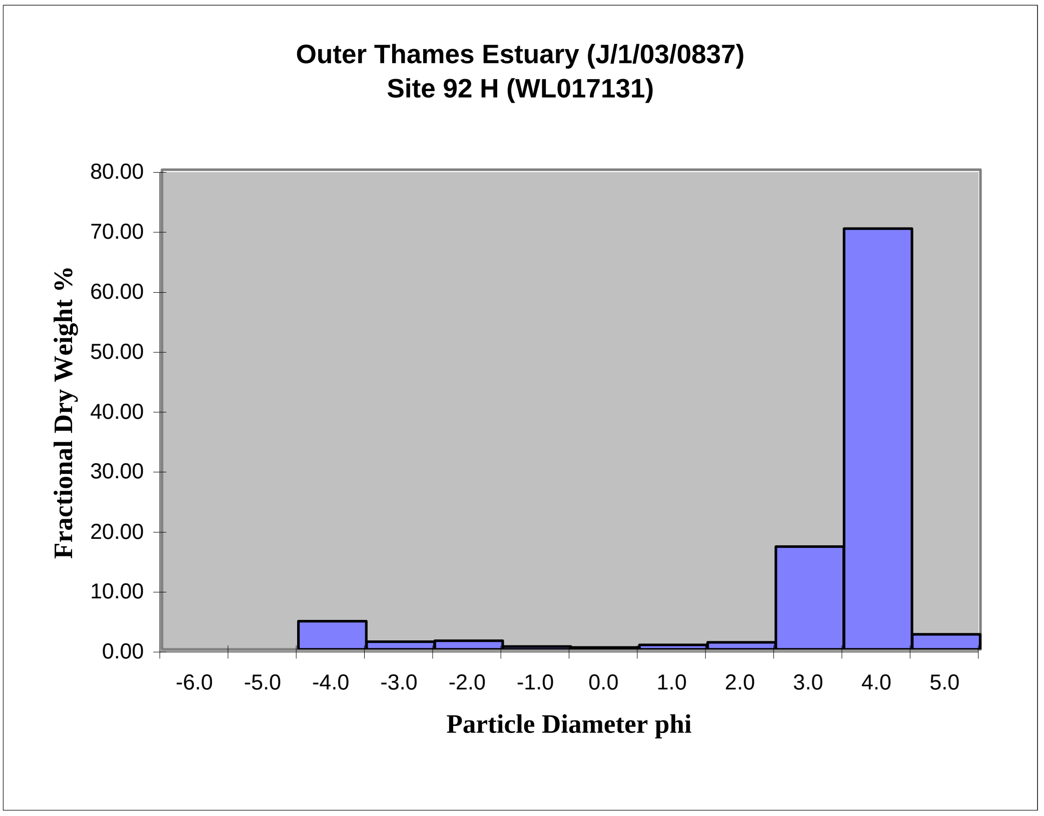
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	10.297	4.69	4.69
Gravel	8	-3.0	2.779	1.27	5.96
	4	-2.0	3.162	1.44	7.40
Coarse Sand	2	-1.0	1.032	0.47	7.87
	1	0.0	0.714	0.33	8.19
Medium Sand	0.5	1.0	1.690	0.77	8.96
	0.25	2.0	2.582	1.18	10.14
Fine Sand	0.125	3.0	37.669	17.16	27.29
	0.063	4.0	154.078	70.18	97.47
Silt/Clay	<0.063	5.0	5.551	2.53	100.00
		Total Weight	219.554	100.00	

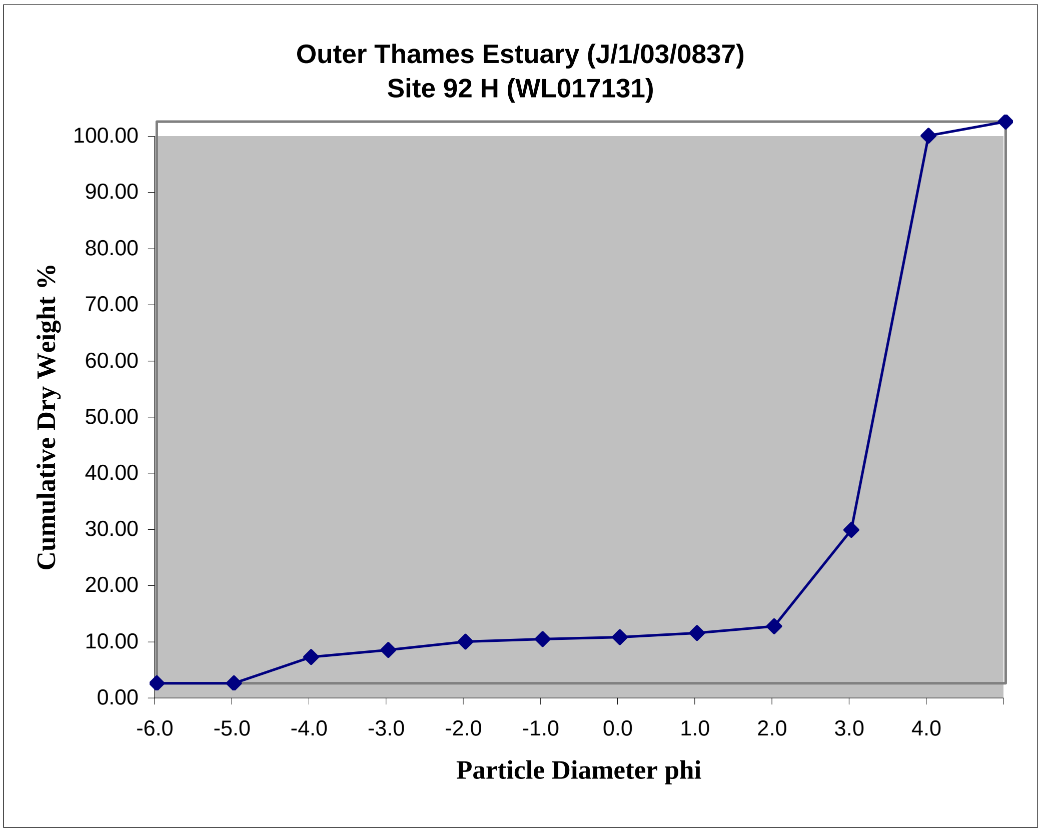
Mean mm	0.22
Md mm	0.10
Mean phi	2.20
Md phi	3.32
Sorting	0.29
Skq	0.04
Kurtosis	-1.09

%Gravel	7.40
% Sand	90.08
% Fines	2.53
% Org C	0.788

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 92 H (WL017131)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 92 H (WL017131)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 93 (WL017132)

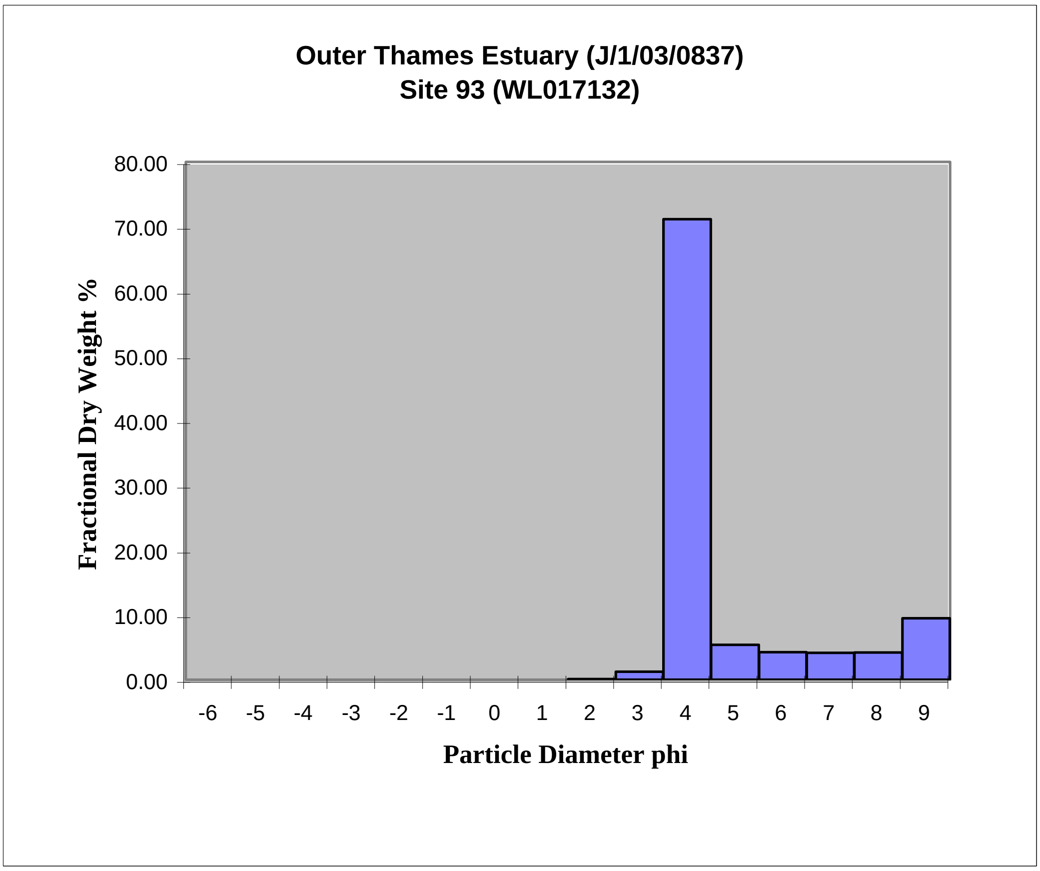
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.024	0.01	0.01
Medium Sand	0.5	1.0	0.026	0.01	0.03
	0.25	2.0	0.119	0.06	0.09
Fine Sand	0.125	3.0	2.491	1.26	1.34
	0.063	4.0	141.155	71.13	72.47
Silt	0.032	5.0	10.727	5.41	77.87
	0.0156	6.0	8.443	4.25	82.13
	0.0078	7.0	8.278	4.17	86.30
	0.0039	8.0	8.303	4.18	90.48
Clay	<0.0039	9.0	18.883	9.52	100.00
		Total Weight	198	100	

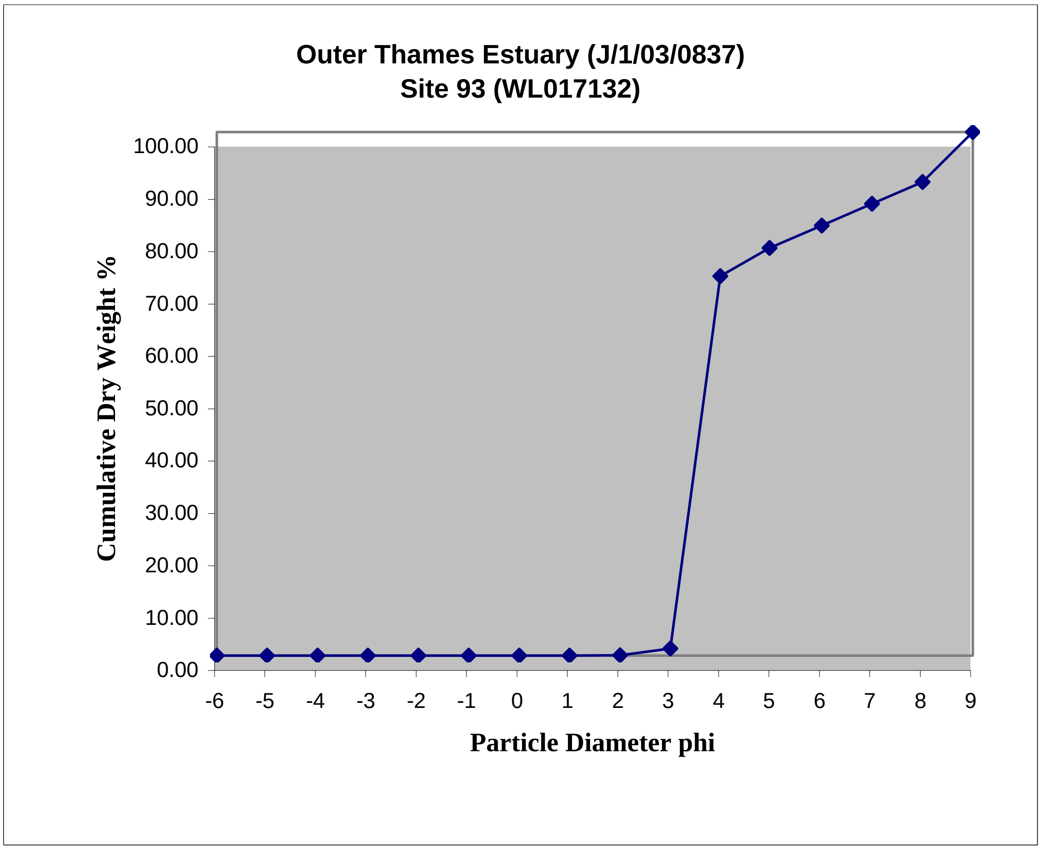
Mean mm	0.05
Md mm	0.08
Mean phi	4.44
Md phi	3.68
Sorting	1.55
Skq	0.73
Kurtosis	1.80

%Gravel	0.00
% Sand	72.47
% Fines	27.53
% Org C	1.442

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 93 (WL017132)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 93 (WL017132)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 94 (WL017133)

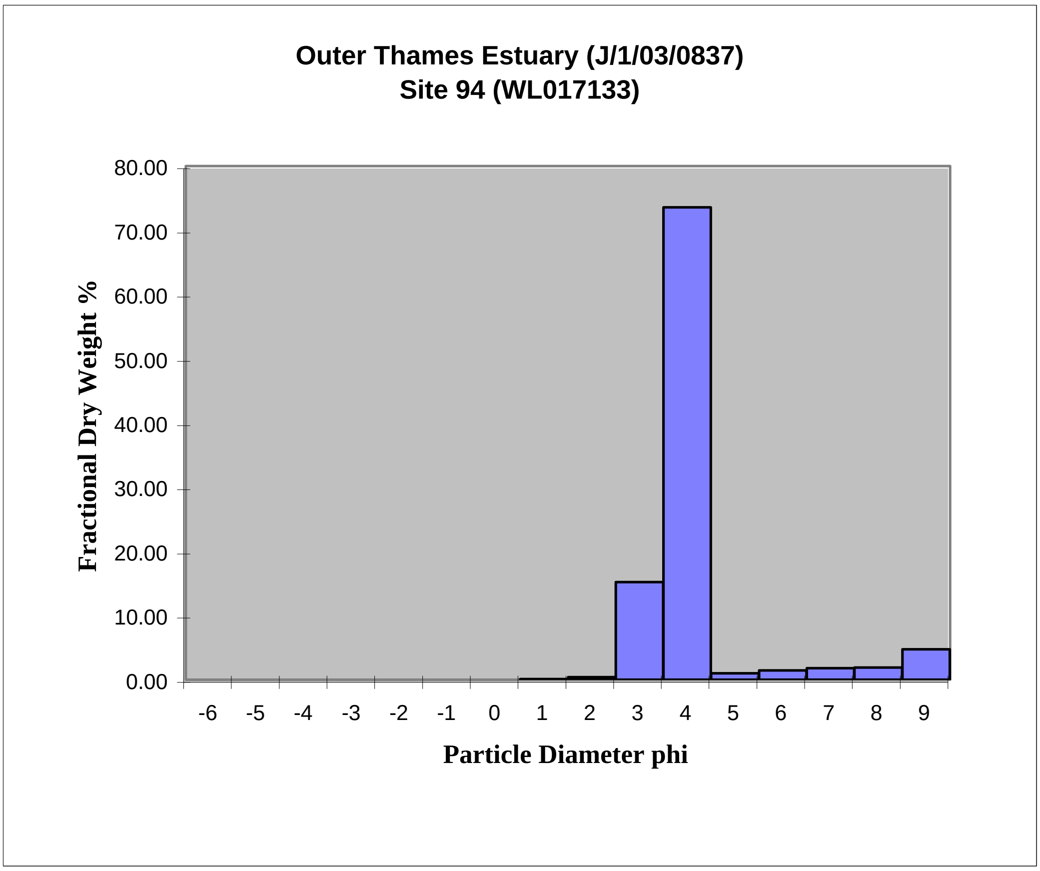
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.001	0.00	0.00
	1	0.0	0.026	0.01	0.01
Medium Sand	0.5	1.0	0.106	0.04	0.05
	0.25	2.0	1.105	0.41	0.46
Fine Sand	0.125	3.0	40.588	15.18	15.65
	0.063	4.0	196.693	73.57	89.22
Silt	0.032	5.0	2.672	1.00	90.22
	0.0156	6.0	3.798	1.42	91.64
	0.0078	7.0	4.761	1.78	93.42
	0.0039	8.0	4.999	1.87	95.29
Clay	<0.0039	9.0	12.594	4.71	100.00
		Total Weight	267	100	

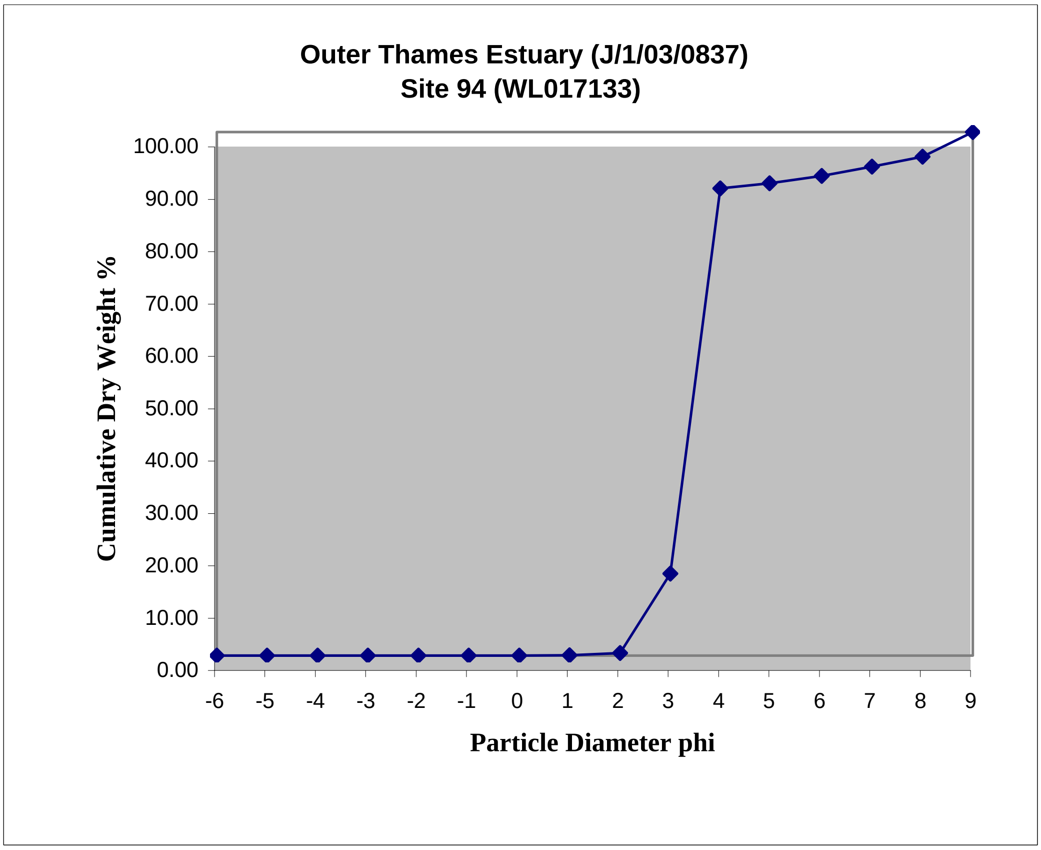
Mean mm	0.09
Md mm	0.09
Mean phi	3.46
Md phi	3.46
Sorting	1.07
Skq	0.29
Kurtosis	3.39

%Gravel	0.00
% Sand	89.22
% Fines	10.78
% Org C	1.183

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 94 (WL017133)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 94 (WL017133)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 95 (WL017134)

