




<h1>Hayle Harbour, Hayle. Maintenance dredge sampling</h1>
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Project No: 63322

Revision No.0

Environment, Planning & Economy Highways Services Engineering Services Laboratory

Revision	
0	
Revision Date	
07/06/2010	
Originator	Initial
ERB	
Checked	Initial
BOC	
Authorised for Issue	Initial
RNH	
Purpose of Issue	
For Approval	
Nature of Change	

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1.0 Executive Summary

1. The Harbour Master, The Old Customs House, North Quay, Hayle, Cornwall has commissioned the Engineering Services Laboratory (Cornwall Council) to carry out a programme of sampling on material that has been dredged from Hayle Harbour. It is understood that the end use for the dredged material will be either agricultural use or beach rebuilding.
2. The sampling programme involved the sampling of a 4000tonne stockpile of dredged material on each sampling event. Samples were taken on 23rd April 2010 and from a separate stockpile on 30th April 2010.
3. For each sampling event a sample of 1000 tonnes was taken and the particle size distribution determined. The results from the sample event shows sand that is fairly consistent in particle size distribution with the four samples taken on the 23rd April 1% in three of the samples and 2% for the remaining sample above the 2mm size cut off for sand and only 1% in three of the samples from 30th April (stockpile above the 2mm size cut off for sand with the final sample becoming classified as 100% sand. The material light brown homogenous sand showing no variations in colour.
4. The values for arsenic, copper and zinc do not indicate elevated levels above the original benchmark sampling and therefore can be considered safe for the proposed end use. One sample showed levels for lead and nickel marginally above the original benchmark sampling levels however this was by less than 1mg/kg and therefore can be considered comparable and not a cause for concern.
5. The pH values for both these sampling events ranged between 9.04 and 9.63 which is more alkaline than the original benchmark sampling results but should not represent a risk to the proposed end use and is comparable with other recent sampling events.
6. The sampling undertaken for 16 speciated poly aromatic hydrocarbons (PAH), BTEX's and extractable petroleum hydrocarbons the majority were below or comparable with the results of the 27th November 2007 sampling event. One sample from each sample event was marginally above the Limit of Detection for Extractable Petroleum Hydrocarbons (EPH) Range Organics (C10 – C40) of 35ug/kg. These values were 40.4ug/kg and 39ug/kg and as such are only marginally above the limit of detection and therefore in our opinion can be considered safe for the proposed use.

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2. Introduction

2.1 Terms of Reference

1. The Harbour Master, The Old Customs House, North Quay, Hayle Cornwall has commissioned the Engineering Services Laboratory (CC) to carry out a programme of sampling on material that has been dredged from Hayle Harbour. It is understood that the end use for the dredged material will be used for either agricultural use or beach/dune rebuilding.

2.2 Scope of Project

1. The primary objectives of this report are:
 - to undertake geochemical sampling of a stockpile of dredged material for a range of contaminants.
 - to undertake particle size distribution analysis on representative samples of the dredged material.
 - to interpret the geochemical testing when compared against a set of samples taken on 27th November 2007 to be used as a benchmark for all further testing.

2.3 Guideline Methods

1. The methodology for the comparison of the samples against the client provided benchmark has been based on the Environmental Protection Act 1990⁽¹⁾ and the Contaminated Land Exposure Assessment (CLEA) reports, published by the Environment Agency in 2002 and 2009.

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3.0 Sampling

1. The sampling programme involved the sampling of a 4000 tonne stockpile of dredged material on each sampling event. A sample for every 400 tonnes was subject to the standard analysis suite which includes arsenic, copper, lead, nickel, zinc, total organic carbon and pH. For every 1000 tonnes an extended analysis suite was undertaken. This comprised analysis of Gasoline Range Organics (GRO) BTEX's, Extractable Petroleum Hydrocarbons (EPH) (DRO's), speciated poly aromatic hydrocarbons (PAH) and tri butyl tins (TBT's).
2. This report relates to a dredged sample taken on 23rd April 2010 and a sample from a stockpile taken on 30th April 2010.

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4.0 Results

4.1 Geochemical

- Table 4.1 shows the range of values for each sampling event and compares them against the set of samples taken on 27th November 2007 which are being used as the benchmark.