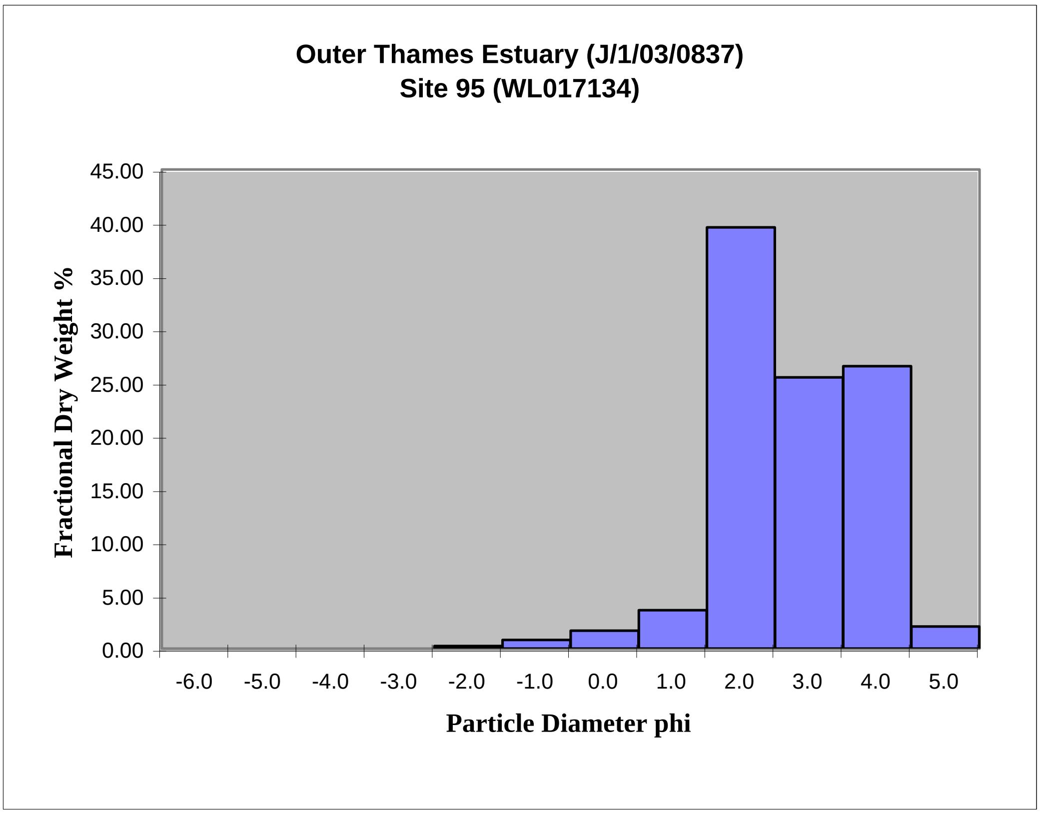
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.716	0.25	0.25
Coarse Sand	2	-1.0	2.309	0.82	1.07
	1	0.0	4.754	1.68	2.75
Medium Sand	0.5	1.0	10.162	3.60	6.35
	0.25	2.0	111.771	39.57	45.92
Fine Sand	0.125	3.0	71.963	25.48	71.40
	0.063	4.0	74.949	26.53	97.94
Silt/Clay	<0.063	5.0	5.831	2.06	100.00
		Total Weight	282.455	100.00	

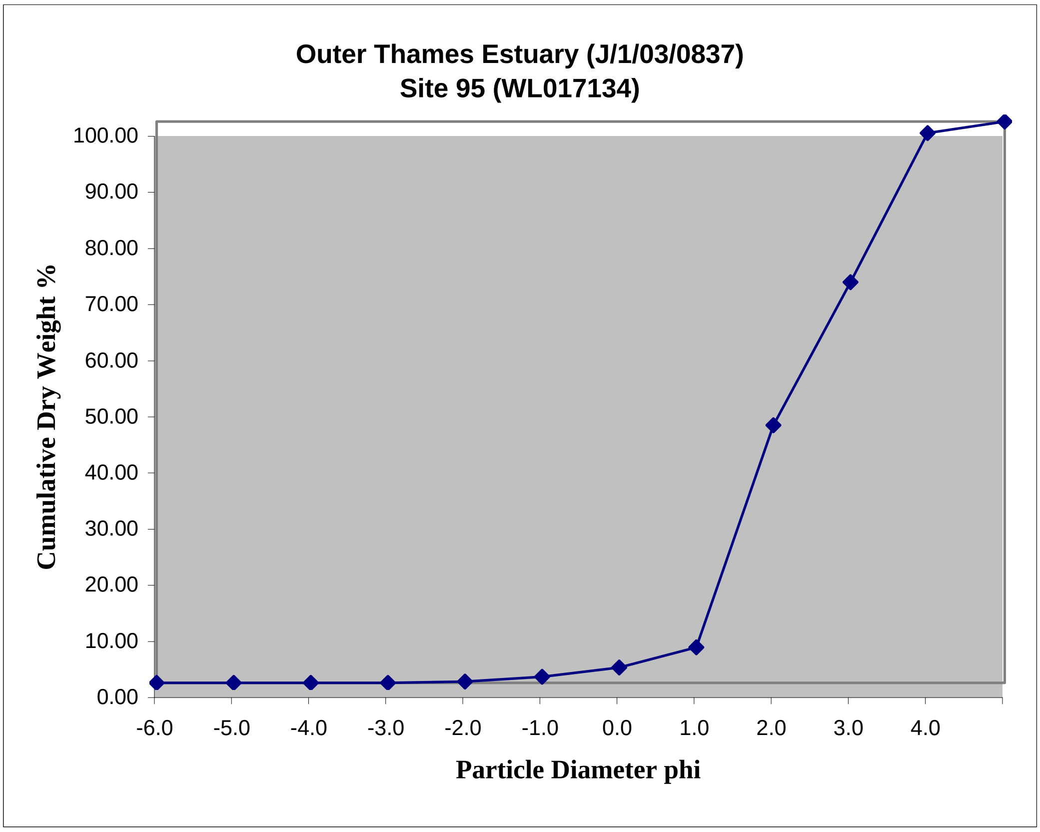
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.24
Md mm	0.22
Mean phi	2.08
Md phi	2.16
Sorting	0.70
Skq	-0.33
Kurtosis	0.57

%Gravel	0.25
% Sand	97.68
% Fines	2.06
% Org C	0.989

Sand


Outer Thames Estuary (J/1/03/0837)
Site 95 (WL017134)
Fractional Dry Weight %
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 95 (WL017134)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 96 (WL017135)

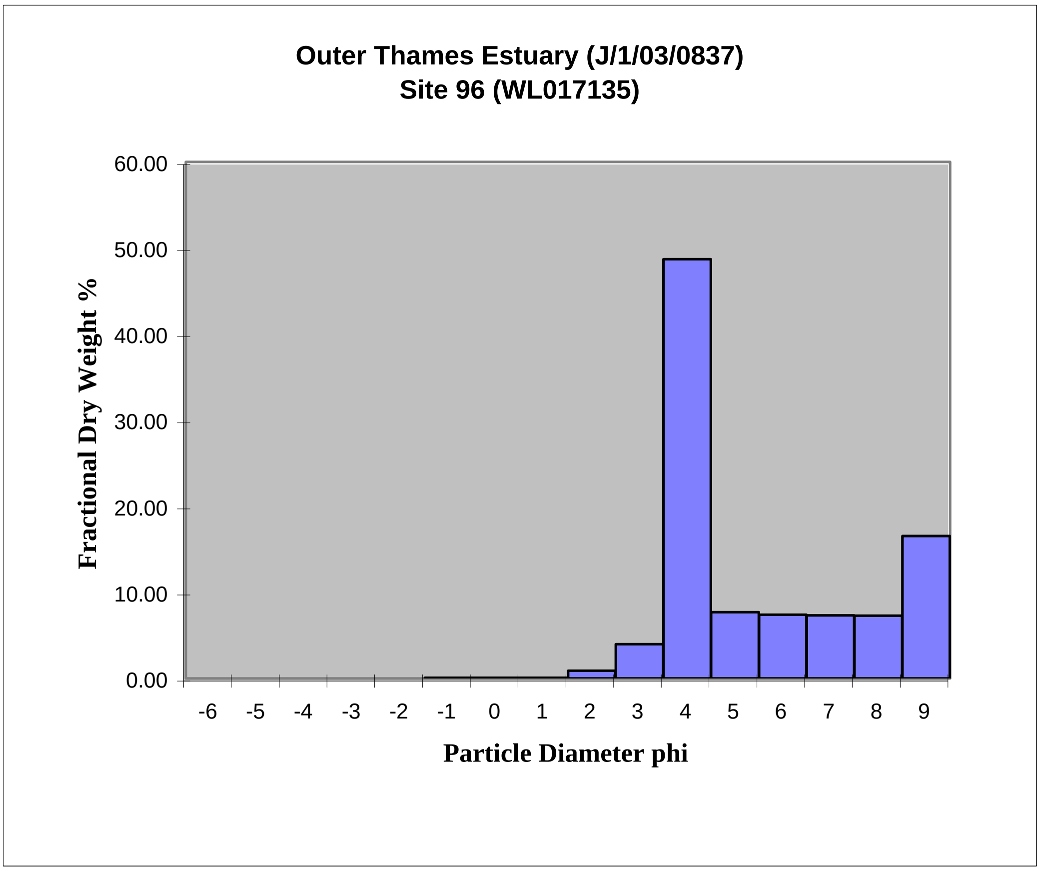
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.040	0.04	0.04
	1	0.0	0.049	0.05	0.09
Medium Sand	0.5	1.0	0.090	0.09	0.17
	0.25	2.0	0.919	0.90	1.07
Fine Sand	0.125	3.0	4.065	3.96	5.03
	0.063	4.0	49.982	48.70	53.73
Silt	0.032	5.0	7.898	7.70	61.43
	0.0156	6.0	7.607	7.41	68.84
	0.0078	7.0	7.525	7.33	76.17
	0.0039	8.0	7.464	7.27	83.44
Clay	<0.0039	9.0	16.991	16.56	100.00
		Total Weight	103	100	

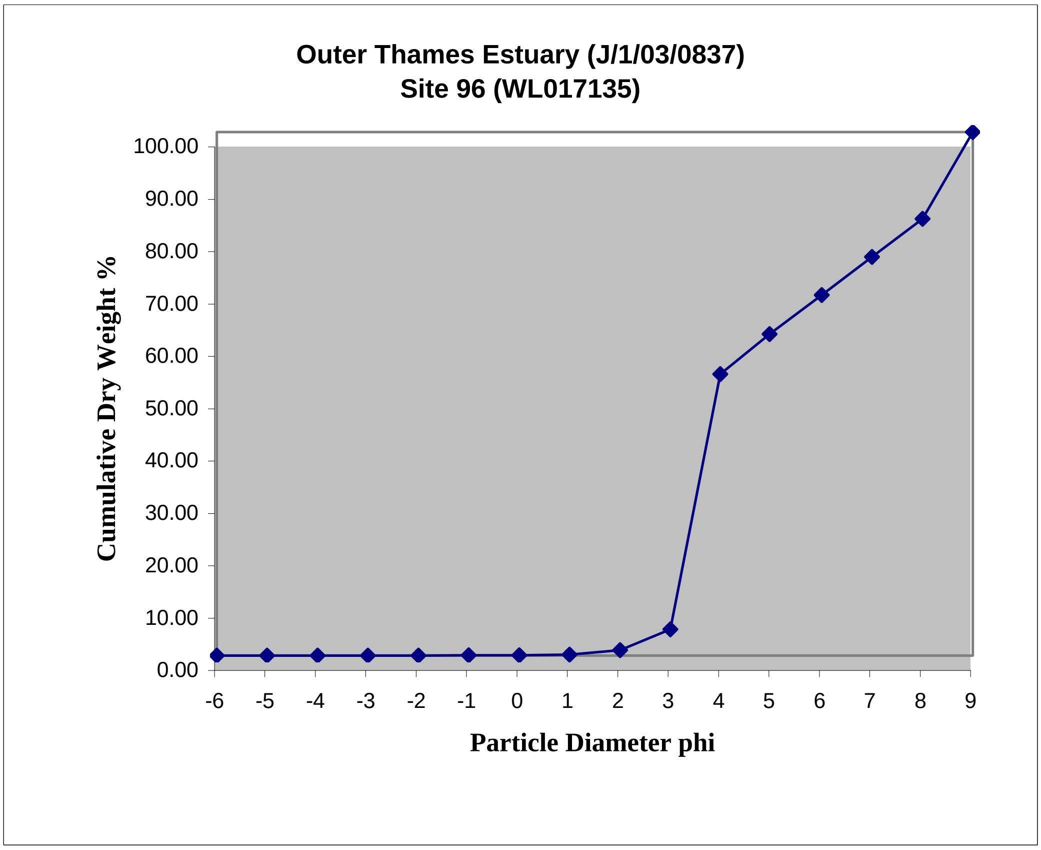
Mean mm	0.03
Md mm	0.07
Mean phi	5.04
Md phi	3.91
Sorting	1.93
Skq	0.67
Kurtosis	0.58

%Gravel	0.00
% Sand	53.73
% Fines	46.27
% Org C	2.309

Silty sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 96 (WL017135)
Fractional Dry Weight %
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 96 (WL017135)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 97 (WL017136)

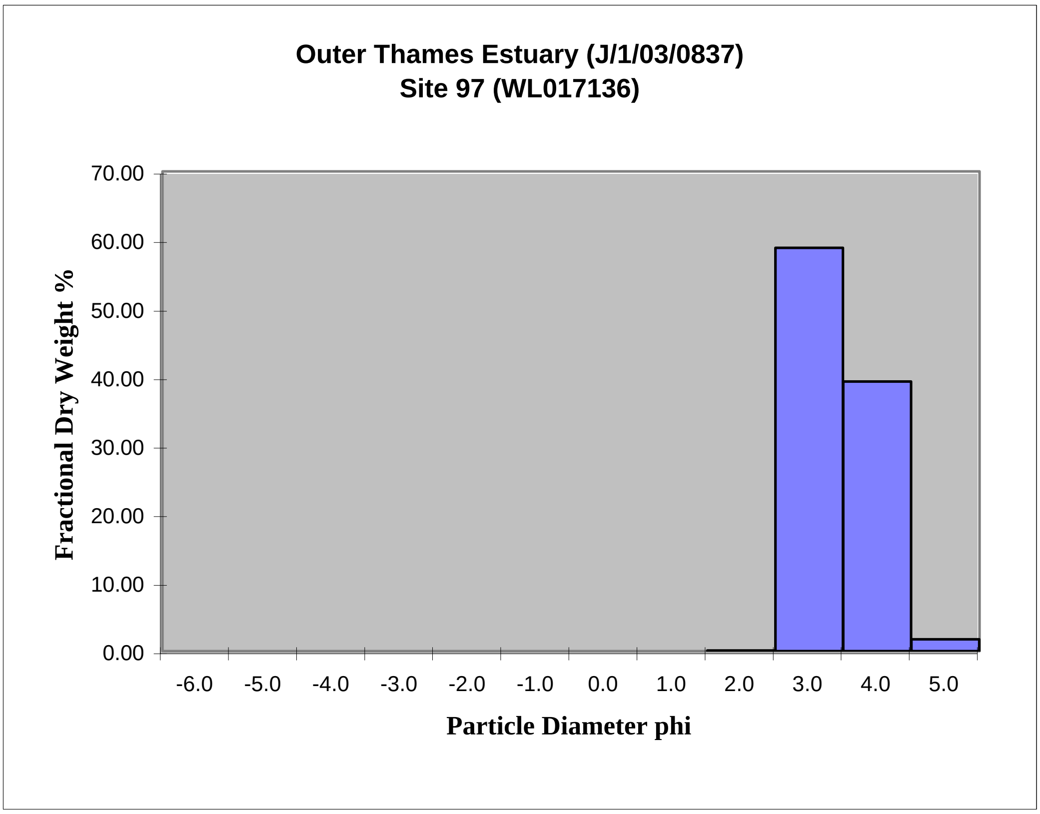
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.000	0.00	0.00
	0.25	2.0	0.132	0.05	0.05
Fine Sand	0.125	3.0	143.311	58.87	58.92
	0.063	4.0	95.753	39.33	98.25
Silt/Clay	<0.063	5.0	4.255	1.75	100.00
		Total Weight	243.451	100.00	

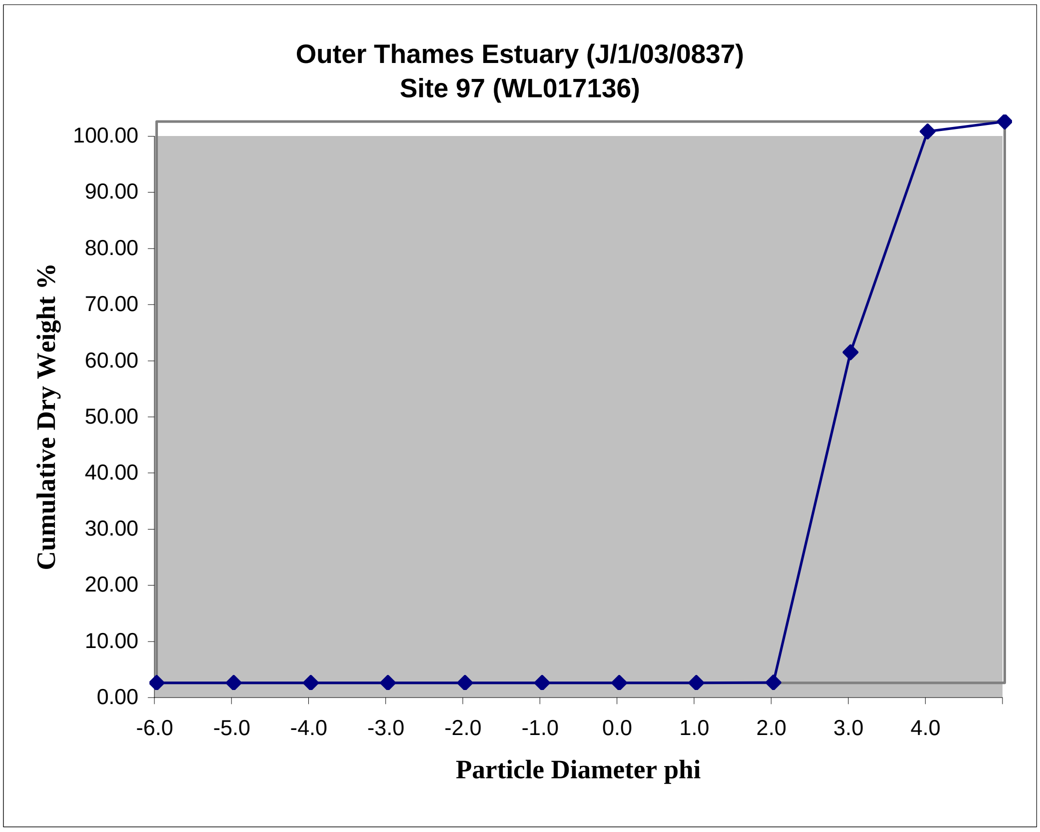
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.14
Mean phi	2.56
Md phi	2.85
Sorting	0.12
Skq	-3.42
Kurtosis	0.41

%Gravel	0.00
% Sand	98.25
% Fines	1.75
% Org C	0.547

Sand


Outer Thames Estuary (J/1/03/0837)
Site 97 (WL017136)
Fractional Dry Weight %
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 97 (WL017136)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 98 (WL017137)

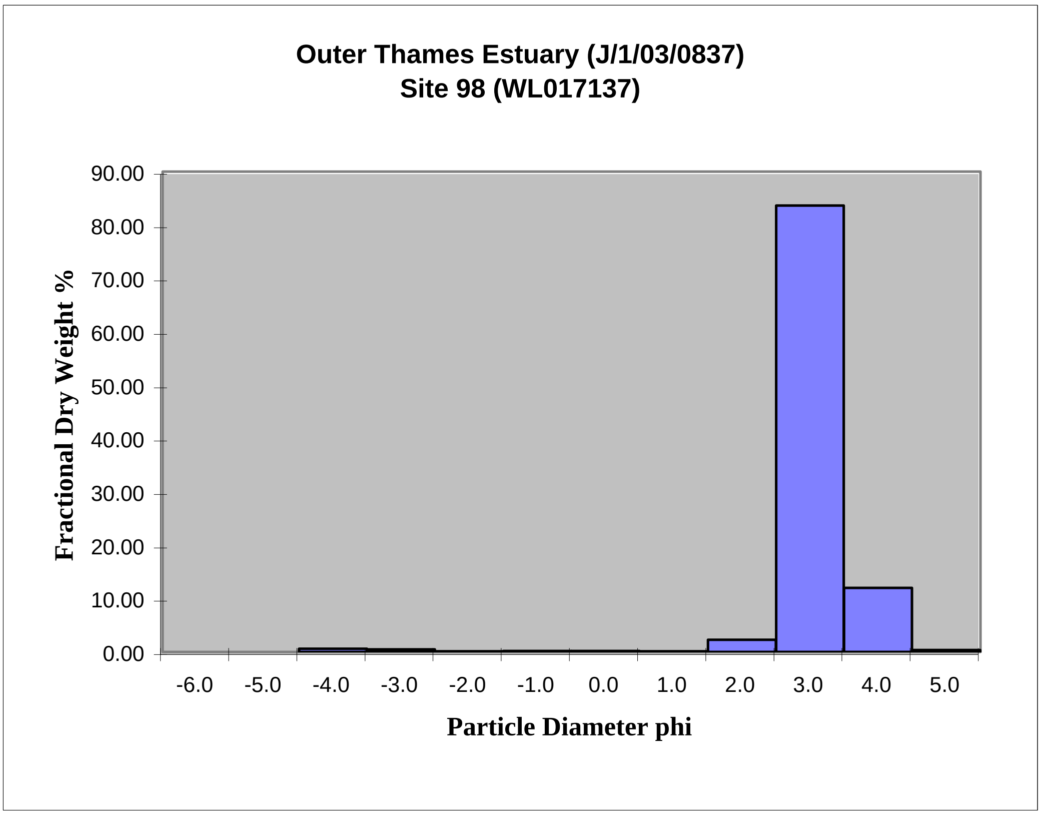
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	1.823	0.62	0.62
Gravel	8	-3.0	1.493	0.50	1.12
	4	-2.0	0.129	0.04	1.16
Coarse Sand	2	-1.0	0.537	0.18	1.35
	1	0.0	0.550	0.19	1.53
Medium Sand	0.5	1.0	0.369	0.12	1.66
	0.25	2.0	6.744	2.28	3.93
Fine Sand	0.125	3.0	247.596	83.66	87.60
	0.063	4.0	35.552	12.01	99.61
Silt/Clay	<0.063	5.0	1.154	0.39	100.00
		Total Weight	295.947	100.00	

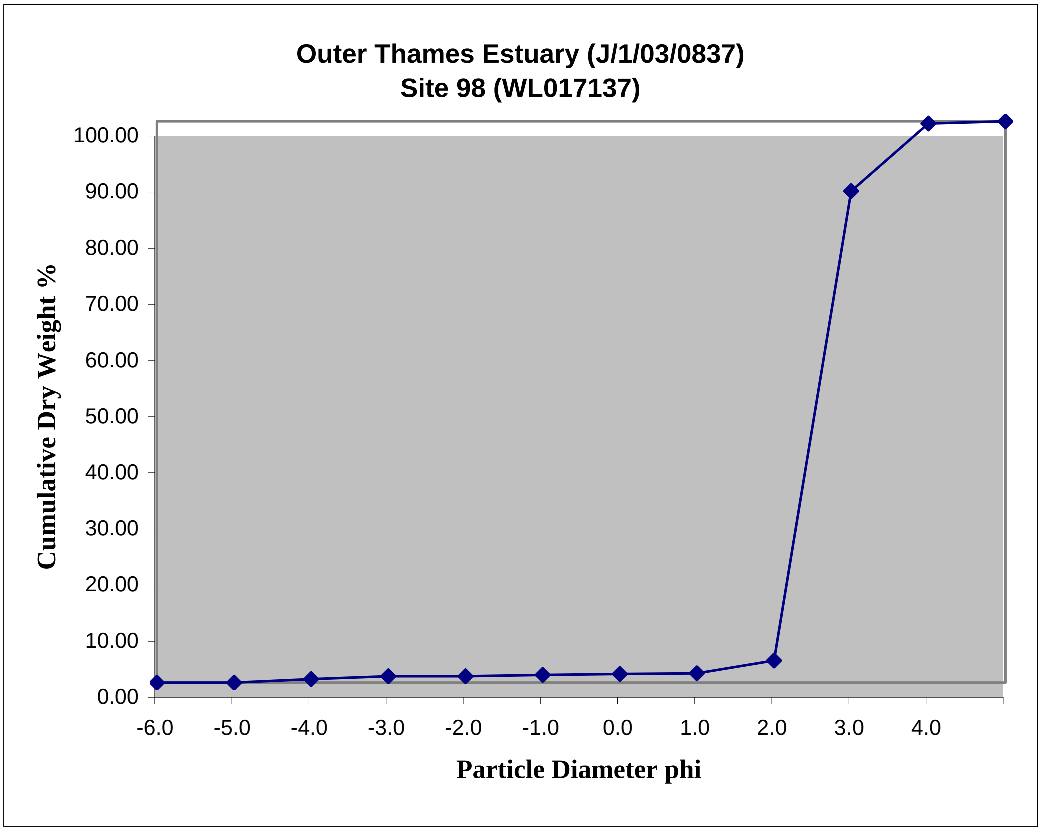
Mean mm	0.17
Md mm	0.17
Mean phi	2.55
Md phi	2.55
Sorting	0.34
Skq	-0.10
Kurtosis	0.62

%Gravel	1.16
% Sand	98.45
% Fines	0.39
% Org C	0.597

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 98 (WL017137)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 98 (WL017137)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 99 (WL017138)

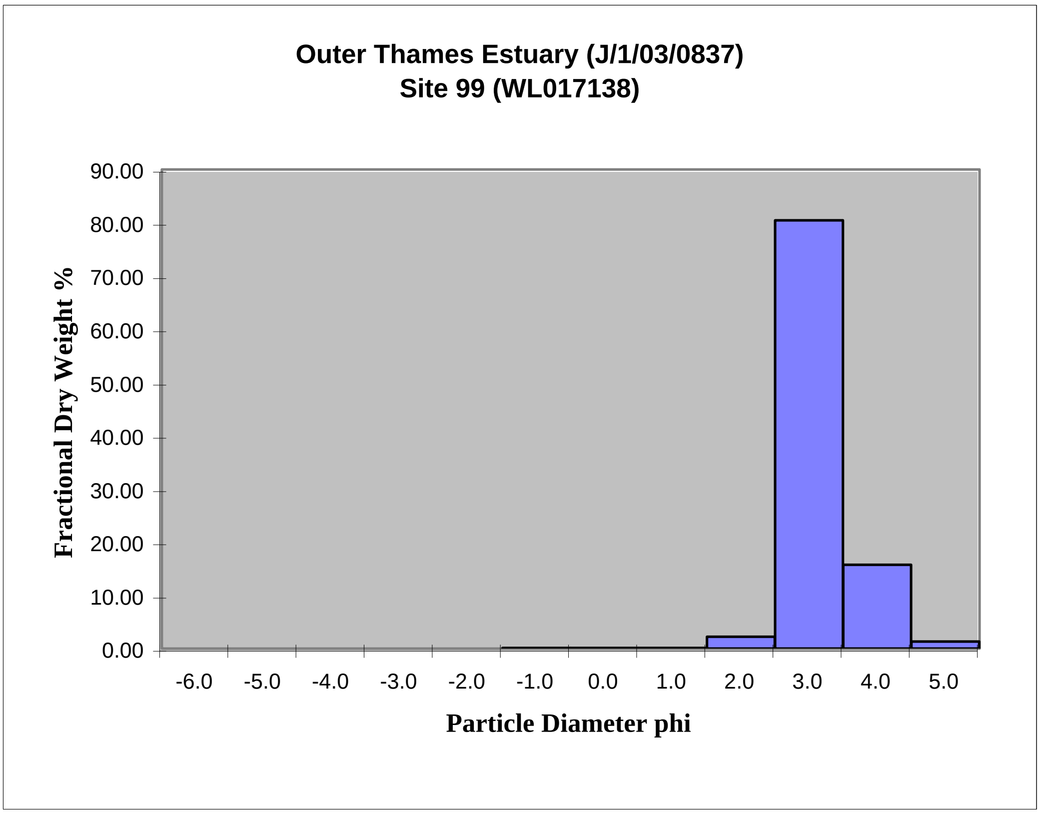
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.210	0.08	0.08
	1	0.0	0.160	0.06	0.14
Medium Sand	0.5	1.0	0.371	0.14	0.27
	0.25	2.0	6.083	2.23	2.50
Fine Sand	0.125	3.0	219.897	80.45	82.95
	0.063	4.0	43.038	15.75	98.69
Silt/Clay	<0.063	5.0	3.577	1.31	100.00
		Total Weight	273.336	100.00	

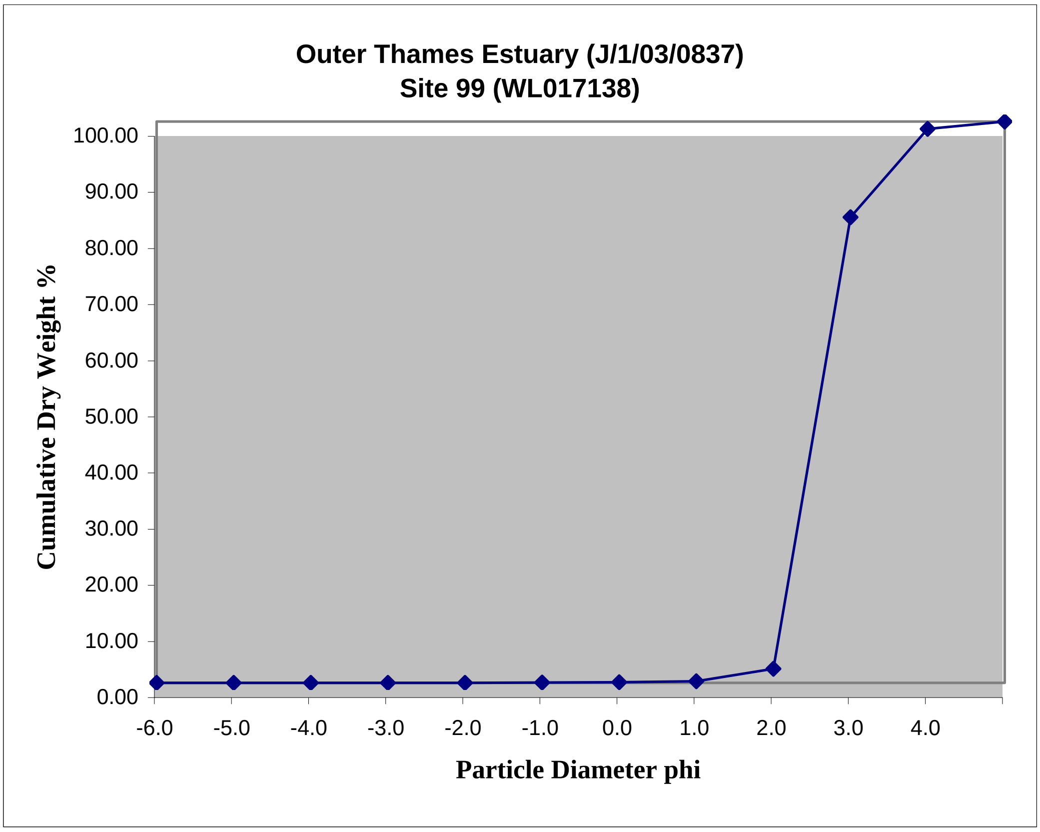
Mean mm	0.17
Md mm	0.17
Mean phi	2.58
Md phi	2.59
Sorting	0.33
Skq	-0.19
Kurtosis	0.54

%Gravel	0.00
% Sand	98.69
% Fines	1.31
% Org C	0.521

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 99 (WL017138)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 99 (WL017138)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 100 (WL017139)

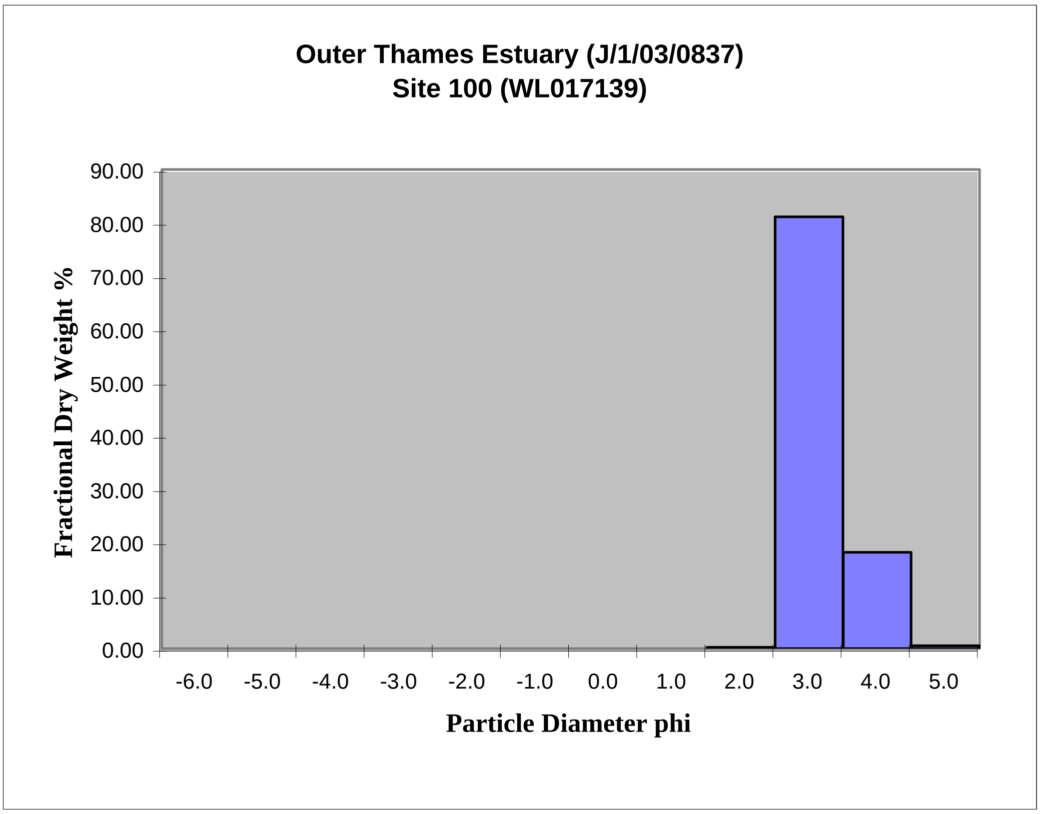
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.000	0.00	0.00
	1	0.0	0.000	0.00	0.00
Medium Sand	0.5	1.0	0.019	0.01	0.01
	0.25	2.0	0.631	0.23	0.23
Fine Sand	0.125	3.0	224.810	81.12	81.35
	0.063	4.0	50.115	18.08	99.43
Silt/Clay	<0.063	5.0	1.573	0.57	100.00
		Total Weight	277.148	100.00	

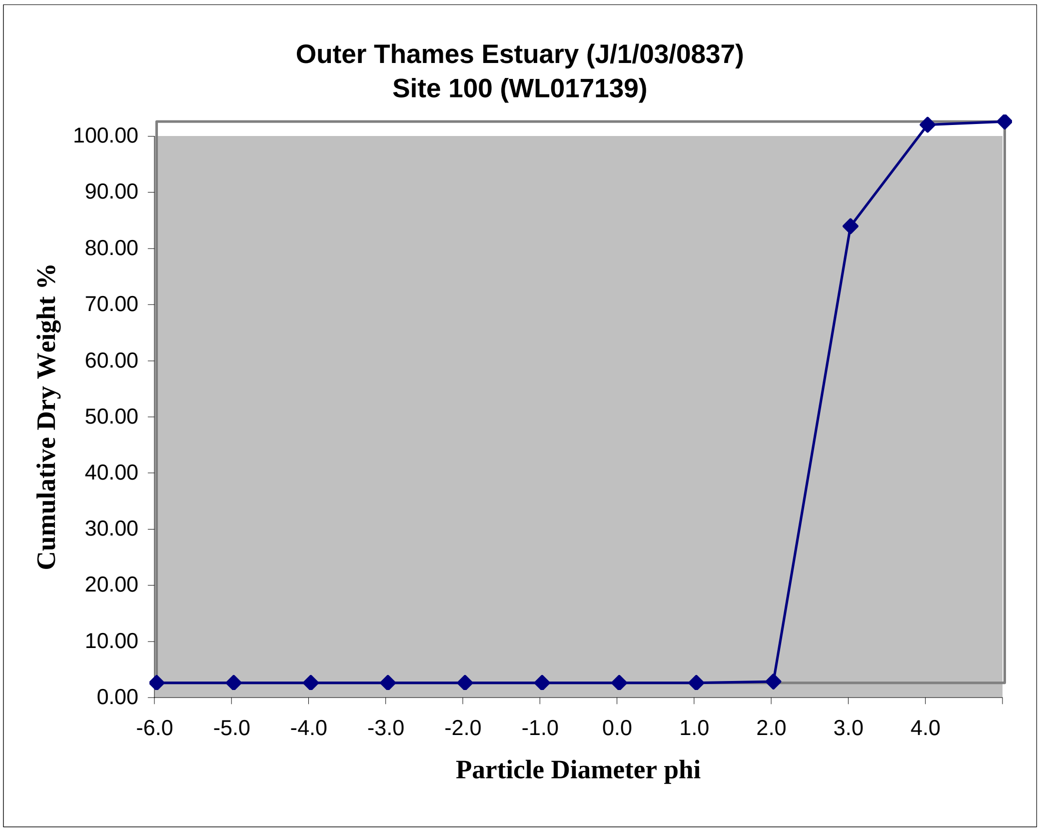
Mean mm	0.17
Md mm	0.16
Mean phi	2.59
Md phi	2.61
Sorting	0.31
Skq	-0.26
Kurtosis	0.51

%Gravel	0.00
% Sand	99.43
% Fines	0.57
% Org C	0.548

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 100 (WL017139)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 100 (WL017139)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 101 (WL017140)

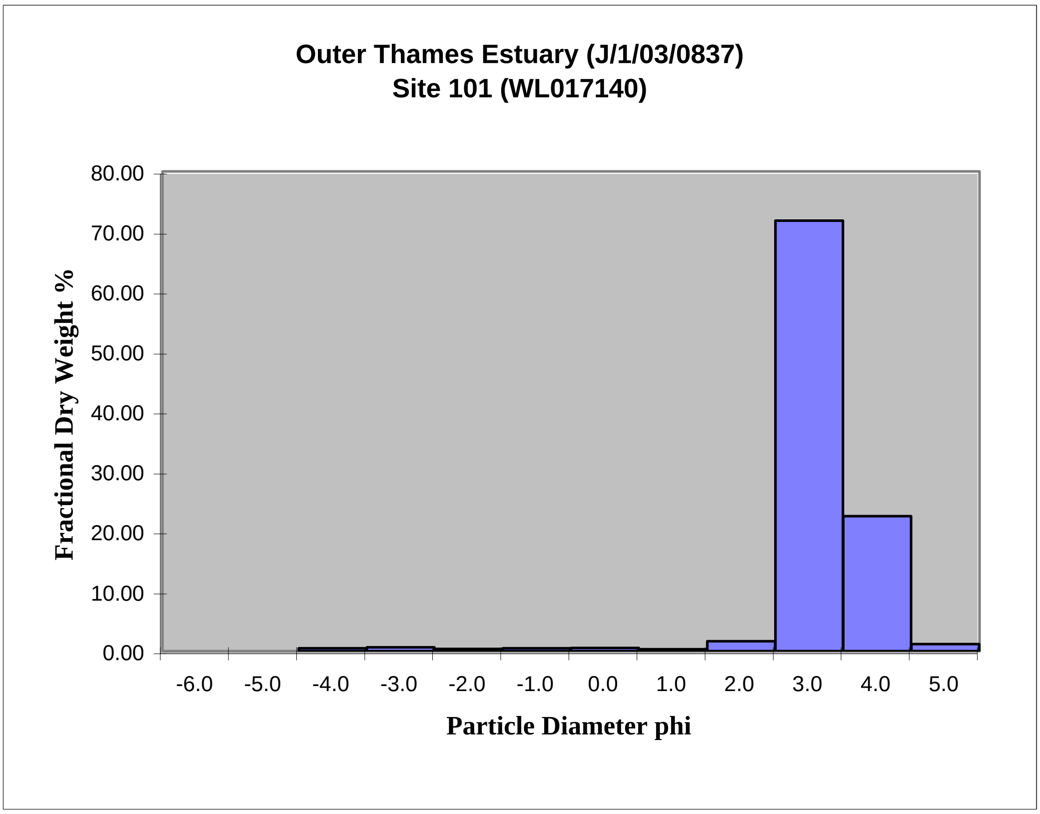
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	1.426	0.49	0.49
Gravel	8	-3.0	1.815	0.62	1.10
	4	-2.0	1.114	0.38	1.48
Coarse Sand	2	-1.0	1.410	0.48	1.96
	1	0.0	1.610	0.55	2.51
Medium Sand	0.5	1.0	0.956	0.33	2.83
	0.25	2.0	4.870	1.66	4.49
Fine Sand	0.125	3.0	211.023	71.79	76.29
	0.063	4.0	66.223	22.53	98.82
Silt/Clay	<0.063	5.0	3.478	1.18	100.00
		Total Weight	293.925	100.00	

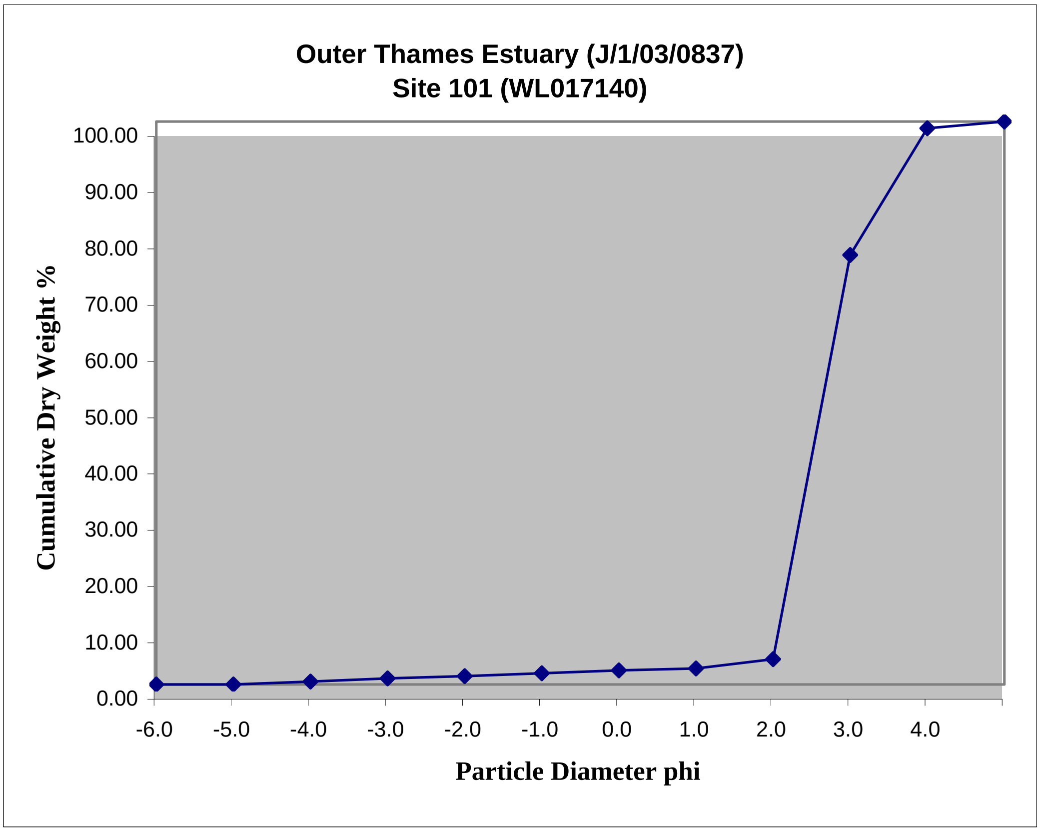
Mean mm	0.17
Md mm	0.16
Mean phi	2.56
Md phi	2.63
Sorting	0.30
Skq	-0.48
Kurtosis	0.44