Table 4.1 – Summary of sample data

	27/11/07	23/04/10	30/04/10 (stockpile)
Arsenic mg/kg	24 - 40	24.2 – 30.4	26.1 – 30.4
Copper mg/kg	17 - 32	18.9 – 23.7	20.3 – 25.2
Lead mg/kg	6 - 13	6.04 – 13.9	6.03 – 7.66
Nickel mg/kg	1.1 -3.9	2.35 – 4.1	2.4 – 3.12
Zinc mg/kg	42 - 70	35.8 – 41.1	35.3 – 39.8
Total organic carbon %	0.2	<0.2	<0.2
pH	8.09 – 8.66	9.04 – 9.63	9.04 – 9.55
TBT's mg/kg	<0.10	<LOD	<LOD
EPH (DRO) (C10-C40) ug/kg	<10	<35 – 40.4	<35 – 39
EPH (DRO) (C10-C40) – surrogate recovery %		92.8 – 106	118 - 121
GRO C4 – C10 ug/kg	<10	<44	<44
GRO C10 – C12 ug/kg	<10		
Benzene ug/kg	<10	<10	<10
Toluene ug/kg	<10	<10	<2
Ethyl benzene ug/kg	<10	<10	<3
m & p Xylene ug/kg	<10	<10	<6
O Xylene ug/kg	<10	<10	<3
Sum m&p and o Xylene ug/kg	<10	<10	<10
Sum of BTEX ug/kg	<10	<10	<10
MTBE ug/kg	<10	<10	<10
Naphthalene ug/kg	12	<9	<9
Acenaphthylene ug/kg	13	<12	<12
Acenaphthene ug/kg	<14	<8	<8
Fluorene ug/kg	15	<10	<10
Phenanthrene ug/kg	56 – 140	<15	<15
Anthracene ug/kg	11 – 49	<16	<16
Fluoranthene ug/kg	34 – 360	<17	<17
Pyrene ug/kg	29 – 320	<15	<15
Benz(a)anthracene ug/kg	38 – 190	<14	<14

Chrysene ug/kg	19 – 210	<10	<10
Benzo(b)fluoranthene ug/kg	22 - 230	<15	<15
Benzo(k)fluoranthene ug/kg	150	<14	<14
Benzo(a)pyrene ug/kg	21 - 270	<15	<15
Indeno(123cd)pyrene ug/kg	14 – 170	<18	<18
Dibenzo(ah)anthracene ug/kg	37	<23	<23
Benzo(ghi)perylene ug/kg	16 – 190	<24	<24
PAH 16 Total ug/kg	200 - 2400	<118	<118

The full results from Alcontrol Laboratories are included within Appendix B.

4.2 Particle size distribution

For each sampling event a sample per 1000 tonnes was taken and the particle size distribution determined. The full results of this analysis are presented in Appendix C.

5.0 Conclusions

5.1 Geochemical

The geochemical results were compared with the results from 27th November 2007. Where possible they were also compared against Soil Guideline Values (EA – 2009) and Generic Assessment Criteria (GAC – LQM/CIEH 2009)

5.1.1 Heavy metals

The values for arsenic, copper, and zinc within Table 3.1 do not indicate elevated levels above the original benchmark sampling and therefore can be considered safe for the proposed end use.

One sample showed levels for lead and nickel marginally above the original benchmark sampling levels however this was by less than 1mg/kg and therefore can be considered comparable and not a cause for concern. In addition these values are well below the most stringent Soil Guideline Value for a Residential land use and can therefore considered safe for the proposed end use.

The pH values for both these sampling events ranged between 9.04 and 9.63 which is more alkaline than the original benchmark sampling results but should not represent a risk to the proposed end use and is comparable with other recent sampling events.

5.1.2 Poly Aromatic Hydrocarbons

The sampling undertaken for the benchmark included an analysis suite for 16 speciated poly aromatic hydrocarbons (PAH), BTEX's and extractable petroleum hydrocarbons. The samples taken on 23rd April 2010 and 30th April 2010 were all below or comparable with the results of the 27th November 2007 sampling event.

One sample from each sample event was marginally above the Limit of Detection for Extractable Petroleum Hydrocarbons (EPH) Range Organics (C10 – C40) of 35ug/kg. These values were 40.4ug/kg and 39ug/kg and as such are only marginally above the limit of detection and therefore in our opinion can be considered safe for the proposed use.

It is recommended that the results of any testing of the dredged material in this area (Area B – Harbour entrance) are subject to the same testing and the material is not moved until the results are returned.

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5.2 Particle size distribution

The results from the sample event show sand that is fairly consistent in particle size distribution. Samples taken on 23rd April had three samples where 1% was above the 2mm size cut off for sand and one sample where 2% was above the 2mm size cut off. The material from was light brown homogenous sand showing no variation in colour.