%Gravel	1.48
% Sand	97.34
% Fines	1.18
% Org C	0.564

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 101 (WL017140)
Fractional Dry Weight %
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 101 (WL017140)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 102 (WL017141)

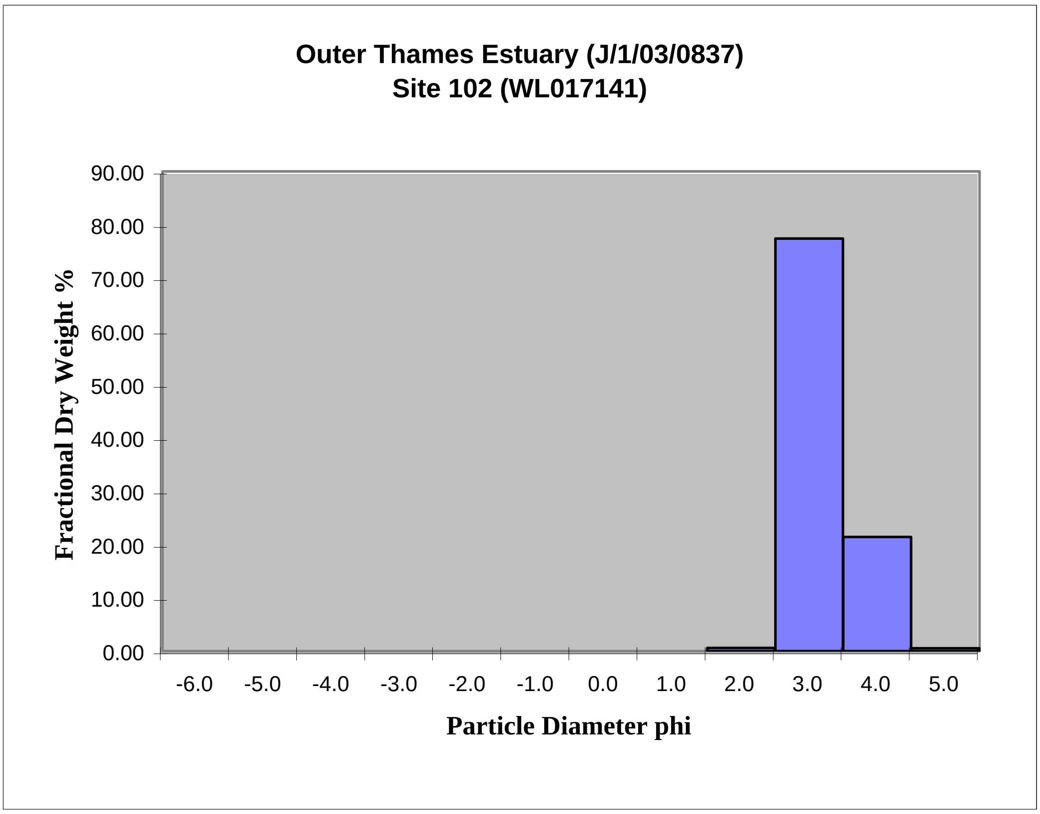
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.003	0.00	0.00
	1	0.0	0.001	0.00	0.00
Medium Sand	0.5	1.0	0.043	0.02	0.02
	0.25	2.0	1.574	0.62	0.64
Fine Sand	0.125	3.0	197.332	77.40	78.03
	0.063	4.0	54.559	21.40	99.43
Silt/Clay	<0.063	5.0	1.442	0.57	100.00
		Total Weight	254.954	100.00	

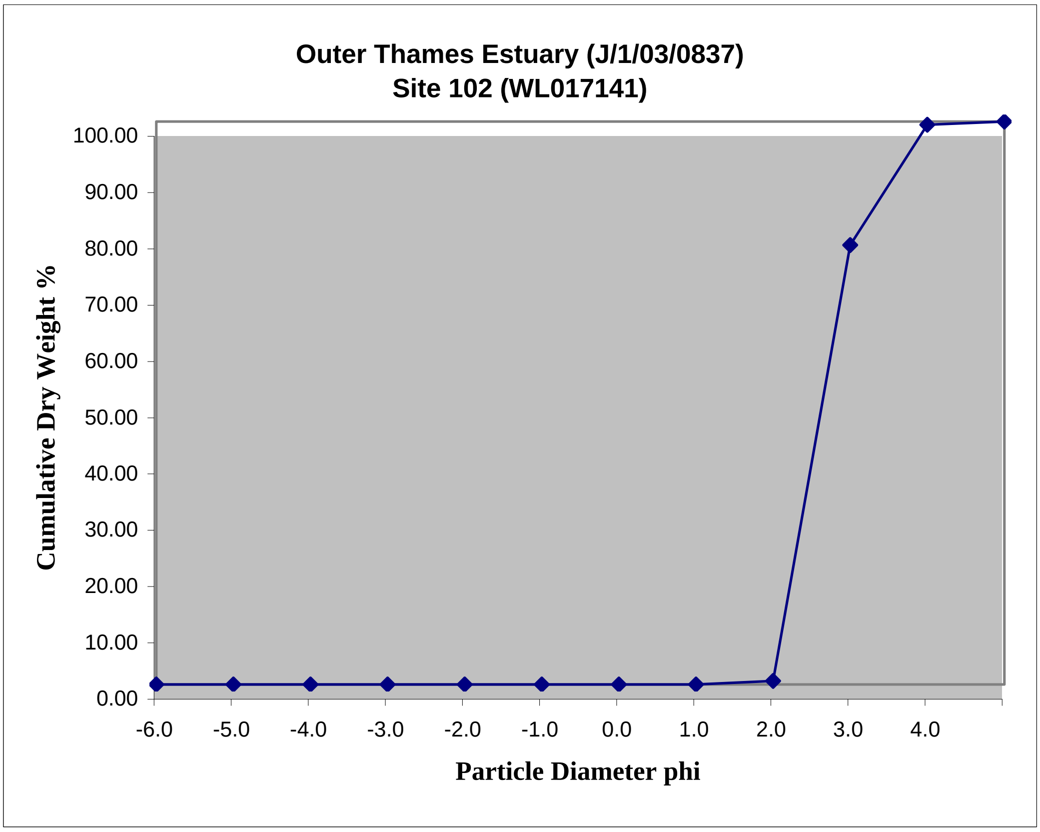
* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

Mean mm	0.17
Md mm	0.16
Mean phi	2.59
Md phi	2.64
Sorting	0.29
Skq	-0.41
Kurtosis	0.46

%Gravel	0.00
% Sand	99.43
% Fines	0.57
% Org C	0.358

Sand


Outer Thames Estuary (J/1/03/0837)
Site 102 (WL017141)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 102 (WL017141)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 103 (WL017142)

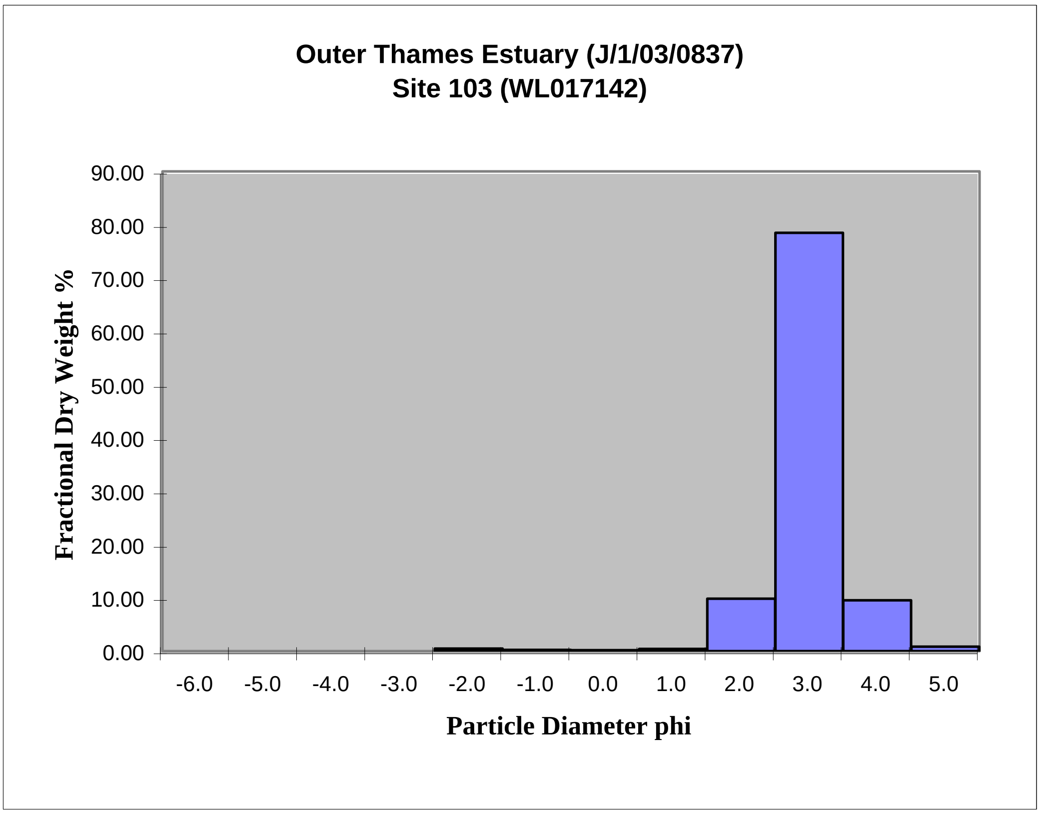
*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage Fractional	Percentage Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	1.363	0.49	0.49
Coarse Sand	2	-1.0	0.610	0.22	0.71
	1	0.0	0.481	0.17	0.88
Medium Sand	0.5	1.0	1.193	0.43	1.31
	0.25	2.0	27.362	9.84	11.16
Fine Sand	0.125	3.0	218.130	78.47	89.63
	0.063	4.0	26.459	9.52	99.14
Silt/Clay	<0.063	5.0	2.380	0.86	100.00
		Total Weight	277.978	100.00	

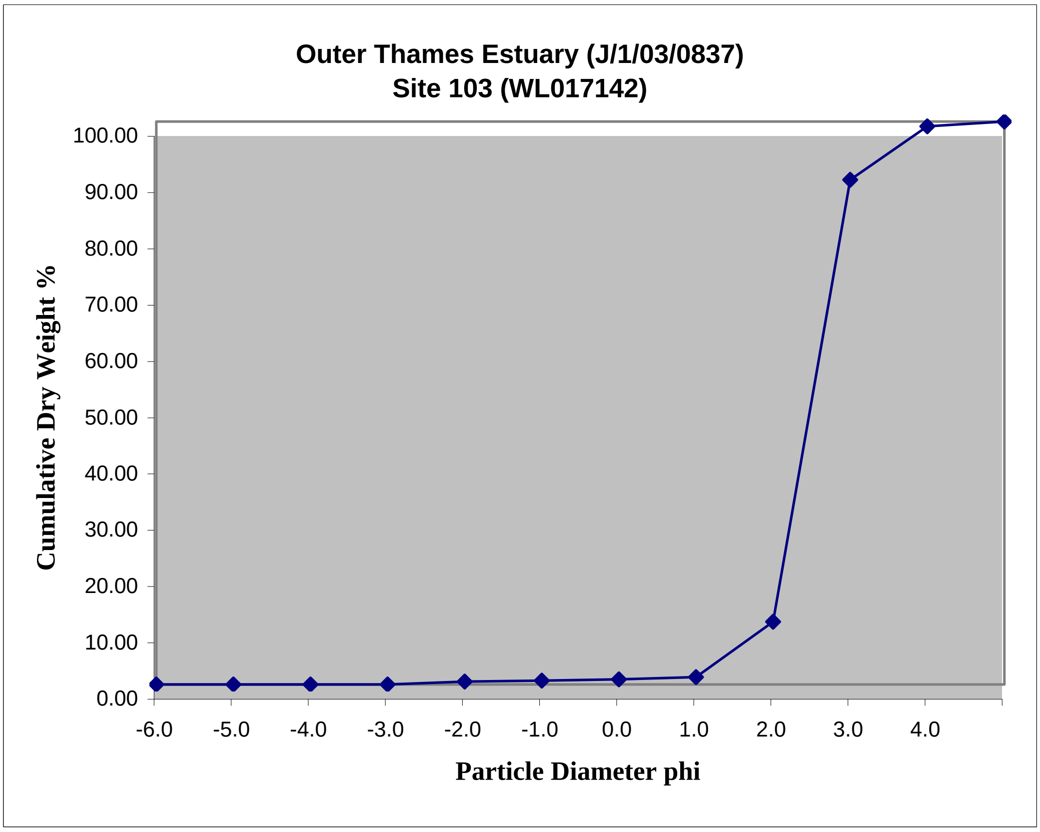
Mean mm	0.18
Md mm	0.18
Mean phi	2.50
Md phi	2.50
Sorting	0.45
Skq	-0.22
Kurtosis	1.01

%Gravel	0.49
% Sand	98.65
% Fines	0.86
% Org C	0.791

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.


Outer Thames Estuary (J/1/03/0837)
Site 103 (WL017142)
Fractional Dry Weight %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
Particle Diameter phi


Outer Thames Estuary (J/1/03/0837)
Site 103 (WL017142)
Cumulative Dry Weight %
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0.0
1.0
2.0
3.0
4.0
Particle Diameter phi

Outer Thames Estuary (J/1/03/0837)
Site 1 (WL017040)

*Broad Description of Grain Size	Aperture mm	Aperture (phi units)	Weight Retained (g)	Percentage	
				Fractional	Cumulative
Cobble	64	-6.0	0.000	0.00	0.00
Pebble	32	-5.0	0.000	0.00	0.00
	16	-4.0	0.000	0.00	0.00
Gravel	8	-3.0	0.000	0.00	0.00
	4	-2.0	0.000	0.00	0.00
Coarse Sand	2	-1.0	0.014	0.01	0.01
	1	0.0	0.000	0.00	0.01
Medium Sand	0.5	1.0	0.054	0.02	0.03
	0.25	2.0	0.953	0.43	0.46
Fine Sand	0.125	3.0	130.265	59.32	59.79
	0.063	4.0	86.239	39.27	99.06
Silt/Clay	<0.063	5.0	2.067	0.94	100.00
		Total Weight	219.592	100.00	

Mean mm	0.17
Md mm	0.14
Mean phi	2.56
Md phi	2.84
Sorting	0.13
Skq	-2.99
Kurtosis	0.41

%Gravel	0.00
% Sand	99.06
% Fines	0.94
% Org C	0.773

Sand

* Based on Connor *et al*, 2004. The Marine Habitat Classification for Britain and Ireland Version 04.05 which uses a modified Wentworth Scale.

APPENDIX III

Grab, Dredge and Trawl Deck Photos

Site 1

Site 2

Site 3

Site 4

Site 5

Site 6

Site 7

Site 8

Site 9

Site 10

Site 11

Site 12

 Site 13	 Site 14
 Site 15	 Site 16

Site 18

Site 19

Site 21

Site 22

Site 23

Site 24

Site 26

Site 27

Site 28

Site 30

Site 31

Site 32

Site 33

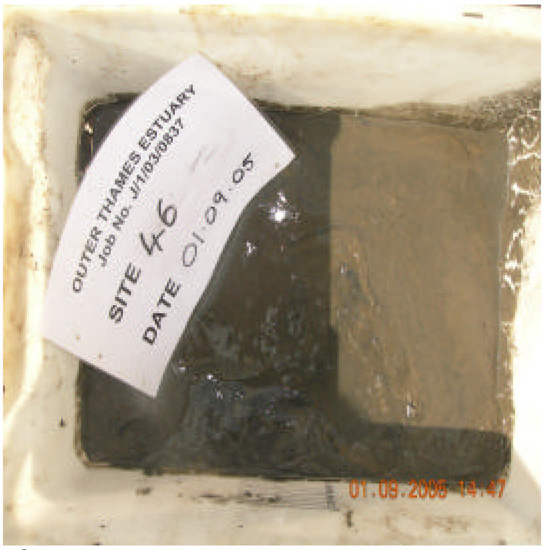
Site 34

Site 35

Site 36

 Site 37	 Site 38
 SIte 39	 Site 40

 Site 41	 Site 42
 Site 44 (Hamon)	 Site 45



Site 46

Site 47

Site 48

Site 49 (Hamon)

Site 50

Site 51

Site 52

Site 53

 Site 54	 Site 55
 Site 56	 Site 58

Site 59

Site 60

Site 61


Site 62 (Hamon)

Site 63

Site 64

Site 65

Site 66

Site 69

Site 70

Site 71 (Day)

Site 71 (Hamon)

Site 73 (Hamon)

Site 74 (Hamon)

Site 75 (Hamon)

Site 76

Site 77

Site 78

Site 81

Site 82 (Hamon)

Site 83

Site 84

Site 85

Site 86

Site 87

Site 88

Site 89

Site 90

Ite 91	Site 92
Site 93	Site 94

Site 95

Site 96

Site 97

Site 98

 Site 99	 Site 100
 Site 101	 Site 102


OUTER THAMES ESTUARY
Job No. J/1/03/0837
SITE 103
DATE 31.08.05
31 08 2005 19:35

Site 103

Site 7 dredge

Site 9 dredge

Site 10 dredge

Site 11 dredge

Site 19 dredge

Site 20 dredge

Site 23 dredge

Site 26 dredge

 Site 31 dredge	 Site 37 dredge
 Site 40 dredge	 Site 44 dredge

Site 46 dredge

Site 48 dredge

Site 50 dredge

Site 51 dredge

Site 58 dredge

Site 59 dredge

Site 62 dredge

Site 63 dredge

 Site 65 dredge	 Site 69 dredge
 Site 75 dredge	 Site 79 dredge

Site 81 dredge

Site 86 dredge

Site 87 dredge

Site 93 dredge

Site 94 dredge

Site 96 dredge

Site 103 dredge

Beam Trawl 7 (photograph slate incorrect)

Beam Trawl 9

Beam Trawl 15

Beam Trawl 19

Beam Trawl 20

Beam Trawl 23

Beam Trawl 26

Beam Trawl 31

Beam Trawl 37

Beam Trawl 44

Beam Trawl 46

Beam Trawl 48

Beam Trawl 49

Beam Trawl 50

Beam Trawl 51

Beam Trawl 58

**Beam Trawl 59**	**Beam Trawl 62**
**Beam Trawl 63**	**Beam Trawl 65**

Beam Trawl 68

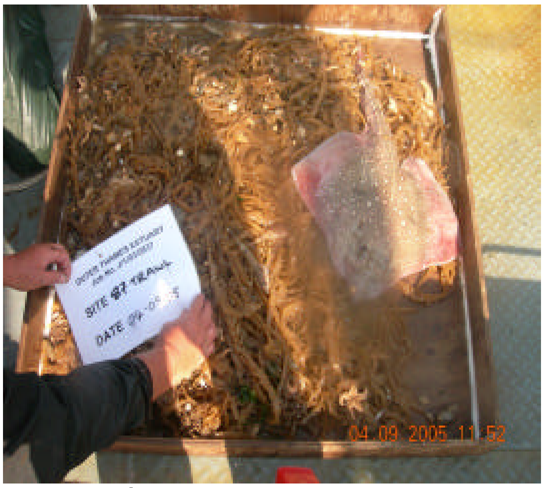
Beam Trawl 69

Beam Trawl 75

Beam Trawl 81

Beam Trawl 83

Beam Trawl 86



Beam Trawl 87

Beam Trawl 94 (Photograph slate incorrect)

Beam Trawl 98

APPENDIX IV

Grab, Dredge and Trawl Faunal Data

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Species	**MCS**	**Ref**																											
Eudendrium sp.*	D0218	149																											
Hydractinia echinata *	D0273	169\227																											
Calycella syringa *	D0348	105																											
Halecium spp.*	D0390	121															3				3							
Hydrallamania falcata *	D0424	161														3												
Sertularia cupressina *	D0435	160														3												
Clytia hemisphaerica *	D0503	130												3		3									3	3		
Obelia spp.*	D0517	NA																											
Obelia bidentata *	D0518	006																			3						3	3
Obelia dichotoma *	D0519	136																						3				
Cerianthus lloydii	D0632	146												1														
Actiniaria	D0662	NA												3		2								5				
Urticina felina	D0684	034																											
Turbellaria	F0002	117																			2							
Nemertea	G0001	NA												5		4	1				3		1	7			1	
Cerebratulus sp.	G0039	039																											
Sipuncula (juv.)	N0001	NA																											
Aphrodita aculeata	P0019	100																											
Harmothoe spp.	P0050	NA														4					1							
Harmothoe pagenstecheri	P0050	188\233																											
Lepidonotus squamatus	P0082	037																									1	
Pholoe spp. (juv.)	P0091	NA																											
Pholoe baltica	P0091	082														1					1			1				
Sigalion mathildae	P0104	198																											
Sthenalais boa	P0107	036														1												
Sthenalais limicola	P0109	140					1																					
Phyllodocidae (juv.)	P0114	NA																											
Eteone spp. (juv.)	P0116	NA																											
Eteone longa/flava	117/P01	062												1									1					
Eteone foliosa	P0124	123																											
Mysta barbata	P0126	069																											
Mysta picta	P0127	097																											
Anaitides longipes	P0143	151																											
Anaitides maculata	P0144	042																			1							
Anaitides rosea	P0146	083																						1				
Eulalia spp.	P0150	NA																			1							
Eulalia ornata	P0156	040																											
Eumida spp. (juv.)	P0163	NA																											