The four samples from the stockpile taken on 30th April showed a consistent particle size distribution. One of the samples was 100% sand i.e. equal to or less than 2mm. The other three samples were 99% sand with only 1% greater than the 2mm size. The material from was light brown homogenous sand showing no variation in colour.

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6.0 References

- 1 Environment Protection Act 1990.
- 2 CLEA Guidelines – DEFRA & EA 2002/2009
- 3 Generic Assessment Criteria for Human Health Risk Assessment – Chartered Institute of Environmental Health & Land Quality Management Ltd. 2009

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APPENDIX A

Site location plans

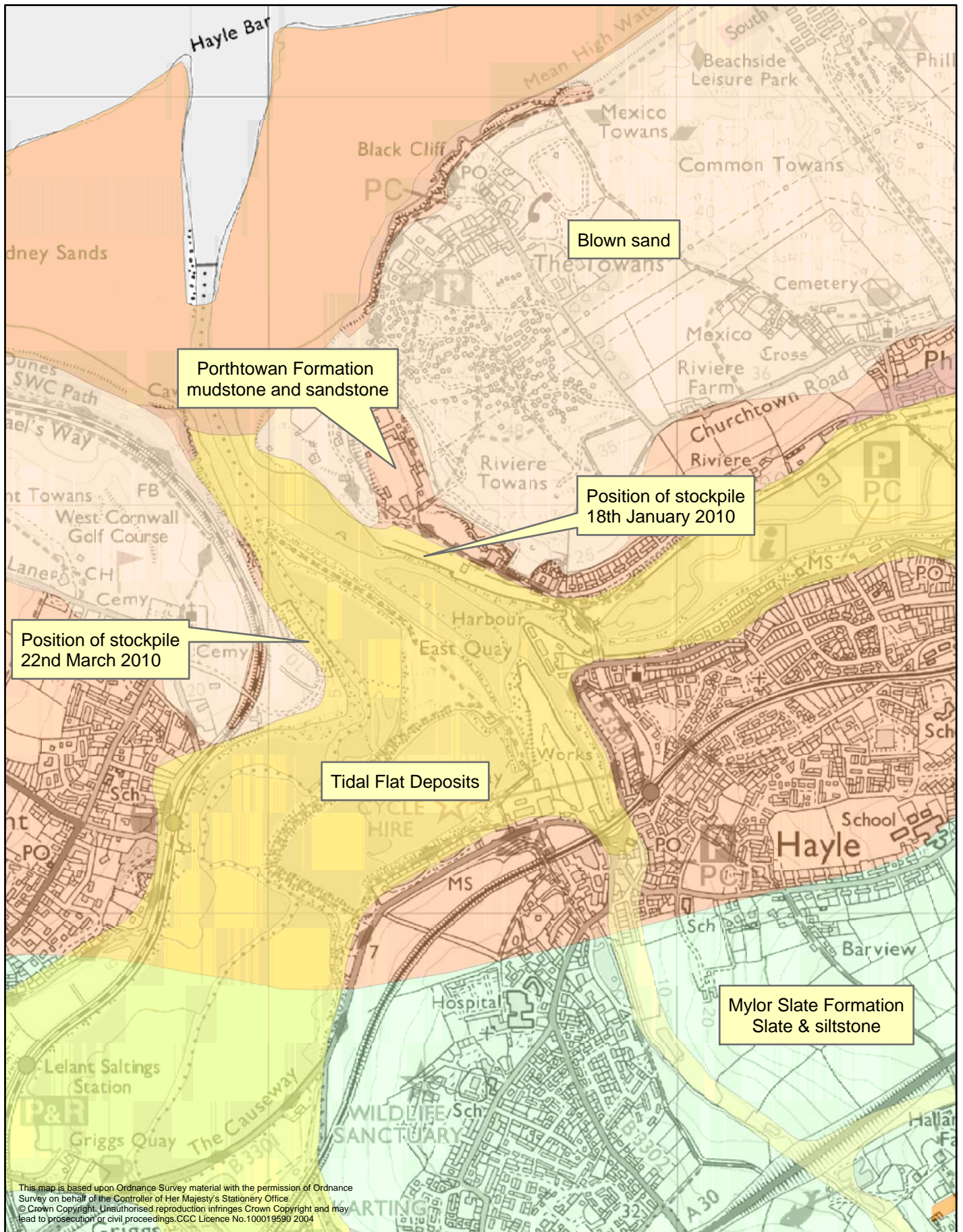
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Figure 1: Location Plan

LOCATION: Hayle harbour, Hayle, Cornwall

Scale 1:12,500

Drawn by E Blakesley Date 28th April 2010



APPENDIX B
Geochemical Test Results

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APPENDIX C

Particle Size Distribution Results

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SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS 23.04.10)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**
 Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

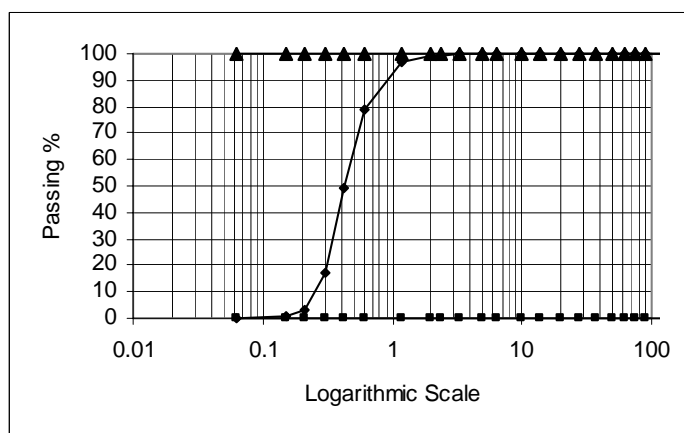
Date Sampled: **23/04/2010** Sampled By: **RP** Date Tested: **30/04/2010** Tested By: **RP**
 Date Received: **23/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm		
3.35mm	100	
2.36mm	99	
2mm	99	
1.18mm	97	
600µm	79	
425µm	49	
300µm	17	
212µm	3	
150µm	1	
63µm	0	

Test Report No:	S1020
Ticket No.	2299A/1
Project No:	63322
Order Number	-----
Date Reported:	01/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS 23.04.10)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

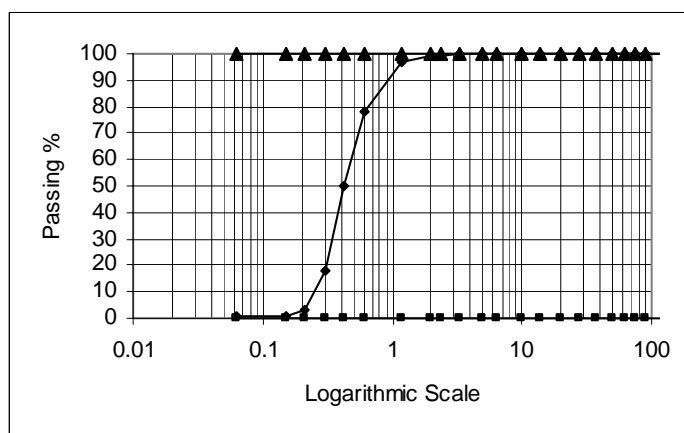
Date Sampled: **23/04/2010** Sampled By: **RP** Date Tested: **06/05/2010** Tested By: **RP**
 Date Received: **23/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm		
3.35mm	100	
2.36mm	99	
2mm	99	
1.18mm	97	
600µm	78	
425µm	50	
300µm	18	
212µm	3	
150µm	1	
63µm	1	

Test Report No:	S1021
Ticket No.	2299A/2
Project No:	63322
Order Number	-----
Date Reported:	01/06/2010
Page 1 of 1	

Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS 23.04.10)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

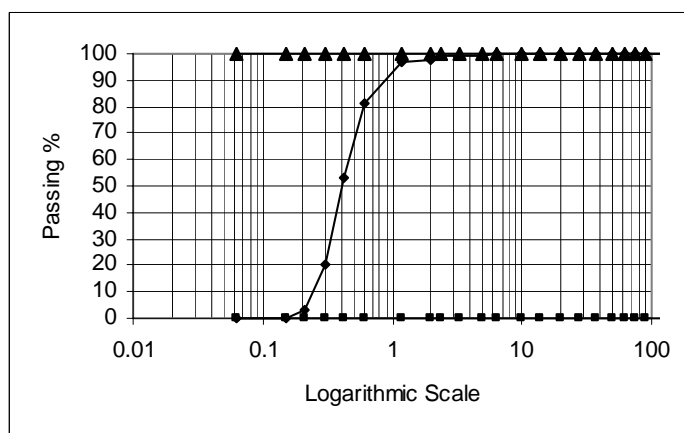
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 Date Received: **23/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm	100	
5mm	99	
3.35mm	99	
2.36mm	99	
2mm	98	
1.18mm	97	
600µm	81	
425µm	53	
300µm	20	
212µm	3	
150µm	0	
63µm	0	