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Eumida spp.	P0163	065															5					4							
Glycera spp. (juv.)	P0255	NA																2		1									
Glycera alba	P0256	045															6								3				
Glycera oxycephala	P0260	092																2											
Glycinde nordmanni	P0268	200																1				4							
Goniada maculata	P0271	052													1				3						3		1		
Hesionidae (juv.)	P0293	NA																											
Podarkeopsis capensis	P0319	068															1												1
Microphthalamus similis	P0333	170																											
Syllidae (Epitoke)	P0346	NA																											
Eusyllis blomstrandi	P0380	047																											
Syllides benedicti	P0407	044																											
Autolytus spp.	P0434	041													1							1			1	1			
Nereis spp. (juv.)	P0473	NA													1		1			1		3							
Nereis longissima	P0475	050																				2			1				1
Nephtys spp. (juv.)	P0494	NA												1		2			3		1				6	2	4	4	1
Nephtys assimilis	P0495	022																											
Nephtys cirrosa	P0498	023	7	6		2	3		9	11			7	5								1	2	2		2			
Nephtys hombergii	P0499	016							1				1				1		9				5			3	8	14	22
Nephtys kersivalensis	P0502	186																											
Nephtys longosetosa	P0503	143						2																					
Marphysa bellii	P0564	122																											
Lumbrineris spp. (juv.)	P0572	NA															7												
Lumbrineris gracilis	P0579	098															12	3							1				
Protodorvillea kefersteini	P0638	070													1		3												
Scoloplos armiger	P0672	111														2		1					1		5				
Poecilochaetus serpens	P0718	011															1					4					1		
Aonides oxycephala	P0722	059															1								4				
Aonides paucibranchiata	P0723	110													1			1											
Polydora caeca	P0750	152																											
Polydora caulleryi	P0751	137																											
Polydora flava	P0754	043																											
Pseudopolydora pulchra	P0774	084																											
Pygospio elegans	P0776	131																											
Scolelepis spp. (juv.)	P0777	NA																											
Scolelepis bonnieri	P0779	141					1	2																					
Heteranomia squamata	P0783	165															1												
Spio decorata	P0789	176																									1		
Spio martinensis	P0791	144								1																			

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Spiophanes bombyx	P0794	013	1				6						4		11	1	5	5	1			52	5	1	53	9	5	57	11
Magelona johnstoni	P0803	015		1		2	8		3		1		2			1							4			3	1		1
Magelona alleni	P0804	081															1												
Magelona filiformis	P0805	197																											
Aphelochaeta sp.	P0824	NA																											
Aphelochaeta sp. A	P0824	163															1												
Aphelochaeta marioni	P0824	181																											
Caulleriella alata	P0829	067									2						9												
Caulleriella zetlandica	P0831	150																											
Chaetozone sp.	P0832	NA			1																								
Chaetozone setosa	P0834	199																											
Flabelligera affinis	P0881	129																											
Pherusa sp.	P0882	153																											
Mediomastus fragilis	P0919	060															11	1											
Notomastus spp.	P0920	010													1		6	2					1					1	4
Euclymene oerstedii	P0964	164															34											13	
Ophelia borealis	P0999	091									9				2			1				1		2					
Scalibregma inflatum	P1027	057															4	3				1			1				
Galathowenia spp.	P1093	NA															1								1				
Galathowenia oculata	P1093	162																											
Owenia fusiformis	P1098	058															1												
Lagis koreni	P1107	063													2		5		1			49			6	1		7	29
Sabellaria spinulosa	P1117	014													48		4					103							
Ampharete lindstroemi	P1139	061															8					1			1			1	
Terebellidae	P1179	NA													1														
Eupolymnia nesidensis	P1190	048																											
Lanice conchilega	P1195	012															7					2						1	2
Polycirrus spp.	P1235	112																1											
Polycirrus medusa	P1242	174																											
Sabella sp.	P1317	172																											
Sabella pavonina	P1320	214																											
Pomatoceros triqueter	P1341	035															8	2											
Oligochaeta	P1402	NA																							1				
Nymphonidae	Q0003	NA																											
Nymphon brevirostre	Q0005	076															2								3			1	
Achelia echinata	Q0015	074															1												
Anoplodactylus petiolatus	Q0044	073				1											1					16		1	1			2	
Verruca stroemia	R0041	193																											
Balanus crenatus	R0077	005																											

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Gastrosaccus spinifer	S0044	089						2					1																
Schistomysis kervillei	S0086	094																			1								
Pontocrates altamarinus	S0133	093		1						1		1		1															
Synchelidium maculatum	S0138	139					1																						
Amphilochus neapolitanus	S0159	077																1											
Stenothoe marina	S0213	029															1	1											
Urothoe sp.	S0246	NA													1														
Urothoe brevicornis	S0247	145			1							2																	
Urothoe elegans	S0248	173																											
Urothoe poseidonis	S0250	088																											
Acidostoma obesum	S0275	175																											
Atylus falcata	S0410	021													1														
Atylus guttatus	S0411	171																											
Ampelisca spp. (juv.)	S0423	NA																				1			1				
Ampelisca brevicornis	S0427	NA																										5	
Ampelisca diadema	S0429	158															3												
Ampelisca spinipes	S0438	072													2		10					6			3				
Bathyporeia spp.	S0451	NA															1												
Bathyporeia elegans	S0452	018					15	1		4		2	5	4		4					2	1	2	2					
Bathyporeia guilliamsoniana	S0454	020	4	10		5							24																
Melitidae sp. (juv.)	S0495	NA																											
Abludomelita obtusata	S0498	027															4	2				15			3				
Cheirocratus sp. (female)	S0503	184																											
Maerella tenuimana	S0521	107													1			2											
Gammaropsis maculata	S0541	028																											
Photis longicaudata	S0552	127															24											6	
Ericthonus punctatus	S0564	078															2												
Aora gracilis	S0579	075																							2			1	
Corophium sextonae	S0615	154																											
Corophium volutator	S0616	182																											
Unciola crenatipalma	S0621	026																											
Phtisica marina	S0657	194																											
Pseudoprotella phasma	S0659	195																											
Tanaopsis graciloides	S1142	178													1														
Bodotria scorpioides	S1197	116															1					1							
Diastylis rathkei	S1253	177											1																
Caridean (juv.)	S1293	NA																1											
Palaemonididae	S1311	NA																											
Thoralus cranchii	S1360	196																											

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Pandalina brevirostre	S1374	155																											
Pandalus montagui	S1377	201																											
Crangon crangon	S1385	007																											
Callianassa subterranea	S1415	133																											
Upogebia sp. (juv.)	S1418	NA																								1			
Anomura (juv.)	S1435	NA		1																									
Paguridae (juv.)	S1445	NA																											
Pagurus bernhardus	S1457	024																2											
Galathea intermedia	S1472	179																											
Pisidia longicornis	S1482	008															1	2				2							
Majidae (juv.)	S1512	NA															1								1				
Inachinae (juv.)	S1520	NA																											
Macropodia rostrata	S1532	134																											
Corystes cassivelaunus	S1552	189																											
Liocarcinus spp. (juv.)	S1577	NA											1																
Liocarcinus depurator	S1580	244																				1							
Liocarcinus holsatus	S1581	190																											
Pilumnus hirtellus	S1615	025																											
Leptochiton asellus	W0053	157															1												
Crepidula fornicata	W0439	055																				1						2	
Polinices pulchellus	W0491	079																											
Doto spp.	W1270	108																1											
Onchidoris spp.	W1320	056																											
Acanthodoris pilosa	W1333	118																				1							
Nuculidae (juv.)	W1563	NA																					2					1	1
Nucula nitidosa	W1569	032																1									1	24	
Nucula nucleus	W1570	031																											
Mytilidae (juv.)	W1691	NA													5		2	2							19	2		1	
Tellimya ferruginosa	W1902	168																										9	
Mysella bidentata	W1906	080												1	6		2		1			4						28	24
Mactra stultorum	W1972	138	1																										
Spisula elliptica	W1975	090									1				1							1							
Ensis arcuatus	W1998	147													1														
Phaxas pellucidus	W2006	085															1					1							
Fabulina fabula	W2019	099												1									7						
Macoma balthica	W2029	017																											
Donax vittatus	W2041	191																											
Abra spp. (juv.)	W2058	NA																											
Abra alba	W2059	009					3						2	1			85	1	5			4	6		3	1	12	52	10

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	19	21	22	23	24	26	27	28	29	30	31
		WL01	7040	7041	7042	7043	7044	7045	7046	7047	7048	7049	7050	7051	7052	7053	7054	7055	7058	7060	7061	7062	7063	7065	7066	7067	7068	7069	7070
Corbula gibba	W2157	156															1												
Pholadacea (juv.)	W2173	NA																											
Barnea candida	W2181	183																											
Thracia spp.	W2227	NA															2												
Alcyonidium diaphanum *	Y0076	033																3				7							
AlcyonidIum mytili *	Y0080	002																7				7							
Alcyonidium parasiticum *	Y0081	104																											
Vesicularia spinosa *	Y0131	102																										7	
Conopeum reticulum *	Y0172	004					3				3	3			7			20			3	7		3	7	3	3	7	7
Electra monostachys *	Y0177	003					3					7			20			20				20			20	3	3	3	7
Electra pilosa *	Y0178	103													7	3		7				7						3	
Aspidelectra melolontha *	Y0182	001					7				3	7			20			20		3		7		3	7	3	3	3	7
Callopora discreta *	Y0203	019																											
Escharella immersa *	Y0364	142					3											3											
Phylactella labrosa *	Y0421	114																		3									
Schizomavella auriculata *	Y0468	113									3						3												
Phoronis spp.	ZA0003	NA																											
Phoronis muelleri	ZA0005	038															2								1				1
Amphiuridae (juv.)	ZB0148	NA													1										2				3
Amphiura brachiata	ZB0151	187																											
Amphipholis squamata	ZB0161	109																1											
Ophiuroidea (juv.)	ZB0166	NA																											
Echinoidea (juv.)	ZB0181	NA																											
Echinocardium cordatum	ZB0223	180											1						1				1					2	8
Ophiura albida	ZB168	101															31					1						3	1
Ophiura ophiura	ZB170	053																							1		1		
Psammechinus miliaris	ZB193	054													1														
Polycarpa fibrosa	ZD112	125																							1				
Gobiidae (juv.)	ZG0455	185																											

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	32	33	34	35	36	37	38	39	40	41	42	45	46	47	48	51	52	53	54	55	56	57	58	59	60	61	63
		WL01	7071	7072	7073	7074	7075	7076	7077	7078	7079	7080	7081	7084	7085	7086	7087	7090	7091	7092	7093	7094	7095	7096	7097	7098	7099	7100	7102
Species	**MCS**	**Ref**																											
Eudendrium sp.*	D0218	149																											
Hydractinia echinata *	D0273	169\227	3																										
Calycella syringa *	D0348	105							3																				
Halecium spp.*	D0390	121																											
Hydrallamania falcata *	D0424	161																											
Sertularia cupressina *	D0435	160																											
Clytia hemisphaerica *	D0503	130																											
Obelia spp.*	D0517	NA											3																
Obelia bidentata *	D0518	006							7																20				
Obelia dichotoma *	D0519	136																											
Cerianthus lloydii	D0632	146																											
Actiniaria	D0662	NA																2											
Urticina felina	D0684	034																											
Turbellaria	F0002	117																											
Nemertea	G0001	NA							4		3	5		3		1		4				1			2				
Cerebratulus sp.	G0039	039					1																						
Sipuncula (juv.)	N0001	NA																											
Aphrodita aculeata	P0019	100							1																		1		
Harmothoe spp.	P0050	NA									1																		
Harmothoe pagenstecheri	P0050	188\233																											
Lepidonotus squamatus	P0082	037																											
Pholoe spp. (juv.)	P0091	NA																											
Pholoe baltica	P0091	082																1											
Sigalion mathildae	P0104	198																											
Sthenalais boa	P0107	036																											
Sthenalais limicola	P0109	140																											
Phyllodocidae (juv.)	P0114	NA																											
Eteone spp. (juv.)	P0116	NA																											
Eteone longa/flava	117/P01	062							1														1						
Eteone foliosa	P0124	123			1																								
Mysta barbata	P0126	069																											
Mysta picta	P0127	097																											
Anaitides longipes	P0143	151																											
Anaitides maculata	P0144	042																											
Anaitides rosea	P0146	083																											
Eulalia spp.	P0150	NA																											
Eulalia ornata	P0156	040																											
Eumida spp. (juv.)	P0163	NA																											

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	32	33	34	35	36	37	38	39	40	41	42	45	46	47	48	51	52	53	54	55	56	57	58	59	60	61	63
		WL01	7071	7072	7073	7074	7075	7076	7077	7078	7079	7080	7081	7084	7085	7086	7087	7090	7091	7092	7093	7094	7095	7096	7097	7098	7099	7100	7102
Eumida spp.	P0163	065							1		2						1												
Glycera spp. (juv.)	P0255	NA																											
Glycera alba	P0256	045							1		1														2				
Glycera oxycephala	P0260	092										2				1							1						
Glycinde nordmanni	P0268	200																											
Goniada maculata	P0271	052		2														3	1						1	1	1		
Hesionidae (juv.)	P0293	NA																											
Podarkeopsis capensis	P0319	068								1								1											
Microphthalamus similis	P0333	170									3																		
Syllidae (Epitoke)	P0346	NA							1																				
Eusyllis blomstrandi	P0380	047																											
Syllides benedicti	P0407	044																											
Autolytus spp.	P0434	041							1			2													5				
Nereis spp. (juv.)	P0473	NA							1								2												
Nereis longissima	P0475	050							1	1																			
Nephtys spp. (juv.)	P0494	NA		3		1			8	2		1	1	3									1		2				
Nephtys assimilis	P0495	022																										1	
Nephtys cirrosa	P0498	023	8	2	8	4	6	3	1		1		4				4		4	1	1	2				1		3	
Nephtys hombergii	P0499	016						1	6	18					5				1					12	3	2	2	1	5
Nephtys kersivalensis	P0502	186																											
Nephtys longosetosa	P0503	143		1															1										
Marphysa bellii	P0564	122																											
Lumbrineris spp. (juv.)	P0572	NA																											
Lumbrineris gracilis	P0579	098																											
Protodorvillea kefersteini	P0638	070									2	3																	
Scoloplos armiger	P0672	111		1							1	1	1					1						1	2	1			
Poecilochaetus serpens	P0718	011							5																9				
Aonides oxycephala	P0722	059																											
Aonides paucibranchiata	P0723	110									1			2															
Polydora caeca	P0750	152																											
Polydora caulleryi	P0751	137																											
Polydora flava	P0754	043																											
Pseudopolydora pulchra	P0774	084																											
Pygospio elegans	P0776	131																											
Scolelepis spp. (juv.)	P0777	NA						1									1												
Scolelepis bonnieri	P0779	141	1	1	1		4										1				2								
Heteranomia squamata	P0783	165																											
Spio decorata	P0789	176														1													
Spio martinensis	P0791	144																											

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Indivduals in counts per 0.1m2

		Site	32	33	34	35	36	37	38	39	40	41	42	45	46	47	48	51	52	53	54	55	56	57	58	59	60	61	63
		WL01	7071	7072	7073	7074	7075	7076	7077	7078	7079	7080	7081	7084	7085	7086	7087	7090	7091	7092	7093	7094	7095	7096	7097	7098	7099	7100	7102
Spiophanes bombyx	P0794	013	3			1		2	77		1		1	7	5			12					2	11	63		4	1	3
Magelona johnstoni	P0803	015	3	1	4	1	16	21	2				2				1				1			77	8				
Magelona alleni	P0804	081																											
Magelona filiformis	P0805	197																											
Aphelochaeta sp.	P0824	NA															1												
Aphelochaeta sp. A	P0824	163																											
Aphelochaeta marioni	P0824	181																											
Caulleriella alata	P0829	067												2									1						
Caulleriella zetlandica	P0831	150																											
Chaetozone sp.	P0832	NA																											
Chaetozone setosa	P0834	199																											
Flabelligera affinis	P0881	129																											
Pherusa sp.	P0882	153																											
Mediomastus fragilis	P0919	060							1																1				
Notomastus spp.	P0920	010						1	8	1	8			1									1		2				
Euclymene oerstedii	P0964	164																											
Ophelia borealis	P0999	091		3							49	27		73			8					17	37						
Scalibregma inflatum	P1027	057							1		1							1											
Galathowenia spp.	P1093	NA																											
Galathowenia oculata	P1093	162																											
Owenia fusiformis	P1098	058																											
Lagis koreni	P1107	063								336								9							1				
Sabellaria spinulosa	P1117	014							1							1													
Ampharete lindstroemi	P1139	061																											
Terebellidae	P1179	NA																											
Eupolymnia nesidensis	P1190	048																											
Lanice conchilega	P1195	012							4																				
Polycirrus spp.	P1235	112																											
Polycirrus medusa	P1242	174												8															
Sabella sp.	P1317	172																											
Sabella pavonina	P1320	214																											
Pomatoceros triqueter	P1341	035												1															
Oligochaeta	P1402	NA							1																4				
Nymphonidae	Q0003	NA																											
Nymphon brevirostre	Q0005	076																											
Achelia echinata	Q0015	074																											
Anoplodactylus petiolatus	Q0044	073							3															1	2		1		
Verruca stroemia	R0041	193																											
Balanus crenatus	R0077	005																1											

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Indivduals in counts per 0.1m2

		Site	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**45**	**46**	**47**	**48**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**63**
		WL01	**7071**	**7072**	**7073**	**7074**	**7075**	**7076**	**7077**	**7078**	**7079**	**7080**	**7081**	**7084**	**7085**	**7086**	**7087**	**7090**	**7091**	**7092**	**7093**	**7094**	**7095**	**7096**	**7097**	**7098**	**7099**	**7100**	**7102**
Gastrosaccus spinifer	S0044	089																					1						
Schistomysis kervillei	S0086	094		1	1				1																				
Pontocrates altamarinus	S0133	093																											
Synchelidium maculatum	S0138	139																											
Amphilochus neapolitanus	S0159	077												1															
Stenothoe marina	S0213	029							1																				
Urothoe sp.	S0246	NA																											
Urothoe brevicornis	S0247	145																											
Urothoe elegans	S0248	173												3															
Urothoe poseidonis	S0250	088								1				1										1					
Acidostoma obesum	S0275	175																											
Atylus falcata	S0410	021																1										1	
Atylus guttatus	S0411	171																											
Ampelisca spp. (juv.)	S0423	NA																											
Ampelisca brevicornis	S0427	NA																											
Ampelisca diadema	S0429	158																											
Ampelisca spinipes	S0438	072							1															1					
Bathyporeia spp.	S0451	NA							1																				
Bathyporeia elegans	S0452	018		25	4			3		1			1		1		60			34	4	1	1			1		1	
Bathyporeia guilliamsoniana	S0454	020																	1					1			3	3	
Melitidae sp. (juv.)	S0495	NA																											
Abludomelita obtusata	S0498	027			1				1																				
Cheirocratus sp. (female)	S0503	184																											
Maerella tenuimana	S0521	107																											
Gammaropsis maculata	S0541	028																											
Photis longicaudata	S0552	127																											
Ericthonus punctatus	S0564	078																											
Aora gracilis	S0579	075																											
Corophium sextonae	S0615	154																											
Corophium volutator	S0616	182																											
Unciola crenatipalma	S0621	026																											
Phtisica marina	S0657	194																											
Pseudoprotella phasma	S0659	195																											
Tanaopsis graciloides	S1142	178																											
Bodotria scorpioides	S1197	116				1																							
Diastylis rathkei	S1253	177											1	1	1														
Caridean (juv.)	S1293	NA																											
Palaemonididae	S1311	NA																											
Thoralus cranchii	S1360	196																											

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		Site	32	33	34	35	36	37	38	39	40	41	42	45	46	47	48	51	52	53	54	55	56	57	58	59	60	61	63
		WL01	7071	7072	7073	7074	7075	7076	7077	7078	7079	7080	7081	7084	7085	7086	7087	7090	7091	7092	7093	7094	7095	7096	7097	7098	7099	7100	7102
Pandalina brevirostre	S1374	155																											
Pandalus montagui	S1377	201																											
Crangon crangon	S1385	007																											
Callianassa subterranea	S1415	133																											
Upogebia sp. (juv.)	S1418	NA																											
Anomura (juv.)	S1435	NA																											
Paguridae (juv.)	S1445	NA																											
Pagurus bernhardus	S1457	024	1																										
Galathea intermedia	S1472	179																											
Pisidia longicornis	S1482	008														1													
Majidae (juv.)	S1512	NA																											
Inachinae (juv.)	S1520	NA																											
Macropodia rostrata	S1532	134																											
Corystes cassivelaunus	S1552	189																											
Liocarcinus spp. (juv.)	S1577	NA																			1								
Liocarcinus depurator	S1580	244																											
Liocarcinus holsatus	S1581	190																											
Pilumnus hirtellus	S1615	025																											
Leptochiton asellus	W0053	157																											
Crepidula fornicata	W0439	055																											
Polinices pulchellus	W0491	079								1														1					
Doto spp.	W1270	108																											
Onchidoris spp.	W1320	056																											
Acanthodoris pilosa	W1333	118																											
Nuculidae (juv.)	W1563	NA																								2	33		
Nucula nitidosa	W1569	032																									6		
Nucula nucleus	W1570	031							1																	2	16		
Mytilidae (juv.)	W1691	NA								1			2												7				
Tellimya ferruginosa	W1902	168																											
Mysella bidentata	W1906	080							1	7																			1
Mactra stultorum	W1972	138																											
Spisula elliptica	W1975	090										1		1									1						
Ensis arcuatus	W1998	147																											
Phaxas pellucidus	W2006	085																											
Fabulina fabula	W2019	099							2						1									2	2				1
Macoma balthica	W2029	017																											
Donax vittatus	W2041	191																											
Abra spp. (juv.)	W2058	NA																											
Abra alba	W2059	009	2		1			4	45	3								1	1					7	6	2	7	1	9

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		Site	32	33	34	35	36	37	38	39	40	41	42	45	46	47	48	51	52	53	54	55	56	57	58	59	60	61	63
		WL01	**7071**	**7072**	**7073**	**7074**	**7075**	**7076**	**7077**	**7078**	**7079**	**7080**	**7081**	**7084**	**7085**	**7086**	**7087**	**7090**	**7091**	**7092**	**7093**	**7094**	**7095**	**7096**	**7097**	**7098**	**7099**	**7100**	**7102**
Corbula gibba	W2157	156																											
Pholadacea (juv.)	W2173	NA																											
Barnea candida	W2181	183																											
Thracia spp.	W2227	NA																											
Alcyonidium diaphanum *	Y0076	033																											
AlcyonidIum mytili *	Y0080	002												3															
Alcyonidium parasiticum *	Y0081	104							3																				
Vesicularia spinosa *	Y0131	102							3				3																
Conopeum reticulum *	Y0172	004		3					7		3	7		20		3	3	20							3	3		3	
Electra monostachys *	Y0177	003		3					7		3	7		20		3		7											3
Electra pilosa *	Y0178	103							3			3													3	3	3		
Aspidelectra melolontha *	Y0182	001		3					7		7	7		20		3	3	20								3		3	3
Callopora discreta *	Y0203	019																										3	
Escharella immersa *	Y0364	142																											
Phylactella labrosa *	Y0421	114																											
Schizomavella auriculata *	Y0468	113																											
Phoronis spp.	ZA0003	NA																											
Phoronis muelleri	ZA0005	038																											
Amphiuridae (juv.)	ZB0148	NA										1																	
Amphiura brachiata	ZB0151	187																											
Amphipholis squamata	ZB0161	109																											
Ophiuroidea (juv.)	ZB0166	NA																											
Echinoidea (juv.)	ZB0181	NA																											
Echinocardium cordatum	ZB0223	180			1																								
Ophiura albida	ZB168	101							1																				
Ophiura ophiura	ZB170	053																						1					
Psammechinus miliaris	ZB193	054																											
Polycarpa fibrosa	ZD112	125																											
Gobiidae (juv.)	ZG0455	185																											

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		Site	64	65	66	67	68	69	70	71	72	76	77	78	79	80	81	83	84	86	87	88	89	90	91	93	94	95	96
		WL01	**7103**	**7104**	**7105**	**7106**	**7107**	**7108**	**7109**	**7110**	**7111**	**7115**	**7116**	**7117**	**7118**	**7119**	**7120**	**7122**	**7123**	**7125**	**7126**	**7127**	**7128**	**7129**	**7130**	**7132**	**7133**	**7134**	**7135**
Species	**MCS**	**Ref**																											
Eudendrium sp.*	D0218	149																											
Hydractinia echinata *	D0273	169\227																											
Calycella syringa *	D0348	105																7											
Halecium spp.*	D0390	121																											
Hydrallamania falcata *	D0424	161																											
Sertularia cupressina *	D0435	160																											
Clytia hemisphaerica *	D0503	130																20							3				
Obelia spp.*	D0517	NA	3																										
Obelia bidentata *	D0518	006									3								7										
Obelia dichotoma *	D0519	136																							7				
Cerianthus lloydii	D0632	146																											
Actiniaria	D0662	NA	28													2		4	5			1			7				
Urticina felina	D0684	034	3																										
Turbellaria	F0002	117																1							1				
Nemertea	G0001	NA														5	18	18	46		21				1				
Cerebratulus sp.	G0039	039	2																		1								
Sipuncula (juv.)	N0001	NA															1												
Aphrodita aculeata	P0019	100																											
Harmothoe spp.	P0050	NA	17							1								6							2				
Harmothoe pagenstecheri	P0050	188\233															1												
Lepidonotus squamatus	P0082	037	2																										
Pholoe spp. (juv.)	P0091	NA	1															1											
Pholoe baltica	P0091	082														1	3		1		1	1			2				
Sigalion mathildae	P0104	198																											
Sthenalais boa	P0107	036	1													2	1	1							1				
Sthenalais limicola	P0109	140																											
Phyllodocidae (juv.)	P0114	NA	1																										
Eteone spp. (juv.)	P0116	NA	1																2										
Eteone longa/flava	117/P01	062															8	1	13		4								
Eteone foliosa	P0124	123																											
Mysta barbata	P0126	069																1											
Mysta picta	P0127	097															1				1								
Anaitides longipes	P0143	151																											
Anaitides maculata	P0144	042	9														2												
Anaitides rosea	P0146	083																	4			1							
Eulalia spp.	P0150	NA																											
Eulalia ornata	P0156	040	13																										
Eumida spp. (juv.)	P0163	NA																				1							

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		Site	64	65	66	67	68	69	70	71	72	76	77	78	79	80	81	83	84	86	87	88	89	90	91	93	94	95	96
		WL01	7103	7104	7105	7106	7107	7108	7109	7110	7111	7115	7116	7117	7118	7119	7120	7122	7123	7125	7126	7127	7128	7129	7130	7132	7133	7134	7135
Eumida spp.	P0163	065	2													16	21	1	2		1				2				
Glycera spp. (juv.)	P0255	NA									1					1	6	1	5		2				1				
Glycera alba	P0256	045	1													2	6	1	1		2								
Glycera oxycephala	P0260	092																				1							
Glycinde nordmanni	P0268	200																											
Goniada maculata	P0271	052	1					1	1								2		1		3			2		1		2	
Hesionidae (juv.)	P0293	NA														1													
Podarkeopsis capensis	P0319	068																5	2		1								
Microphthalamus similis	P0333	170																											
Syllidae (Epitoke)	P0346	NA																							1				
Eusyllis blomstrandi	P0380	047	2																										
Syllides benedicti	P0407	044	2															3											
Autolytus spp.	P0434	041	10													1		22	1		1				4				
Nereis spp. (juv.)	P0473	NA	1														1	1	8		4				3				
Nereis longissima	P0475	050	4													3	14	3	2		6								
Nephtys spp. (juv.)	P0494	NA		1		3	2			2						2	1	1	1	8	5	3			1	2	5	3	
Nephtys assimilis	P0495	022										3			1					1									
Nephtys cirrosa	P0498	023		3	7	9	2		3			5	2	1	6	1						4	1	1					
Nephtys hombergii	P0499	016		1		4				3	1								5	2			1			2	4		9
Nephtys kersivalensis	P0502	186																											
Nephtys longosetosa	P0503	143																											
Marphysa bellii	P0564	122																											
Lumbrineris spp. (juv.)	P0572	NA																2											
Lumbrineris gracilis	P0579	098	2														11	1	1	1	1				2				
Protodorvillea kefersteini	P0638	070	1														1	1	1						1				
Scoloplos armiger	P0672	111														1				1		1		5			1		
Poecilochaetus serpens	P0718	011									1					7	1		90		7								
Aonides oxycephala	P0722	059																2	1		1								
Aonides paucibranchiata	P0723	110																											
Polydora caeca	P0750	152																											
Polydora caulleryi	P0751	137	2																						5				
Polydora flava	P0754	043	5																										
Pseudopolydora pulchra	P0774	084	1																1										
Pygospio elegans	P0776	131						1																					
Scolelepis spp. (juv.)	P0777	NA																											
Scolelepis bonnieri	P0779	141											1										1	1					
Heteranomia squamata	P0783	165																											
Spio decorata	P0789	176	1												1														
Spio martinensis	P0791	144																											

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Indivduals in counts per 0.1m2

		Site	64	65	66	67	68	69	70	71	72	76	77	78	79	80	81	83	84	86	87	88	89	90	91	93	94	95	96
		WL01	7103	7104	7105	7106	7107	7108	7109	7110	7111	7115	7116	7117	7118	7119	7120	7122	7123	7125	7126	7127	7128	7129	7130	7132	7133	7134	7135
Spiophanes bombyx	P0794	013	6			1	2	4			5	1			3	50	36	8	337	7	20	42			2		1	4	
Magelona johnstoni	P0803	015		8	9	25			9	1	1	1	1		5					34		1				3	13		
Magelona alleni	P0804	081																	1		1								
Magelona filiformis	P0805	197																									1		
Aphelochaeta sp.	P0824	NA																											
Aphelochaeta sp. A	P0824	163																											
Aphelochaeta marioni	P0824	181																											
Caulleriella alata	P0829	067														1	6	8							1				
Caulleriella zetlandica	P0831	150															1												
Chaetozone sp.	P0832	NA																											
Chaetozone setosa	P0834	199																											
Flabelligera affinis	P0881	129	1																										
Pherusa sp.	P0882	153																											
Mediomastus fragilis	P0919	060	1														1	13	1		1				4				
Notomastus spp.	P0920	010	2						1		1			1	1	25	58	74	15	1	43				4		3	1	
Euclymene oerstedii	P0964	164														3	3												
Ophelia borealis	P0999	091					2															7							
Scalibregma inflatum	P1027	057	1															4	2		1								
Galathowenia spp.	P1093	NA														1													
Galathowenia oculata	P1093	162															4												
Owenia fusiformis	P1098	058															4	1	3										
Lagis koreni	P1107	063						1								4	76	6	65		35	1							
Sabellaria spinulosa	P1117	014	###					36			1						6	10	2			31			20				
Ampharete lindstroemi	P1139	061														1	12	9			4								
Terebellidae	P1179	NA																											
Eupolymnia nesidensis	P1190	048	1															3											
Lanice conchilega	P1195	012				1		1			1					15			1										
Polycirrus spp.	P1235	112															1												
Polycirrus medusa	P1242	174																											
Sabella sp.	P1317	172																											
Sabella pavonina	P1320	214																12											
Pomatoceros triqueter	P1341	035	14														82												
Oligochaeta	P1402	NA																	1	1							2		
Nymphonidae	Q0003	NA	1																										
Nymphon brevirostre	Q0005	076																2											
Achelia echinata	Q0015	074	1															8							1				
Anoplodactylus petiolatus	Q0044	073														6		7			4								
Verruca stroemia	R0041	193																							2				
Balanus crenatus	R0077	005	1								6						2												

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**76**	**77**	**78**	**79**	**80**	**81**	**83**	**84**	**86**	**87**	**88**	**89**	**90**	**91**	**93**	**94**	**95**	**96**
		WL01	**7103**	**7104**	**7105**	**7106**	**7107**	**7108**	**7109**	**7110**	**7111**	**7115**	**7116**	**7117**	**7118**	**7119**	**7120**	**7122**	**7123**	**7125**	**7126**	**7127**	**7128**	**7129**	**7130**	**7132**	**7133**	**7134**	**7135**
Gastrosaccus spinifer	S0044	089																		1									
Schistomysis kervillei	S0086	094												1															
Pontocrates altamarinus	S0133	093												1															
Synchelidium maculatum	S0138	139																											
Amphilochus neapolitanus	S0159	077																1							1				
Stenothoe marina	S0213	029	1																						1				
Urothoe sp.	S0246	NA																											
Urothoe brevicornis	S0247	145																											
Urothoe elegans	S0248	173																				1							
Urothoe poseidonis	S0250	088										2																1	
Acidostoma obesum	S0275	175																											
Atylus falcata	S0410	021																				1							
Atylus guttatus	S0411	171				1	4										1												
Ampelisca spp. (juv.)	S0423	NA																											
Ampelisca brevicornis	S0427	NA																											
Ampelisca diadema	S0429	158																							5				
Ampelisca spinipes	S0438	072														3	9	2			3								
Bathyporeia spp.	S0451	NA																											
Bathyporeia elegans	S0452	018			6	1			4	10			3	4	5		2			2		1	1						1
Bathyporeia guilliamsoniana	S0454	020		1		1														2									
Melitidae sp. (juv.)	S0495	NA	1																										
Abludomelita obtusata	S0498	027	3	1			38								1	2	9				1				2				
Cheirocratus sp. (female)	S0503	184					1											1											
Maerella tenuimana	S0521	107																											
Gammaropsis maculata	S0541	028	8																						4				
Photis longicaudata	S0552	127															5												
Ericthonus punctatus	S0564	078																1											
Aora gracilis	S0579	075																3							5				
Corophium sextonae	S0615	154	8					2																	6				
Corophium volutator	S0616	182																											
Unciola crenatipalma	S0621	026	17																						34				
Phtisica marina	S0657	194																							1				
Pseudoprotella phasma	S0659	195																							1				
Tanaopsis graciloides	S1142	178																											
Bodotria scorpioides	S1197	116	1																						1				
Diastylis rathkei	S1253	177																											
Caridean (juv.)	S1293	NA																											
Palaemonididae	S1311	NA	3																										
Thoralus cranchii	S1360	196																							2				

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Indivduals in counts per 0.1m2

		Site	64	65	66	67	68	69	70	71	72	76	77	78	79	80	81	83	84	86	87	88	89	90	91	93	94	95	96
		WL01	7103	7104	7105	7106	7107	7108	7109	7110	7111	7115	7116	7117	7118	7119	7120	7122	7123	7125	7126	7127	7128	7129	7130	7132	7133	7134	7135
Pandalina brevirostre	S1374	155																							2				
Pandalus montagui	S1377	201																							1				
Crangon crangon	S1385	007		2							1																		
Callianassa subterranea	S1415	133																											
Upogebia sp. (juv.)	S1418	NA																											
Anomura (juv.)	S1435	NA																1		1					3				
Paguridae (juv.)	S1445	NA					1							1															
Pagurus bernhardus	S1457	024	1													2	1												
Galathea intermedia	S1472	179																											
Pisidia longicornis	S1482	008	23				2				1						3								23				
Majidae (juv.)	S1512	NA																											
Inachinae (juv.)	S1520	NA																							2				
Macropodia rostrata	S1532	134																											
Corystes cassivelaunus	S1552	189																											
Liocarcinus spp. (juv.)	S1577	NA					1											2											
Liocarcinus depurator	S1580	244																											
Liocarcinus holsatus	S1581	190																											
Pilumnus hirtellus	S1615	025	2																						4				
Leptochiton asellus	W0053	157																											
Crepidula fornicata	W0439	055														2		1											
Polinices pulchellus	W0491	079																	1			1							
Doto spp.	W1270	108																											
Onchidoris spp.	W1320	056																2			1								
Acanthodoris pilosa	W1333	118																											
Nuculidae (juv.)	W1563	NA															2							2		7			
Nucula nitidosa	W1569	032																								1			27
Nucula nucleus	W1570	031																						1					24
Mytilidae (juv.)	W1691	NA	13															25	1						49				
Tellimya ferruginosa	W1902	168																											
Mysella bidentata	W1906	080	2													10	15		17		7				2				
Mactra stultorum	W1972	138																											
Spisula elliptica	W1975	090																											
Ensis arcuatus	W1998	147																											
Phaxas pellucidus	W2006	085														1	2		1		1								
Fabulina fabula	W2019	099										4			1									1			1		
Macoma balthica	W2029	017																											11
Donax vittatus	W2041	191																											
Abra spp. (juv.)	W2058	NA																	2										
Abra alba	W2059	009	24			1	1		1		1			1	3	59	70	16			3		2	4	9	5	6	4	31

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Indivduals in counts per 0.1m2

		Site	64	65	66	67	68	69	70	71	72	76	77	78	79	80	81	83	84	86	87	88	89	90	91	93	94	95	96
		WL01	7103	7104	7105	7106	7107	7108	7109	7110	7111	7115	7116	7117	7118	7119	7120	7122	7123	7125	7126	7127	7128	7129	7130	7132	7133	7134	7135
Corbula gibba	W2157	156																											
Pholadacea (juv.)	W2173	NA						1																					
Barnea candida	W2181	183																											
Thracia spp.	W2227	NA																											
Alcyonidium diaphanum *	Y0076	033	3																										
AlcyonidIum mytili *	Y0080	002	3					3			20			3		3	3				3	3							
Alcyonidium parasiticum *	Y0081	104																7							7				
Vesicularia spinosa *	Y0131	102																											
Conopeum reticulum *	Y0172	004	7				7	3			20			7		20	7	20	20		20	7			3				
Electra monostachys *	Y0177	003					7	7			20			3		20	7	55	20		3	7			3				3
Electra pilosa *	Y0178	103	7				3	3										20	3						3				
Aspidelectra melolontha *	Y0182	001	3				20	7			20			7		20	3	7	20		3	7						3	
Callopora discreta *	Y0203	019																											
Escharella immersa *	Y0364	142															3												
Phylactella labrosa *	Y0421	114																											
Schizomavella auriculata *	Y0468	113														3	3												
Phoronis spp.	ZA0003	NA	3																										
Phoronis muelleri	ZA0005	038	8														3								1				
Amphiuridae (juv.)	ZB0148	NA	9																										
Amphiura brachiata	ZB0151	187															2												
Amphipholis squamata	ZB0161	109																											
Ophiuroidea (juv.)	ZB0166	NA														4	13	1							2				
Echinoidea (juv.)	ZB0181	NA																											
Echinocardium cordatum	ZB0223	180																											
Ophiura albida	ZB168	101														2	5												
Ophiura ophiura	ZB170	053																1											
Psammechinus miliaris	ZB193	054																1											
Polycarpa fibrosa	ZD112	125																3											
Gobiidae (juv.)	ZG0455	185																											

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Indivduals in counts per 0.1m2

		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	**7136**	**7137**	**7138**	**7139**	**7140**	**7141**	**7142**	**7296**	**7295**	**7294**	**7293**	**7292**	**7297**	**7291**	**7290**	**7289**	**7288**	**7283**	**7298**
Species	**MCS**	**Ref**																			
Eudendrium sp.*	D0218	149								3											
Hydractinia echinata *	D0273	169\227																			
Calycella syringa *	D0348	105																			
Halecium spp.*	D0390	121																			
Hydrallamania falcata *	D0424	161																			
Sertularia cupressina *	D0435	160																			
Clytia hemisphaerica *	D0503	130								7						7					
Obelia spp.*	D0517	NA																			
Obelia bidentata *	D0518	006							3											3	
Obelia dichotoma *	D0519	136								7								3	3		
Cerianthus lloydii	D0632	146								1			2								
Actiniaria	D0662	NA								18			13			24			3	33	
Urticina felina	D0684	034																			
Turbellaria	F0002	117																			
Nemertea	G0001	NA								6	1		6			7		1	10	18	
Cerebratulus sp.	G0039	039																			
Sipuncula (juv.)	N0001	NA																			
Aphrodita aculeata	P0019	100																			
Harmothoe spp.	P0050	NA								3									1		
Harmothoe pagenstecheri	P0050	188\233																			
Lepidonotus squamatus	P0082	037																			
Pholoe spp. (juv.)	P0091	NA																			
Pholoe baltica	P0091	082								5				3		1			1	4	
Sigalion mathildae	P0104	198																			1
Sthenalais boa	P0107	036												1					4	3	
Sthenalais limicola	P0109	140																			
Phyllodocidae (juv.)	P0114	NA																			
Eteone spp. (juv.)	P0116	NA																			
Eteone longa/flava	117/P01	062								2	1			2				2			
Eteone foliosa	P0124	123											1				1				
Mysta barbata	P0126	069																			
Mysta picta	P0127	097																			
Anaitides longipes	P0143	151								1											
Anaitides maculata	P0144	042																			
Anaitides rosea	P0146	083																2		1	
Eulalia spp.	P0150	NA																			
Eulalia ornata	P0156	040																			
Eumida spp. (juv.)	P0163	NA																			

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Indivduals in counts per 0.1m2

		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	7136	7137	7138	7139	7140	7141	7142	7296	7295	7294	7293	7292	7297	7291	7290	7289	7288	7283	7298
Eumida spp.	P0163	065								8	1			1		5		1	2		
Glycera spp. (juv.)	P0255	NA								2			2							2	
Glycera alba	P0256	045								2									2	2	
Glycera oxycephala	P0260	092														1		2			
Glycinde nordmanni	P0268	200																			
Goniada maculata	P0271	052								4								1	4	2	
Hesionidae (juv.)	P0293	NA														1					
Podarkeopsis capensis	P0319	068								1									3	1	
Microphthalamus similis	P0333	170																			
Syllidae (Epitoke)	P0346	NA																			
Eusyllis blomstrandi	P0380	047																			
Syllides benedicti	P0407	044																			
Autolytus spp.	P0434	041								2			1			7			4	2	
Nereis spp. (juv.)	P0473	NA								2						1			5	1	
Nereis longissima	P0475	050								1				6		1		1	5	1	
Nephtys spp. (juv.)	P0494	NA		1	1	3	4	1	2	1							1		4		
Nephtys assimilis	P0495	022					1														
Nephtys cirrosa	P0498	023	6	2		3		7	1								1			1	
Nephtys hombergii	P0499	016	2		6					1	1				1				1		1
Nephtys kersivalensis	P0502	186														2				1	
Nephtys longosetosa	P0503	143																			
Marphysa bellii	P0564	122															1				
Lumbrineris spp. (juv.)	P0572	NA																			
Lumbrineris gracilis	P0579	098								9			4			7			2	1	
Protodorvillea kefersteini	P0638	070											1								
Scoloplos armiger	P0672	111					1						1			1	8	3	1	1	
Poecilochaetus serpens	P0718	011							3		1		1								
Aonides oxycephala	P0722	059								5										2	
Aonides paucibranchiata	P0723	110																		1	
Polydora caeca	P0750	152								5											
Polydora caulleryi	P0751	137																			
Polydora flava	P0754	043														5					
Pseudopolydora pulchra	P0774	084																			
Pygospio elegans	P0776	131																			
Scolelepis spp. (juv.)	P0777	NA																			
Scolelepis bonnieri	P0779	141																			
Heteranomia squamata	P0783	165																			
Spio decorata	P0789	176																			
Spio martinensis	P0791	144																			

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		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	7136	7137	7138	7139	7140	7141	7142	7296	7295	7294	7293	7292	7297	7291	7290	7289	7288	7283	7298
Spiophanes bombyx	P0794	013	1					1	18	11	13					3		8	12	17	1
Magelona johnstoni	P0803	015		1				1							6		1				3
Magelona alleni	P0804	081								2						1			2		
Magelona filiformis	P0805	197																			
Aphelochaeta sp.	P0824	NA																			
Aphelochaeta sp. A	P0824	163																			
Aphelochaeta marioni	P0824	181											3								
Caulleriella alata	P0829	067														1			2	3	
Caulleriella zetlandica	P0831	150								2			1								
Chaetozone sp.	P0832	NA																			
Chaetozone setosa	P0834	199							1												
Flabelligera affinis	P0881	129																		1	
Pherusa sp.	P0882	153								1											
Mediomastus fragilis	P0919	060								12	3		4	10		2		2	8	1	
Notomastus spp.	P0920	010							1	8			2	16		1		4	55	6	
Euclymene oerstedii	P0964	164																			
Ophelia borealis	P0999	091																5			
Scalibregma inflatum	P1027	057								2			1	2					2	6	
Galathowenia spp.	P1093	NA											2								
Galathowenia oculata	P1093	162																		3	
Owenia fusiformis	P1098	058								2									2	4	
Lagis koreni	P1107	063								8	1	1	4	1				4	4	42	
Sabellaria spinulosa	P1117	014								22	1					35				102	
Ampharete lindstroemi	P1139	061								6				1		1			4	6	
Terebellidae	P1179	NA																			
Eupolymnia nesidensis	P1190	048												1							
Lanice conchilega	P1195	012									1		1	2		1					
Polycirrus spp.	P1235	112																			
Polycirrus medusa	P1242	174														1					
Sabella sp.	P1317	172									1										
Sabella pavonina	P1320	214																			
Pomatoceros triqueter	P1341	035									1		11			7					
Oligochaeta	P1402	NA								1											
Nymphonidae	Q0003	NA																			
Nymphon brevirostre	Q0005	076														2					
Achelia echinata	Q0015	074								1											
Anoplodactylus petiolatus	Q0044	073								5						2			1	4	
Verruca stroemia	R0041	193																			
Balanus crenatus	R0077	005																			

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		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	7136	7137	7138	7139	7140	7141	7142	7296	7295	7294	7293	7292	7297	7291	7290	7289	7288	7283	7298
Gastrosaccus spinifer	S0044	089			1												1				
Schistomysis kervillei	S0086	094																			
Pontocrates altamarinus	S0133	093																			
Synchelidium maculatum	S0138	139																			
Amphilochus neapolitanus	S0159	077																			
Stenothoe marina	S0213	029								1						6					
Urothoe sp.	S0246	NA																			
Urothoe brevicornis	S0247	145																			
Urothoe elegans	S0248	173																			
Urothoe poseidonis	S0250	088																			
Acidostoma obesum	S0275	175										1									
Atylus falcata	S0410	021																			
Atylus guttatus	S0411	171									1										
Ampelisca spp. (juv.)	S0423	NA																			
Ampelisca brevicornis	S0427	NA																			
Ampelisca diadema	S0429	158																			
Ampelisca spinipes	S0438	072								7	1	2	16					9		6	
Bathyporeia spp.	S0451	NA																			
Bathyporeia elegans	S0452	018	2	1			4		23						1						
Bathyporeia guilliamsoniana	S0454	020		1	1			3	2												
Melitidae sp. (juv.)	S0495	NA																			
Abludomelita obtusata	S0498	027								6	3		1	6		2		6	1	5	
Cheirocratus sp. (female)	S0503	184																			
Maerella tenuimana	S0521	107																			
Gammaropsis maculata	S0541	028																			
Photis longicaudata	S0552	127								1			2						6		
Ericthonus punctatus	S0564	078																			
Aora gracilis	S0579	075														2			1		
Corophium sextonae	S0615	154								1											
Corophium volutator	S0616	182												1							
Unciola crenatipalma	S0621	026														2					
Phtisica marina	S0657	194																			
Pseudoprotella phasma	S0659	195																			
Tanaopsis graciloides	S1142	178																			
Bodotria scorpioides	S1197	116								1						2				1	
Diastylis rathkei	S1253	177																			
Caridean (juv.)	S1293	NA																	1		
Palaemonididae	S1311	NA														3					
Thoralus cranchii	S1360	196																			

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		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	7136	7137	7138	7139	7140	7141	7142	7296	7295	7294	7293	7292	7297	7291	7290	7289	7288	7283	7298
Pandalina brevirostre	S1374	155								1											
Pandalus montagui	S1377	201																			
Crangon crangon	S1385	007														1					
Callianassa subterranea	S1415	133																	1		
Upogebia sp. (juv.)	S1418	NA																			
Anomura (juv.)	S1435	NA																			
Paguridae (juv.)	S1445	NA																	1		
Pagurus bernhardus	S1457	024												4		1					
Galathea intermedia	S1472	179									1										
Pisidia longicornis	S1482	008								2	2					7					
Majidae (juv.)	S1512	NA																			
Inachinae (juv.)	S1520	NA																			
Macropodia rostrata	S1532	134																	1		
Corystes cassivelaunus	S1552	189	1																		
Liocarcinus spp. (juv.)	S1577	NA								1	1							1		1	
Liocarcinus depurator	S1580	244																			
Liocarcinus holsatus	S1581	190																		1	
Pilumnus hirtellus	S1615	025														1					
Leptochiton asellus	W0053	157																			
Crepidula fornicata	W0439	055								1											
Polinices pulchellus	W0491	079																			
Doto spp.	W1270	108														3			1		
Onchidoris spp.	W1320	056																			
Acanthodoris pilosa	W1333	118																	1		
Nuculidae (juv.)	W1563	NA																			4
Nucula nitidosa	W1569	032	1																		3
Nucula nucleus	W1570	031												4				4			
Mytilidae (juv.)	W1691	NA														4				2	
Tellimya ferruginosa	W1902	168																			
Mysella bidentata	W1906	080								1				3		1		4	2		
Mactra stultorum	W1972	138																			
Spisula elliptica	W1975	090																			
Ensis arcuatus	W1998	147																			
Phaxas pellucidus	W2006	085																			
Fabulina fabula	W2019	099			1																
Macoma balthica	W2029	017	3																		
Donax vittatus	W2041	191					2	1													1
Abra spp. (juv.)	W2058	NA																			
Abra alba	W2059	009			1				4	4	6	1	8	2	1	23		19	74	22	

* Indicates colonial epifauna quantified using EMU in house abundance scale
Indivduals in counts per 0.1m2

		Site	97	98	99	100	101	102	103	18 H	44 H	49 H	50 H	62 H	71 H	73 H	74 H	75 H	82 H	85 H	92 H
		WL01	7136	7137	7138	7139	7140	7141	7142	7296	7295	7294	7293	7292	7297	7291	7290	7289	7288	7283	7298
Corbula gibba	W2157	156														1					
Pholadacea (juv.)	W2173	NA																			
Barnea candida	W2181	183												144							
Thracia spp.	W2227	NA																			
Alcyonidium diaphanum *	Y0076	033												3				3			
AlcyonidIum mytili *	Y0080	002								3	3	3	3	3		3			3		
Alcyonidium parasiticum *	Y0081	104								3									3		
Vesicularia spinosa *	Y0131	102								3											
Conopeum reticulum *	Y0172	004							3	7	20	7	20	3		20		3	20	3	7
Electra monostachys *	Y0177	003							3	20	20	7	7	7		20			20	3	
Electra pilosa *	Y0178	103								7				3		3		3	7	3	
Aspidelectra melolontha *	Y0182	001							3	20	20	3	3	3		20		3	20		7
Callopora discreta *	Y0203	019																			
Escharella immersa *	Y0364	142																			
Phylactella labrosa *	Y0421	114																			
Schizomavella auriculata *	Y0468	113											7								
Phoronis spp.	ZA0003	NA																			
Phoronis muelleri	ZA0005	038								1				3					4	4	
Amphiuridae (juv.)	ZB0148	NA											3								
Amphiura brachiata	ZB0151	187																			
Amphipholis squamata	ZB0161	109																			
Ophiuroidea (juv.)	ZB0166	NA														8				7	
Echinoidea (juv.)	ZB0181	NA																		1	
Echinocardium cordatum	ZB0223	180		1																	
Ophiura albida	ZB168	101														1			1	1	
Ophiura ophiura	ZB170	053																			
Psammechinus miliaris	ZB193	054																		1	
Polycarpa fibrosa	ZD112	125																			
Gobiidae (juv.)	ZG0455	185														1					

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D7	D9	D10	D11	D15	D19	D20	D23	D26	D31	D37	D40	D44	D46	D48	D50	D51	D58
		WL01	7046	7048	7049	7050	7054	7058	7059	7062	7065	7070	7076	7079	7083	7085	7087	7089	7090	7097
Species	**MCS**	**Ref**																		
Calycella syringa	D0348	105																		
Hydrallamania falcata	D0424	161																		
Sertularia spp.	D0433	NA						P	P							P				
Obelia spp.	D0517	NA		P				P		P										
Obelia bidentata	D0518	006																		P
Actiniaria	D0662	NA							1	1									3	
Nemertea	G0001	NA										1			1					
Aphrodita aculeata	P0019	100					1													
Harmothoe spp.	P0050	NA								1										
Sthenalais boa	P0107	036																		
Eteone longa/flava	P0117/P0118	062																		
Anaitides maculata	P0144	042								1										
Anaitides rosea	P0146	083				1														
Glycera alba	P0256	045								1		2	1		1				1	
Autolytus spp.	P0434	041																		
Nereis longissima	P0475	050						1		1										
Nephtys spp. (juv.)	P0494	NA	5			14		49		1		32			2					2
Nephtys assimilis	P0495	022	2			3		1												
Nephtys caeca	P0496	106													5					
Nephtys cirrosa	P0498	023	20		1	32														
Nephtys hombergii	P0499	016	13			8		35				34	2			3				
Nephtys kersivalensis	P0502	186															1			
Nephtys longosetosa	P0503	143																		
Lumbrineris gracilis	P0579	046																		
Scoloplos armiger	P0672	111										1								
Poecilochaetus serpens	P0718	011																		
Scolelepis bonnieri	P0779	141																		
Spio decorata	P0789	051																		
Spiophanes bombyx	P0794	013				13		15				10			4					1
Magelona johnstoni	P0803	015	94			108								1						
Flabelligera affinis	P0881	129					2								11					
Notomastus spp.	P0920	010						1				4								
Owenia fusiformis	P1098	058								3										

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D7	D9	D10	D11	D15	D19	D20	D23	D26	D31	D37	D40	D44	D46	D48	D50	D51	D58
		WL01	7046	7048	7049	7050	7054	7058	7059	7062	7065	7070	7076	7079	7083	7085	7087	7089	7090	7097
Lagis koreni	P1107	063					2	3		21		422			1					1
Sabellaria spinulosa	P1117	014								279									1	
Ampharete lindstroemi	P1139	061																		
Lanice conchilega	P1195	012					1								1					
Sabellidae	P1257	NA																		
Sabella pavonina	P1320	064																		
Pomatoceros triqueter	P1341	035																5		
Achelia echinata	Q0015	074																		
Anoplodactylus petiolatus	Q0044	073																		
Perioculodes longimanus	S0131	211																		
Pontocrates altamarinus	S0133	093	1			1														
Urothoe poseidonis	S0250	088																		
Atylus guttatus	S0411	171	3																	
Ampelisca spinipes	S0438	072					1								1			4		
Bathyporeia guilliamsoniana	S0454	020			1	198														
Bathyporeia elegans	S0452	018	48			56		2				1								
Photis longicaudata	S0552	127					1													
Pariambus typica	S0651	128					5													
Diastylis rugosa	S1254	207																		
Crangon crangon	S1385	007																		
Pagurus bernhardus	S1457	024					1	1	4											
Atelecyclus rotundatus	S1555	204																		
Liocarcinus spp. (juv.)	S1577	NA																		
Liocarcinus arcuatus	S1578	205							1											
Liocarcinus holsatus	S1581	190							1											
Portumnus latipes	S1596	212																		
Crepidula fornicata	W0439	055							9											
Polinices pulchellus	W0491	079					2	1				1								
Buccinum undatum	W0708	203					1		2											
Retusa obtusata	W1077	206																		
Acanthodoris pilosa	W1333	118																		
Nuculidae (juv.)	W1563	NA																		
Nucula nitidosa	W1569	032						1												
Nucula nucleus	W1570	031																	1	

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D7	D9	D10	D11	D15	D19	D20	D23	D26	D31	D37	D40	D44	D46	D48	D50	D51	D58
		WL01	7046	7048	7049	7050	7054	7058	7059	7062	7065	7070	7076	7079	7083	7085	7087	7089	7090	7097
Mytilidae (juv.)	W1691	NA																		
Mytilus edulis	W1695	126							1											
Tellimya ferruginosa	W1902	168										4								
Mysella bidentata	W1906	080						1		4		29								
Acanthocardia sp. (juv.)	W1940	135																		
Acanthocardia tuberculata	W1946	208																		
Parvicardium ovale	W1951	248																		
Mactra stultorum	W1972	138				1														
Fabulina fabula	W2019	099				2														
Donax vittatus	W2041	191				6														
Abra alba	W2059	009	1			4	1	17				30	7		95	9		12	1	27
Alcyonidium diaphanum	Y0076	033								P					P					
Alcyonidium mytili	Y0080	002							P	P								P		
Alcyonidium parasiticum	Y0081	104		P																
Vesicularia spinosa	Y0131	102													P					
Conopeum reticulum	Y0172	004			P		P			P	P	P			P		P	P	P	P
Electra monostachys	Y0177	003					P				P	P			P			P	P	
Electra pilosa	Y0178	103							P							P	P			
Aspidelectra melolontha	Y0182	001			P					P	P	P			P					
Asterias rubens	ZB0100	124					1		3											
Amphiuridae (juv.)	ZB0148	NA								1										
Amphiura brachiata	ZB0151	187																		
Ophiuroidea (juv.)	ZB0166	NA								1		1								
Ophiura albida	ZB0168	101					50			6		4						1		
Ophiura ophiura	ZB0170	053							5	1	3									
Psammechinus miliaris	ZB0193	054					5		9						1			8		
Echinocardium cordatum	ZB0223	180						1				16								
Polycarpa fibrosa	ZD0112	125																		

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D59	D62	D63	D65	D69	D75	D79	D81	D83	D86	D87	D93	D94	D98	D103
		WL01	7098	7101	7102	7104	7108	7114	7118	7120	7122	7125	7126	7132	7133	7137	7142
Species	**MCS**	**Ref**															
Calycella syringa	D0348	105		P							P						
Hydrallamania falcata	D0424	161								P					P		
Sertularia spp.	D0433	NA						P									
Obelia spp.	D0517	NA			P						P						
Obelia bidentata	D0518	006						P					P		P		
Actiniaria	D0662	NA						3		3	1						
Nemertea	G0001	NA								1	1				1	2	
Aphrodita aculeata	P0019	100			1					1	1						
Harmothoe spp.	P0050	NA									1						
Sthenalais boa	P0107	036								1							
Eteone longa/flava	P0117/P0118	062								1	1						
Anaitides maculata	P0144	042															
Anaitides rosea	P0146	083															
Glycera alba	P0256	045	1		2						1						
Autolytus spp.	P0434	041		5							18						
Nereis longissima	P0475	050									2		1				
Nephtys spp. (juv.)	P0494	NA										55	1		116	9	1
Nephtys assimilis	P0495	022				1			1						6		
Nephtys caeca	P0496	106		1			1	3		2							
Nephtys cirrosa	P0498	023				1			2					12		14	
Nephtys hombergii	P0499	016			4				2			11	1	14	27		
Nephtys kersivalensis	P0502	186															
Nephtys longosetosa	P0503	143														1	
Lumbrineris gracilis	P0579	046									1						
Scoloplos armiger	P0672	111									1	5			2		
Poecilochaetus serpens	P0718	011			1								1				
Scolelepis bonnieri	P0779	141										1					
Spio decorata	P0789	051													1	1	
Spiophanes bombyx	P0794	013			3					1		6			3		
Magelona johnstoni	P0803	015							1			25		1	45	4	
Flabelligera affinis	P0881	129								6	17						
Notomastus spp.	P0920	010			2					4	4				5		
Owenia fusiformis	P1098	058								3	2						

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D59	D62	D63	D65	D69	D75	D79	D81	D83	D86	D87	D93	D94	D98	D103
		WL01	7098	7101	7102	7104	7108	7114	7118	7120	7122	7125	7126	7132	7133	7137	7142
Lagis koreni	P1107	063			19	2		2	1	15	7		87			1	
Sabellaria spinulosa	P1117	014		3							24			2			
Ampharete lindstroemi	P1139	061									2						
Lanice conchilega	P1195	012		1	4												
Sabellidae	P1257	NA									1						
Sabella pavonina	P1320	064									2						
Pomatoceros triqueter	P1341	035		9						4							
Achelia echinata	Q0015	074		7							4						
Anoplodactylus petiolatus	Q0044	073									5				2		
Perioculodes longimanus	S0131	211													1		
Pontocrates altamarinus	S0133	093													1	2	
Urothoe poseidonis	S0250	088													1		
Atylus guttatus	S0411	171															
Ampelisca spinipes	S0438	072						5		3	5						
Bathyporeia guilliamsoniana	S0454	020										11					
Bathyporeia elegans	S0452	018										5		1	22	2	
Photis longicaudata	S0552	127									2						
Pariambus typica	S0651	128									24						
Diastylis rugosa	S1254	207										2					
Crangon crangon	S1385	007												2			
Pagurus bernhardus	S1457	024		5	1				1		6						
Atelecyclus rotundatus	S1555	204								3							
Liocarcinus spp. (juv.)	S1577	NA									1					1	
Liocarcinus arcuatus	S1578	205		1													
Liocarcinus holsatus	S1581	190		3						3			1				
Portumnus latipes	S1596	212														1	
Crepidula fornicata	W0439	055								1	1						
Polinices pulchellus	W0491	079													4		
Buccinum undatum	W0708	203								4							
Retusa obtusata	W1077	206										2					
Acanthodoris pilosa	W1333	118									1						
Nuculidae (juv.)	W1563	NA												7			
Nucula nitidosa	W1569	032												9			
Nucula nucleus	W1570	031						19		2							

Colonial epifauna scored as Presence/Absence only.
Individuals in counts. Data not quantitative.

		Site	D59	D62	D63	D65	D69	D75	D79	D81	D83	D86	D87	D93	D94	D98	D103
		WL01	7098	7101	7102	7104	7108	7114	7118	7120	7122	7125	7126	7132	7133	7137	7142
Mytilidae (juv.)	W1691	NA		131							25				2		
Mytilus edulis	W1695	126									1						
Tellimya ferruginosa	W1902	168														1	
Mysella bidentata	W1906	080								1			2		2	2	
Acanthocardia sp. (juv.)	W1940	135									1						
Acanthocardia tuberculata	W1946	208											1				
Parvicardium ovale	W1951	248														4	
Mactra stultorum	W1972	138							1							2	
Fabulina fabula	W2019	099										36			26		
Donax vittatus	W2041	191							2							6	
Abra alba	W2059	009	12	1	139	2		144	6	27	3	7		44	50		3
Alcyonidium diaphanum	Y0076	033	P	P				P			P		P		P		
Alcyonidium mytili	Y0080	002		P					P	P							
Alcyonidium parasiticum	Y0081	104		P				P		P	P		P				
Vesicularia spinosa	Y0131	102												P	P		
Conopeum reticulum	Y0172	004		P	P			P		P	P						
Electra monostachys	Y0177	003					P	P		P	P						
Electra pilosa	Y0178	103		P	P			P		P	P	P	P		P		
Aspidelectra melolontha	Y0182	001			P					P							
Asterias rubens	ZB0100	124		2							1						
Amphiuridae (juv.)	ZB0148	NA															
Amphiura brachiata	ZB0151	187								1							
Ophiuroidea (juv.)	ZB0166	NA		1											1		
Ophiura albida	ZB0168	101						6		19	73						
Ophiura ophiura	ZB0170	053						1			1						
Psammechinus miliaris	ZB0193	054								3	2						
Echinocardium cordatum	ZB0223	180														1	
Polycarpa fibrosa	ZD0112	125									23						

Colonial epifauna highlighted in red and scored as Presence/Absence only.
Indivduals in counts per trawl

		Station	**7 trawl**	**9 trawl**	**11 trawl**	**15 trawl**	**19 trawl**	**20 trawl**	**23 trawl**	**26 trawl**	**31 trawl**	**37 trawl**	**44 trawl**	**46 trawl**	**48 trawl**	**49 trawl**	**50 trawl**
		WL01	**7257**	**7258**	**7259**	**7260**	**7261**	**7262**	**7263**	**7264**	**7265**	**7266**	**7267**	**7268**	**7269**	**7270**	**7271**
Species	**MCS**	**Ref**															
Hydractinia echinata	D0273	169\227	P	P	P	P	P				P	P	P		P	P	P
Calycella syringa	D0348	105											P			P	
Halecium spp.	D0390	121		P	P		P		P				P	P			P
Diphasia spp.	D0413	NA	P	P	P							P				P	
Hydrallamania falcata	D0424	161	P	P	P	P	P	P	P		P	P	P	P		P	
Sertularia spp.	D0433	NA					P										
Sertularia argentea	D0434	210						P		P							
Sertularia cupressina	D0435	160															
Plumularia setacea	D0469	NA										P					
Clytia hemisphaerica	D0503	130					P		P	P			P	P		P	
Obelia bidentata	D0518	006					P	P	P	P			P	P			
Obelia dichotoma	D0519	136		P	P						P						
Alcyonium digitatum	D0597	NA															P
Actiniaria	D0662	NA		1		7			1	6					1	4	
Urticina felina	D0684	034						8		3							
Metridium senile	D0710	229															
Adamsia carciniopados	D0743	NA				4											
Aphrodita aculeata	P0019	100				4					2						
Harmothoe pagenstecheri	P0050	188\233							2							2	
Harmothoe spp.	P0050	NA							1	6							105
Harmothoe extenuata	P0058	246															
Lepidonotus squamatus	P0082	037						4	2								
Eumida bahusiensis	P0164	202								3							
Sphaerodorum gracilis	P0291	238							1								
Nereis fucata	P0469	225							1		2	1					
Nephtys cirrosa	P0498	023							1								
Nephtys hombergii	P0499	016									10						
Nephtys longosetosa	P0503	143															
Orbinia latreillii	P0664	231															
Flabelligera affinis	P0881	129						52	3				14			6	
Owenia fusiformis	P1098	058															
Lagis koreni	P1107	063									3440					2	
Sabellaria spinulosa	P1117	014							146	3							
Ampharete lindstroemi	P1139	061		1													
Lanice conchilega	P1195	012								3							
Sabella pavonina	P1320	214								3							
Pomatoceros triqueter	P1341	035	2			94			1		34						
Nymphon brevirostre	Q0005	076						4	2							8	
Achelia echinata	Q0015	074								32							

Colonial epifauna highlighted in red and scored as Presence/Absence only.
Indivduals in counts per trawl

		Station	7 trawl	9 trawl	11 trawl	15 trawl	19 trawl	20 trawl	23 trawl	26 trawl	31 trawl	37 trawl	44 trawl	46 trawl	48 trawl	49 trawl	50 trawl
		WL01	7257	7258	7259	7260	7261	7262	7263	7264	7265	7266	7267	7268	7269	7270	7271
Verruca stroemia	R0041	193															
Elminius modestus	R0068	219															
Balanus crenatus	R0077	005	4	65		25	14		4		8	14				12	
Siriella armata	S0034	224	3	3	7		2		1						1		
Schistomysis kervillei	S0086	094		5	33				26	6	2	2					
Acidostoma obesum	S0275	175						4									
Atylus guttatus	S0411	171														2	
Ampelisca spinipes	S0438	072							2								
Gammarus locusta	S0478	223						4									
Gammaropsis maculata	S0541	028							2								
Aoridae (female)	S0577	NA							2								
Idotea linearis	S0939	217					6	4		6			7	8	1		45
Palaemon serratus	S1319	230						56								2	
Hippolyte varians	S1350	237							8				91				
Thoralus cranchii	S1360	236							4								
Processa canaliculata	S1363	NA															
Pandalidae (juv.)	S1370	NA														34	
Pandalina brevirostre	S1374	155	1	14	7	36			96			1	224			4	15
Pandalus montagui	S1377	201	4	21		277	2	52	227	3	24	1	287			54	150
Crangon crangon	S1385	007	161	348	352	1800	164	1044	759	198	1530	567	1008	95	240	252	1515
Axius stirhynchus	S1407	241				4											
Pagurus bernhardus	S1457	024	16	72	8	130	8	4	6	3	96	73	35	11	20	46	270
Galathea intermedia	S1472	179															
Pisidia longicornis	S1482	008							4	3	14		14		1		
Ebalia tuberosa	S1508	240				4											
Maja squinado	S1515	NA															
Hyas coarctatus	S1519	242				7											
Inachus dorsettensis	S1526	218		1													
Macropodia rostrata	S1532	134	12	5	10	29	4	12	130	6	52		70	19	6	118	30
Corystes cassivelaunus	S1552	189			1												
Atelecyclus rotundatus	S1555	204				4											
Cancer pagurus	S1566	NA															
Liocarcinus spp. (juv.)	S1577	NA		4		11	2		9			1	21	11			
Liocarcinus arcuatus	S1578	205						8					14				
Liocarcinus depurator	S1580	244				4		4					28				
Liocarcinus holsatus	S1581	190	6	42	2	130	2	32	41	10	40	22	7		5	6	15
Necora puber	S1589	224															
Pilumnus hirtellus	S1615	025							1								
Pinnotheres pisum	S1638	NA		1													
Leptochiton asellus	W0053	157				4											

Colonial epifauna highlighted in red and scored as Presence/Absence only.
Indivduals in counts per trawl

		Station	7 trawl	9 trawl	11 trawl	15 trawl	19 trawl	20 trawl	23 trawl	26 trawl	31 trawl	37 trawl	44 trawl	46 trawl	48 trawl	49 trawl	50 trawl
		WL01	7257	7258	7259	7260	7261	7262	7263	7264	7265	7266	7267	7268	7269	7270	7271
Calliostoma zizyphinum	W0182	239				4											
Crepidula fornicata	W0439	055									2						
Polinices pulchellus	W0491	079									18						
Epitonium clathrus	W0549	239				4											
Buccinum undatum	W0708	203				36			3								15
Onchidoris sp.	W1320	056			1												
Acanthodoris pilosa	W1333	118	1	2					52		8	1	49			4	
Aeolidiacea	W1414	NA														6	
Nuculidae (juv.)	W1563	NA									2						
Nucula nucleus	W1570	031															
Mytilidae (juv.)	W1691	NA															
Mytilus edulis	W1695	126						4			4		7				
Pectinidae (juv.)	W1768	NA									2						
Aequipecten opercularis	W1773	243				4											
Parvicardium ovale	W1951	NA								3							
Mactra stultorum	W1972	138			3						62						
Spisula elliptica	W1975	090		2							46						
Ensis arcuatus	W1998	147															
Phaxas pellucidus	W2006	085									4						
Abra alba	W2059	009					18				474	4					15
Abra prismatica	W2062	NA									4						
Barnea candida	W2181	183															
Sepiola atlantica	W2329	NA		4	1	4				3	2		14				
Loligo vulgaris	W2338	215			3					3							
Alcyonidium diaphanum	Y0076	033	P	P	P		P	P	P	P	P	P	P	P	P	P	P
AlcyonidIum mytili	Y0080	002	P	P		P			P			P		P	P	P	P
Alcyonidium parasiticum	Y0081	104			P			P	P		P		P	P			
Anguinella palmata	Y0096	213								P							
Vesicularia spinosa	Y0131	102	P	P	P		P	P	P	P	P		P	P		P	P
Conopeum reticulum	Y0172	004	P	P	P	P		P	P	P	P	P	P	P	P		P
Electra monostachys	Y0177	003						P	P	P	P		P		P		
Electra pilosa	Y0178	103	P	P	P		P	P	P	P	P	P	P		P	P	P
Aspidelectra melolontha	Y0182	001		P				P		P	P		P				
Flustra foliacea	Y0187	209				P	P				P		P			P	
Callopora discreta	Y0203	019															
Bicellariella ciliata	Y0256	NA															
Escharella immersa	Y0364	142															
Phylactella labrosa	Y0421	114															
Schizomavella auriculata	Y0468	113				P											
Asterias rubens	ZB0100	124	5	7	3	11	2	140	7	3	14	4	11	30		10	

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Indivduals in counts per trawl

		Station	7 trawl	9 trawl	11 trawl	15 trawl	19 trawl	20 trawl	23 trawl	26 trawl	31 trawl	37 trawl	44 trawl	46 trawl	48 trawl	49 trawl	50 trawl
		WL01	7257	7258	7259	7260	7261	7262	7263	7264	7265	7266	7267	7268	7269	7270	7271
Ophiuroidea (juv.)	ZB0166	NA									22	1					
Ophiura albida	ZB0168	101	200	37		1127		8	7	22	2428	6			3		
Ophiura ophiura	ZB0170	053		52	2		380	4	3	211	294	8					
Echinoidea (juv.)	ZB0181	NA															
Psammechinus miliaris	ZB0193	054	3			475		76	6	3	6		1			62	4500
Echinocardium cordatum	ZB0223	180		1							160						
Ascidia	ZD0002	NA									5						
Styela clava	ZD0104	228															
Polycarpa fibrosa	ZD0112	125								22							
Scyliorhinus canicula	ZF0028	NA		1							1					1	
Raja clavata	ZF0089	NA		1						1					1		
Ciliata mustela	ZG0111	NA						2									
Merlanglus merlangus	ZG0123	NA	5	3	1	3	3	1			9	17			1		
Trisopterus luscus	ZG0143	NA	11				8	3	3		4			1	3		
Trisopterus minutus	ZG0144	NA				2						3	1			7	3
Syngnathus acus	ZG0245	NA						1									
Syngnathus rostellatus	ZG0246	226															
Trigla lucerna	ZG0269	NA				2					1						
Agonas cataphractus	ZG0291	NA	2	4		13		1	8			4	8				1
Liparis montagui	ZG0297	234											2			1	
Dicentrarchus labrax	ZG0312	NA								1							
Echiichthys vipera	ZG0405	NA	1		1												
Pholis gunnellas	ZG0440	245											1				
Ammodytes tobianus	ZG0444	NA		1													
Callionymus lyra	ZG0452	221		1	1	5							1				
Gobiidae	ZG0455	NA	1	7				9								2	
Pomatoschistus spp. (juv.)	ZG0476	NA														2	
Pomatoschistus microps	ZG0478	235											2				
Pomatoschistus minutus	ZG0479	216		2	111	7	9	35	10	17	38	3	11		15		12
Pomatoschistus pictus	ZG0481	NA															
Lepidorhombus whiffiagonis	ZG0549	NA	1		1							2					
Limanda limanda	ZG0572	NA				1		5	1	2		1	2	1			
Microstomus kitt	ZG0574	NA															
Pleuronectes platessa	ZG0578	NA	2		1		3			3	9						
Buglossidium luteum	ZG0585	NA		4	1							10					
Solea solea	ZG0591	220	13	5	17	2	11	2	47	3	40	6	3	3	4	9	13

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Indivduals in counts per trawl

		Station	51 trawl	58 trawl	59 trawl	62 trawl	63 trawl	65 trawl	68 trawl	69 trawl	75 trawl	81 trawl	83 trawl	86 trawl	87 trawl	94 trawl	98 trawl
		WL01	7272	7273	7274	7275	7276	7277	7278	7279	7280	7281	7282	7284	7285	7286	7287
Species	**MCS**	**Ref**															
Hydractinia echinata	D0273	169\227	P	P	P		P	P		P	P	P				P	
Calycella syringa	D0348	105				P							P				
Halecium spp.	D0390	121			P		P	P								P	
Diphasia spp.	D0413	NA															
Hydrallamania falcata	D0424	161				P		P					P		P	P	
Sertularia spp.	D0433	NA							P				P				
Sertularia argentea	D0434	210		P							P						
Sertularia cupressina	D0435	160				P		P						P			
Plumularia setacea	D0469	NA						P									
Clytia hemisphaerica	D0503	130	P	P			P		P		P						
Obelia bidentata	D0518	006	P	P			P	P	P	P	P	P	P	P	P	P	
Obelia dichotoma	D0519	136							P								
Alcyonium digitatum	D0597	NA										P					
Actiniaria	D0662	NA	1	30	2	32	13	1	2	2		10	27	53	18		
Urticina felina	D0684	034		1											9		
Metridium senile	D0710	229														2	
Adamsia carciniopados	D0743	NA															
Aphrodita aculeata	P0019	100			1					2		5			9	1	
Harmothoe pagenstecheri	P0050	188\233		1								10			9		
Harmothoe spp.	P0050	NA									10		4				
Harmothoe extenuata	P0058	246		1													
Lepidonotus squamatus	P0082	037															
Eumida bahusiensis	P0164	202															
Sphaerodorum gracilis	P0291	238															
Nereis fucata	P0469	225															
Nephtys cirrosa	P0498	023															
Nephtys hombergii	P0499	016					1	1									
Nephtys longosetosa	P0503	143			2				7								
Orbinia latreillii	P0664	231			1												
Flabelligera affinis	P0881	129		4				1				715	49				
Owenia fusiformis	P1098	058											4				
Lagis koreni	P1107	063				16			7		10		11				
Sabellaria spinulosa	P1117	014							511			15	57				
Ampharete lindstroemi	P1139	061															
Lanice conchilega	P1195	012															
Sabella pavonina	P1320	214													18	1	
Pomatoceros triqueter	P1341	035		1			1					230					
Nymphon brevirostre	Q0005	076						1	7			10	8	1			
Achelia echinata	Q0015	074															

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		WL01	7272	7273	7274	7275	7276	7277	7278	7279	7280	7281	7282	7284	7285	7286	7287
Verruca stroemia	R0041	193								1							
Elminius modestus	R0068	219												7			
Balanus crenatus	R0077	005	13		25				133	106					114		
Siriella armata	S0034	224		6				1				5					
Schistomysis kervillei	S0086	094	5	8			1	1						1	9		
Acidostoma obesum	S0275	175															
Atylus guttatus	S0411	171															
Ampelisca spinipes	S0438	072															
Gammarus locusta	S0478	223												2			
Gammaropsis maculata	S0541	028										10					
Aoridae (female)	S0577	NA															
Idotea linearis	S0939	217					2	11						21		4	21
Palaemon serratus	S1319	230			1				7								
Hippolyte varians	S1350	237		4								5					
Thoralus cranchii	S1360	236															
Processa canaliculata	S1363	NA											4				
Pandalidae (juv.)	S1370	NA					2										
Pandalina brevirostre	S1374	155	3	4				1				35	27		26		
Pandalus montagui	S1377	201	9	6	1	1264			70	9	350	10	171	6	35	15	
Crangon crangon	S1385	007	227	79	140	784	302	81	3451	284	2460	300	532	417	466	191	3529
Axius stirhynchus	S1407	241															
Pagurus bernhardus	S1457	024	93	25	39	176	42	8	539	203	210	35	4		62	10	11
Galathea intermedia	S1472	179												1			
Pisidia longicornis	S1482	008		4				1	7			15	4		26		
Ebalia tuberosa	S1508	240															
Maja squinado	S1515	NA											4				
Hyas coarctatus	S1519	242															
Inachus dorsettensis	S1526	218											4				
Macropodia rostrata	S1532	134	16	21	11	592	29	28	77	6	380	100	122	22	352	10	
Corystes cassivelaunus	S1552	189						2									
Atelecyclus rotundatus	S1555	204															
Cancer pagurus	S1566	NA				1											
Liocarcinus spp. (juv.)	S1577	NA		1			3	2	42				4	1	18	1	32
Liocarcinus arcuatus	S1578	205		5													11
Liocarcinus depurator	S1580	244		1								50	4				
Liocarcinus holsatus	S1581	190	15	1	7	96	22	3	63	4	70	40	34	19	18	9	
Necora puber	S1589	224		3		32		1					4				
Pilumnus hirtellus	S1615	025		1										1			
Pinnotheres pisum	S1638	NA															
Leptochiton asellus	W0053	157															

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		Station	51 trawl	58 trawl	59 trawl	62 trawl	63 trawl	65 trawl	68 trawl	69 trawl	75 trawl	81 trawl	83 trawl	86 trawl	87 trawl	94 trawl	98 trawl
		WL01	**7272**	**7273**	**7274**	**7275**	**7276**	**7277**	**7278**	**7279**	**7280**	**7281**	**7282**	**7284**	**7285**	**7286**	**7287**
Calliostoma zizyphinum	W0182	239															
Crepidula fornicata	W0439	055	2		1	32	1					20					
Polinices pulchellus	W0491	079	1	2			1								9		
Epitonium clathrus	W0549	239															
Buccinum undatum	W0708	203										10					
Onchidoris sp.	W1320	056															
Acanthodoris pilosa	W1333	118	10	5	4	528	7	4	77	6	30	40	15		70	2	
Aeolidiacea	W1414	NA															
Nuculidae (juv.)	W1563	NA															
Nucula nucleus	W1570	031			1												
Mytilidae (juv.)	W1691	NA		1		4000											
Mytilus edulis	W1695	126										245					
Pectinidae (juv.)	W1768	NA															
Aequipecten opercularis	W1773	243															
Parvicardium ovale	W1951	NA															
Mactra stultorum	W1972	138															
Spisula elliptica	W1975	090	2														21
Ensis arcuatus	W1998	147															488
Phaxas pellucidus	W2006	085															
Abra alba	W2059	009	2	1	21		2		56		20		4		9	2	11
Abra prismatica	W2062	NA															
Barnea candida	W2181	183				16											
Sepiola atlantica	W2329	NA					2		7	2		5		1		1	
Loligo vulgaris	W2338	215		1		16											
Alcyonidium diaphanum	Y0076	033		P	P	P	P	P	P	P	P	P	P	P	P	P	P
AlcyonidIum mytili	Y0080	002	P	P	P		P		P	P	P	P					
Alcyonidium parasiticum	Y0081	104	P	P		P	P	P		P		P	P	P	P	P	
Anguinella palmata	Y0096	213												P			
Vesicularia spinosa	Y0131	102	P	P	P	P	P	P			P		P	P	P		
Conopeum reticulum	Y0172	004	P		P	P	P	P	P	P	P	P	P	P		P	
Electra monostachys	Y0177	003	P			P	P			P	P				P	P	
Electra pilosa	Y0178	103	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
Aspidelectra melolontha	Y0182	001	P			P		P	P	P	P				P		
Flustra foliacea	Y0187	209												P	P		
Callopora discreta	Y0203	019															
Bicellariella ciliata	Y0256	NA	P				P										
Escharella immersa	Y0364	142															
Phylactella labrosa	Y0421	114															
Schizomavella auriculata	Y0468	113										P					
Asterias rubens	ZB0100	124	3	4	6	2720	4	13		2	460	100	99	9	114	13	42

Colonial epifauna highlighted in red and scored as Presence/Absence only.
Indivduals in counts per trawl

		Station	51 trawl	58 trawl	59 trawl	62 trawl	63 trawl	65 trawl	68 trawl	69 trawl	75 trawl	81 trawl	83 trawl	86 trawl	87 trawl	94 trawl	98 trawl
		WL01	**7272**	**7273**	**7274**	**7275**	**7276**	**7277**	**7278**	**7279**	**7280**	**7281**	**7282**	**7284**	**7285**	**7286**	**7287**
Ophiuroidea (juv.)	ZB0166	NA				48								1			
Ophiura albida	ZB0168	101	3	10		64	8	107	21	1	820	470	114		9	4	64
Ophiura ophiura	ZB0170	053	1	9		16	4	1			130		4	1			11
Echinoidea (juv.)	ZB0181	NA				16										1	
Psammechinus miliaris	ZB0193	054		2			3	9				585	27	2			
Echinocardium cordatum	ZB0223	180															
Ascidia	ZD0002	NA										3					
Styela clava	ZD0104	228														1	
Polycarpa fibrosa	ZD0112	125									20				18		
Scyliorhinus canicula	ZF0028	NA				1				2		1	2				
Raja clavata	ZF0089	NA										2			2		
Ciliata mustela	ZG0111	NA		1		1											
Merlanglus merlangus	ZG0123	NA	3	7			5		5	4	2	1	1	1	5	8	
Trisopterus luscus	ZG0143	NA	2		8	2		1			7	4		7	2		
Trisopterus minutus	ZG0144	NA	1	4					5	4						2	
Syngnathus acus	ZG0245	NA															
Syngnathus rostellatus	ZG0246	226														1	
Trigla lucerna	ZG0269	NA			1												
Agonas cataphractus	ZG0291	NA	3			2			2	2	6	9	38		1		
Liparis montagui	ZG0297	234															
Dicentrarchus labrax	ZG0312	NA															1
Echiichthys vipera	ZG0405	NA						1									
Pholis gunnellas	ZG0440	245															
Ammodytes tobianus	ZG0444	NA															
Callionymus lyra	ZG0452	221				2						15	2	1	8		
Gobiidae	ZG0455	NA							1				4		20		
Pomatoschistus spp. (juv.)	ZG0476	NA									1						
Pomatoschistus microps	ZG0478	235								1					10		
Pomatoschistus minutus	ZG0479	216	12	7	5	2	14	8	27	10	2	3	4	49		14	451
Pomatoschistus pictus	ZG0481	NA													4		
Lepidorhombus whiffiagonis	ZG0549	NA															
Limanda limanda	ZG0572	NA				1			2	2		1		2	4	1	
Microstomus kitt	ZG0574	NA											1				
Pleuronectes platessa	ZG0578	NA	3					1	2								
Buglossidium luteum	ZG0585	NA			1		1	5									
Solea solea	ZG0591	220	16	1	11	11	36	2	8	13	8	29	9	8	67	6	