Test Report No:	S1022
Ticket No.	2299A/3
Project No:	63322
Order Number	-----
Date Reported:	01/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS 23.04.10)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

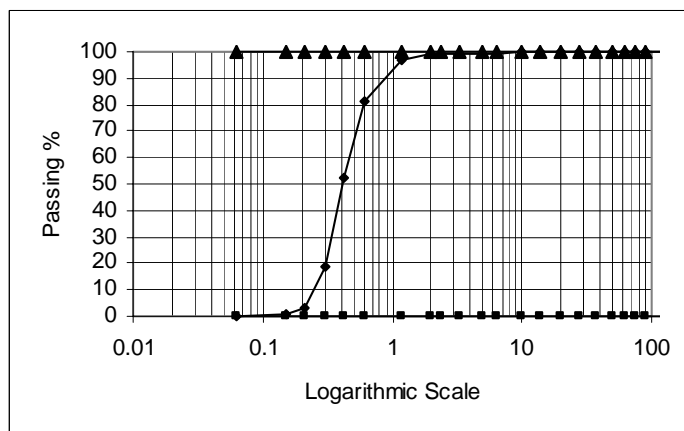
Date Sampled: **23/04/2010** Sampled By: **RP** Date Tested: **21/05/2010** Tested By: **RP**
 Date Received: **23/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm	100	
6.3mm	99	
5mm	99	
3.35mm	99	
2.36mm	99	
2mm	99	
1.18mm	97	
600µm	81	
425µm	52	
300µm	19	
212µm	3	
150µm	1	
63µm	0	

Test Report No:	S1023
Ticket No.	2299A/4
Project No:	63322
Order Number	-----
Date Reported:	01/06/2010
Page 1 of 1	

Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS OCT09)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**
 Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

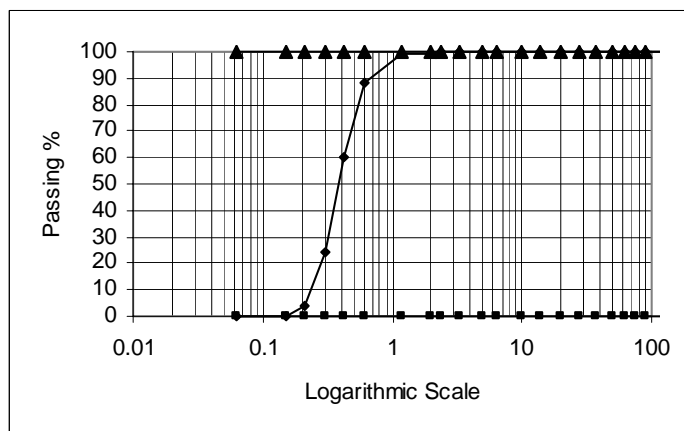
Date Sampled: **30/04/2010** Sampled By: **RP** Date Tested: **02/06/2010** Tested By: **RP**
 Date Received: **30/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm		
3.35mm		
2.36mm	100	
2mm	99	
1.18mm	99	
600µm	88	
425µm	60	
300µm	24	
212µm	4	
150µm	0	
63µm	0	

Test Report No:	S1024
Ticket No.	2305A/1
Project No:	63322
Order Number	-----
Date Reported:	02/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS OCT09)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

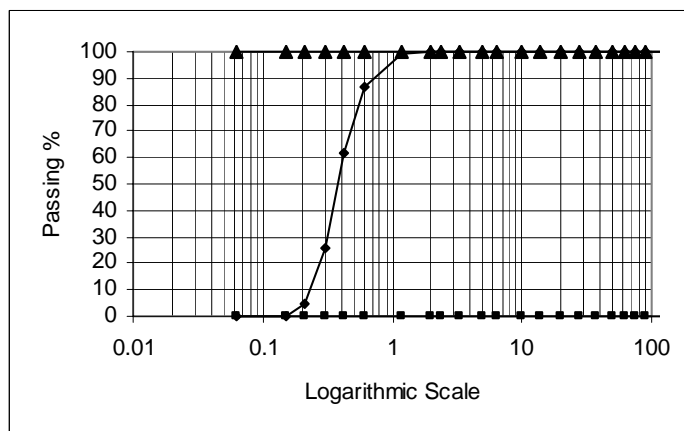
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 Date Received: **30/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm		
3.35mm		
2.36mm		
2mm	100	
1.18mm	99	
600µm	87	
425µm	62	
300µm	26	
212µm	5	
150µm	0	
63µm	0	

Test Report No:	S1025
Ticket No.	2305A/2
Project No:	63322
Order Number	-----
Date Reported:	02/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS OCT09)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

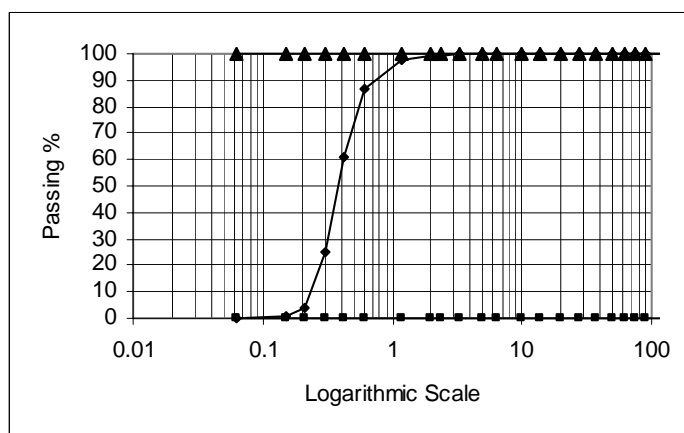
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 Date Received: **30/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm		
3.35mm	100	
2.36mm	99	
2mm	99	
1.18mm	98	
600µm	87	
425µm	61	
300µm	25	
212µm	4	
150µm	1	
63µm	0	

Test Report No:	S1026
Ticket No.	2305A/3
Project No:	63322
Order Number	-----
Date Reported:	02/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory:

SOIL WPSD TEST REPORT

Scheme / Site: **Hayle Harbour Dredging Project**
 Location: **Hayle Harbour North Quay (TS OCT09)**
 Material: **WPSD Compliance Testing**
 Specification: **Tested to BS1377:Pt 2:Md 9.2/3:1990**
 Source: **Site Won Material**
 Sample Type: **Bulk**

Location / Orientation of Sample to Original: **Not Applicable**
 Soil Description, Disturbance & Condition: **Sand / Disturbed / Good**
 Prep Method of Sampling: **BS1377:1990**

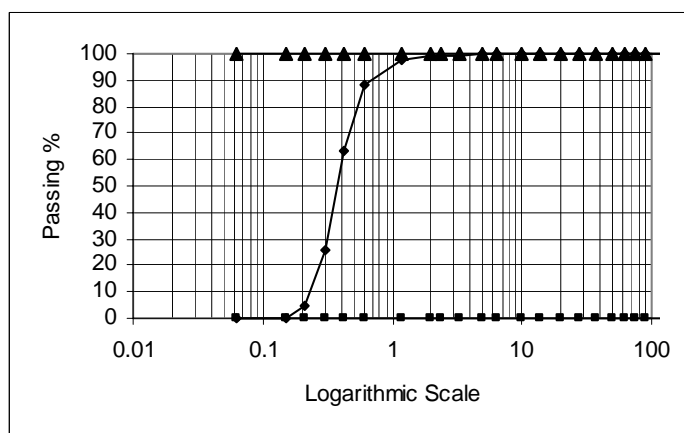
Date Sampled: **30/04/2010** Sampled By: **RP** Date Tested: **02/06/2010** Tested By: **RP**
 Date Received: **30/04/2010** Departure from BS: **None**

Tested To : BS 1377:Pt 2:1990:Md 9.2

Sieve Method:	Part	
Sieve	Passing %	Specification
500mm		
200mm		
125mm		
90mm		
75mm		
63mm		
50mm		
37.5mm		
28mm		
20mm		
14mm		
10mm		
6.3mm		
5mm	100	
3.35mm	99	
2.36mm	99	
2mm	99	
1.18mm	98	
600µm	88	
425µm	63	
300µm	26	
212µm	5	
150µm	0	
63µm	0	

Test Report No:	S1027
Ticket No.	2305A/4
Project No:	63322
Order Number	-----
Date Reported:	02/06/2010
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Test	Result	Specification
Moisture Content(%):		
Uniformity:		



Remarks :

Client Name: **Harbour Master**
 F.A.O: **Richard Ford**
 Address: **The Old Customs House**
North Quay
Hayle
Cornwall
TR27 4BL

Authorised Signatory: