



Neath Port Talbot Borough Council

Afan Lido

Ground Investigation Report



Hyder Consulting (UK) Limited

2212959

5th Floor
The Pithay
All Saints Street
Bristol BS1 2NL
United Kingdom

Tel: +44 (0)117 372 1200

Fax: +44 (0)117 37

www.hyderconsulting.com



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Afan Lido

Ground Investigation Report

Author O Wells/S Van Kal

Checker G R Walker

Approver C Plumb

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1 INTRODUCTION

Hyder Consulting (UK) Limited (HCL) was instructed by Neath Port Talbot Borough Council (NPTBC), 'the Client', on 18 January 2015 to undertake a combined geo-environmental and geotechnical assessment and ground investigation at Afan Lido, Port Talbot. The objectives of the assessment were to:

- Identify existing geo-environmental and geotechnical risks that may have detrimental impact on the site's future development;
- Design and implement an appropriate ground investigation to characterise the site in terms of its geo-environmental conditions and ground conditions;
- Provide a factual account of the fieldwork undertaken, results of *in situ* testing and the subsequent geotechnical and chemical laboratory testing undertaken on samples
- Determine a conceptual ground model of the site from which an assessment of the potential risk posed by contamination on or under the site can be determined;
- Provide a summary of the ground conditions and assess ground risks with appropriate recommendations for foundation options.

The future development of the site had not been determined at the time of the investigation.

1.1 Limitations

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It should be noted that ground conditions between exploratory holes may vary from those identified during this ground investigation; any design should take this into consideration. It should also be noted that groundwater levels may be subject to diurnal, tidal, seasonal, climatic variations and those recorded in this report are solely dependent on the time the ground investigation was carried out and the weather before and during the investigation.

1.2 Sources of Information

The Client made available desk study information in the form of utilities drawings and historic maps, mainly derived from the Ordnance Survey, but also including other environmental source information. In addition to this information, Hyder sourced and reviewed information on the site that was available from a variety of sources. The sources of information therefore included:

- Groundsure Enviroinsight Report; 2013 (provided by NPTBC);
- Coal Authority Mining Report; 2013 (provided by NPTBC);
- Coal Authority Website: (<https://www.gov.uk/government/organisations/the-coal-authority>)

- LDP Strategic Housing Site Assessment Report; Section B Detailed Site Assessment: Port Talbot Spatial Area; August 2013. (provided by NPTBC);
- Sitecheck Report, Landmark Information Group; 2014. (provided by NPTBC);
- OS mapping tiles; (provided by NPTBC)
- Utilities information including – Western Power Distribution August 2013; Wales and West Utilities August 2013; BT Openreach dated 2007; BT Wayleave dated 2011; Linesearch Enquiry Dated August 2013; Dŵr Cymru, August 2013. Provided by NPTBC.
- British Geological Survey 1:50 000 scale mapping. Sheet 247, Swansea, Solid and Drift, 2011;
- British Geological Survey - Openscience website, 2015;
- Environment Agency
- BBC Wales News Report, December 2009.
- Port Talbot Historical Society

2 SITE DETAILS

2.1 Site Location and Description

The site is the former Afan Lido, located off Princess Way, Port Talbot, in the county borough of Neath Port Talbot in South Wales. The site is situated approximately 4 km (2.5 miles) from the centre of Port Talbot. The Ordnance Survey National Grid Reference for the site is 274700, 189500. Figure 1 presents the site location and general layout.

In total, the site comprises some 3.0 hectares and is split in to two parts: the north-western region and the south-eastern region. The north western region contains a dis-used lido (swimming pool) that has been demolished and this part of the site is currently disused. The former Lido site is surrounded by secure fencing, access is enabled through a secure gate. The south east section of the site comprises a car park for a small gym (currently in use) and further south is a field area which is currently open ground bounded by a low wall.

The site is generally flat. Ground levels across the majority of the site are approximately 10 m above Ordnance Datum (AOD) while the north-western site area is approximately 12 m AOD. The site is largely bound by residential properties along the periphery extending the north west to the south east, with the promenade sitting to the south west of the site.

2.2 Site History

The site history and that of the surrounding area is based on historical mapped data from Landmark Information Group [1]. The maps have various dates from 1876 to 1980 and comprise Ordnance Survey Maps. The table below summaries the development of the site based on the mapping available.

Table 2.1: Summary of features identified from historic maps

Year	Map Scale	Source	Detail
1876/77	1:2500	OS	The site area is undeveloped at this time and is within an area of dune sands termed <i>Aberafon Burrows</i> . East of the site area but on the west bank of the River Afan, a series of rail sidings termed the <i>sand sidings</i> connect to the Rhondda and Swansea Bay Railway. These presumably were used to transport sand or mineral from the burrows, however no associated works are shown on the maps. The railway served Aberavon, the adjacent Mansel Tin Plate works and the developing port infrastructure of Port Talbot on the east bank of the river by way of the Cwm Afan Tramway.
1884/85	1:10560	OS	No change to the site area. No significant change to the surrounding areas
1899	1:2500	OS	No change at the site location. The rail heads have been extended to the south (following closely the line of the present Victoria Rd) and run along the North Pier which has been constructed to facilitate the railway. Jubilee Road is shown (now the route of Victoria Road) connecting Aberavon town to the beach head and pier. A band stand is located along the beach probably in the location of the current Jersey Quay just south of the site area. Further development at Port Talbot including major dredging of the River Afan Channel and development of the New Dock. Aberavon is shown with much new housing and industrial plants sited along the River Afan. There is some agricultural encroachment into the burrows north of

the site and along the main rail lines.

1917	1:2500	OS	No change at the site location. North of the site, the rail siding have been re-routed and a brickworks is shown. Jubilee Road has been renamed Victoria Road and housing is shown extending from Aberavan part way towards the beach. At the beach, the Jersey Beach Hotel, skating rink and other buildings indicate that this area has a leisure use. The rail head onto the pier appears to have been removed. South west of the site, some potential reworking of the ground is indicated.
1921	1:10560	OS	No significant changes identified
1939	1:2500	OS	No change on the site. The mapping indicates some extensive housing development to the east as Aberavan significantly develops. The railway sidings through the burrows have been removed as well as the brickworks. Vivian Memorial Park with sports and recreation areas is shown at this time
1951/52	1:10560	OS	An enclosure is shown adjoining the lido site's northern boundary. This is shown containing a number of circular features possible above ground tanks. The general area of the burrows appears to have been further encroached by housing spreading out from Aberavan.
1952-1956	1:2500	OS	The mapping shows no development on the site or to the south of the site, but the land surrounding the north of site has been significantly developed with housing and infrastructure. Immediately adjacent the site are: • The Tywyn Primary school is shown to the north east; • At least six tanks are shown in the enclosed land north east of the site • An electric substation is shown north of the site • Two small enclosed parcels of land are shown on the site of Channel View – these are later shown as residential houses
1956	1:1250	OS	As above detail
1964	1:10560	OS	The map shows development of and along Princess Margaret Way to the south of the site and a layout for Channel View which crosses the site.
1961-1966	1:1250	OS	The western part of the site is shown to contain the Lido and sports centre with associated gardens and car parking and with access from Channel View and Bevin Avenue. The east part of the site is identified as car park. Tanks that were located in the newly developed sports field appear to have been removed or buried and are no longer shown. Houses are shown immediately the north west of the Lido (Carmarthen House (nos 1 to 32) and Lido Houses (nos 1 and 2).
1969	1:2500	OS	No significant change to site or immediate surroundings.
1980-1982	1:10000	OS	No significant change to site or immediate surroundings.
1980-1996	1:10000	OS	No change to the site area. A hotel and office complex are shown north east of the site along Bevin Avenue/Dalton Road

From the above and from historic news reports of Lido's history the key dates for the site are:

- 1964 to 1965 Development of lido site
- 1965 Official opening by HM The Queen

- December 19, 2009 Fire causes permanent closure of facility
- 2012, Demolition of the Lido complex to leave vacant site.

2.3 Current Land Uses with Potential to Impact the Site

Currently the site is disused and contains demolition rubble in the former Lido complex in the north western part and rough open ground with temporary structures housing a gym in the south eastern part.

There are two electricity sub stations located on or close to the site; one is 25 m outside the site boundary in the north west of the site, and one directly on the site in the far south eastern part of the site.

Within the general area the following trade entries are noted as potential contamination sources:

- Chroma Domestic Cleaning Neath, Sitwell Way, Port Talbot – 350 m SE
- Quay Engineering Service Ltd, Sitwell Way, Port Talbot – 350 m SE
- Puncture-Shield, 2 Webb Place Port Talbot – 500 m E
- Murco petrol station Princess Margaret Way - 500 m NW

2.4 Historic Land Use with Potential to Impact the Site

Based on the history of the site and surrounding area Table 2.2 summarises the nearby former activities that have been identified as possible sources of contamination.

Table 2.2: Historic Land Use

Source	Distance m	Direction	Period	Comment
Electric Sub Station	On Site	-	1965? to present	Local chemical impact
Lido Swimming Pool	On Site	-	1965 to 2009	Chemicals, heating and fuel storage
Tanks (six number)	40- 120	NE	1956 – 1964?	Unknown use
Electric Sub Station	40	N	1956 to present	Local chemical impact
Railway	65 m	SE	1899 - 1917	
Filled ground	80	S	1993	Unknown sources
Filled ground	100	S	1884	Unknown sources
Quarry/clay pit	350	NE	1917-1939	Brickworks and railway now infilled

In addition to the listed land uses given in Table 2.2, it should be noted that the site is situated some 1 to 2 km west of the main Port Talbot industrial sites and that these include an industrial legacy of several hundred years dating from around 1717 with the building of the Aberavan Forge [23]. The site is also approximately 2.5 km from the former petrochemical works at Baglan. A summary of the main industrial sites is given in Table 2.3 below.

Table 2.3: Summary of Major Industrial Sites near the Site

Activity	Distance km	Direction	Period	Comment
Afan Forge	2.8	NE	1717- 1822	Absorbed into Margam tinworks
Taibach Copper Works	5.0	E	1774 – 1925	One of the earliest major works
Port Talbot Chemical Works	1.25	NE	Circa 1875	Limited details but possibly related to gas production and later gas works?
Borrows Tin Plate Works	1.15	NE	1850? - 1953	Also called the Burrows?
Margam Tin Plate Works	2.2	NE	1822 - 1916	Converted to steel works 1916 and merged with Mansel works to form British Steel site
Mansel Tin Plate	1.45	NE	1874 – todate	Becomes British Steel in 1967
Afan Vale Tin Works	1.4	NE	1870? – 1915?	
Aberavan Gas Works	1.25	NE	1899 – 1996	
Cwmavon Works	3.85	N	1820 – 1920?	Coal, Steel, coke, copper mills, etc declining after 1920.
Baglan Petrochemicals	2.5	NW	1963 - 2004	Major European petrochemical site

2.5 Environmental Incidents and Permitting

2.5.1 Industrial sites holding Licenses

There are no listed industrial uses requirement permitting at the site or within 500 m of the site boundary. The closest listed users are:

- Murco petrol station Princess Margaret Way - 500 m NW – unloading petroleum to storage for commercial petrol station.

2.5.2 Recorded Pollution Incidents

One reported pollution incident is recorded at the site (List 2) and this relates to the release of air-borne pollutants resulting from the fire that affected the Lido in December 2009. Other List 2 incidents within 250 m of the site include are listed in Table 2.4, there are no List 1 incidents.

Table 2.4: Pollution Incidents near the Site (List 2)

Date	Distance m	Direction	Medium	Comment
5 Apr 2001	163	E	Air: Smoke	Category 4 no impact
10 Dec 2001	165	NE	Air: Dust	Category 3 Air and Land (minor). Water Cat 4 (no impact)
28 Oct 2001	165	NE	Air: Fumes	Category 3 Air (minor). Land and Water Cat 4 (no impact)
25 Mar 2003	191	SE	Air: Dust	Category 3 Air and Land (minor). Water Cat 4 (no impact)

2.6 Landfilling and Waste Sites

No records of landfilling at the site have been recorded, however it is noted that NPTBC has supplied data for on-site landfill. It is presumed that this notification refers to the retention of demolition wastes on the site resulting from the demolition of the Lido site.

It should be noted that the published 1:50,000 scale British Geological Survey map of Swansea (BGS Sheet 247 [2]) shows the general site area to contain artificially modified ground (Landscaped Ground – redeveloped areas and other areas where extensive earth moving has occurred). The area of filling extends across the whole coastal plain of to the north west of Port Talbot and most likely relates to the use of steel slag fill to improve the generally poor ground conditions.

Steel slag contains more iron as free metal or oxides than blast furnace slag and typically have a greater variability in their composition. Due to the presence of free uncombined lime (CaO), magnesia (MgO) the slag readily reacts with water to form hydroxides, a reaction that can give rise to a large increase in volume over time.

Two waste refuse tips are recorded within the Groundsure data information [21] these are detailed in Table 2.5 below together with details of other waste sites and areas of undisclosed filling:

Table 2.5: Landfill and Waste Disposal

Activity	Distance m	Direction	Location	Comment
Refuse tip	905	NE	Not given	
Refuse tip	1155	NE	Not given	
Former Brick pits	350	NE	now adjacent Romney Road.	Infilled clay pits Unknown fill
Commercial and Industrial Waste	1300	E	Jem Recycling Old by-pass works Dock Road, Port Talbot	Expired permits – 1994 to 2000
Household Commercial and Industrial waste <25000 tonnes	1375	E	Paper Dragon Old by-pass works Dock Road, Port Talbot	Active licence since 2006
Clinical Waste Transfer	1125	NE	Neath and Port Talbot Hospital	Active since 2003

2.7 Geology

According to the British Geological Survey map of Swansea [2]) shows the general site area to contain artificially modified ground (Landscaped Ground – redeveloped areas and other areas where extensive earth moving has occurred) overlying a natural littoral sequence of Superficial Deposits which comprises Blown Sand, Storm Beach Deposits and Beach and Tidal Flat Deposits. These recent beach deposits generally are underlain by older Devensian Glaciofluvial Deposits which in turn overlie the Carboniferous South Wales Middle Coal Measures.

The Marine Storm Beach Deposits comprise cobbles and shingle, sand, silt and clay that may be bedded or chaotically deposited in the form of dunes, sheets or banks within a marine environment.

Blown Sand generally forms as dunes of pale brown fine grained sand, and is generally uncemented.

Tidal Flat Deposits generally form in sheltered environments and comprise normally consolidated soft silty clay with intermittent layers of sand, gravel and peat. The soils accumulate through a combination of aeolian processes with intervals of more active fluvial deposition from flooding or tidal surges.

The Glaciofluvial Deposits may be expected to comprise predominantly coarse granular materials and sands that may either be chaotic in nature or crudely sorted and bedded.

Beneath the superficial deposits, the solid geology comprises mudstone with coal seams, seatearth and thin sandstone beds.

A number of faults are shown on the geological mapping in the area of the site and the structure below the site is indicated to comprise a series of faulted blocks, generally downthrown toward the south. A series of thrust faults are indicated on the map, these generally strike in an east-west direction but have a northerly dip allowing strata to override toward the north. As a result the strata generally dips northwards. A second series of faults strike north-west to south-east: these are normal faults and appear to predate the thrust faults. The closest fault to the site is the Giant's Grave Fault, a normal fault that is within 250 m of the northern site boundary.

2.8 Economic Geology

The principal mineral resources in the area are summarised below:

- **Coal** - there are extensive mines and surface works in the general area surrounding Aberavan, however there are no mines or open cast works within 1 km of the site. Several coal seams were recorded in the mineral exploration borehole summarised in Table 2.6 but it would appear that the coal beneath the site was not economic to extract.
- **Sand and gravel** – there is evidence to suggest that the Blown Sands have been excavated in the past and that relatively small scale and localised surface works have been undertaken at various locations at and around the site since 1899.
- **Clay** – map records of brick making north of the site suggest that a brick pit was opened and operational between 1917 and 1950 some 450 m north of the site.

2.9 Hydrology and Hydrogeology

The site is located in a coastal location being approximately 150 m from the marked mean high tide at Aberavan Promenade. No surface water bodies are located on site and it is apparent that the site is well drained with generally little standing water. The nearest water body is therefore the sea. The Afon Afan is located some 850 m to the south east and flows southward into the sea and the River Neath flows into Swansea Bay some 3.5 km north of the site. It may therefore be expected that any groundwater flows will generally be southwards towards the coast and river estuary.

The Superficial Deposits are classed as a Secondary A aquifer and presumably have moderate intergranular permeability.

The underlying coal measures bedrock is also designated as a Secondary A aquifer throughout the site extents. It is considered that generally the permeability within the bedrock will be fracture controlled, there are however laterally extensive beds of sandstone within the sequence which may provide some intergranular flow.

There are no recorded groundwater abstractions that impact on or near the site. The closest abstractions relate to non-potable water abstraction to supply the Port Talbot Docks, more than 1 km to the east of the site.

2.10 Previous Ground Investigations

No details of previous ground investigation are available. However, several boreholes pertinent to the site were located on the BGS database [3] and are summarised below in Table 2.6, their approximate locations are shown on the site plan. The boreholes were drilled between 1892 and 1905 with a stated aim of assessing coal reserves and water supply; consequently, the bores extend to several hundred metres and intersect several coal seams. Due to the age of the logs, the terminology used on the logs and nature of the records are archaic.

A further series of boreholes were drilled in 1952 for an extension of the Aberavan promenade, these boreholes were between 10 and 15 m deep and penetrated into the Tidal Flat Deposits. The 1952 holes are not readily located in plan, but do indicate that the water level in the Blown Sand along the promenade strip was approximately between 4.5 m and 5 m OD at that time.

Table 2.6: Summary of Previous Boreholes Records

Stratum	Depth to Base of Strata m bgl		
	BGS 01	BGS 02	BGS 03
Made Ground	None	None	None
Blown Sand	5.79	6.40	5.79
Tidal Flat Deposits	19.39	22.55	15.85
Marine Beach Deposits	24.38	30.63	24.69
Glacial Till	32.31	40.69	Absent?
Middle Coal Measures	Depth not proven	Depth not proven	Depth not proven

Notes

BGS 01 – No 3 BH Aberavan Marshes 1903. BGS ID 370933 Ref SS78NW9. Location 274650, 189900. Total Length 405 m

BGS 02 – Aberavan Burrows No 1 BH, 1893. BGS ID 370932 Ref SS78NW8. Location 274660, 189290. Total Length 429.76 m

BGS 03 – N02 BH Aberavan Marshes, 1905. BGS ID 370915 Ref SS78NE302. Location 275010, 189550. Total Length 273.7 m

A conceptual geological section based on the above borings is presented in Figure 2.

2.11 Man-made and Natural Geo-hazards

The level of risk is assessed as a function of the severity of a particular hazard and its likelihood to occur. The following terms and scales are used to assess the risk.

Table 2.7: Risk Assessment Parameters

Score	Likelihood	Severity
1	Negligible	Very Low – minor injury, no significant time or cost
2	Unlikely	Low - Minor injury, minor loss of time, low cost
3	Occasional	Medium - Reportable incident, delays, local damage, significant costs
4	Probable	High – Major injury with long term effect, excessive project cost
5	Very Likely	Major Impact – Fatality, project closure

The following table provides a summary of the geotechnical risks that have potential to influence the proposed development. The level of risk may be reduced after appropriate mitigation measures are adopted.

Table 2.8: Risk Assessment

No	Hazard	Cause	Severity	Likelihood	Risk	Potential Mitigation
1	Subsidence	Made ground placement	2	3	6	Inspect footing for loose materials and compact
2	Subsidence	Mine workings	4	1	4	See CA report
3	Heave	Expansive Slag	3	2	6	Assess, remove or avoid
4	Subsidence	Quarry infill	4	1	4	Not required
5	Subsidence	Collapsible soil	2	2	4	Not required
6	Settlement	Compressible soil	2	4	8	Appropriate foundation design, treatment
7	Chemical attack	High Sulphate/low pH/chloride	3	3	9	Assess, remove, protect at risk elements
8	Contamination	Pollutants	2	4	8	Assess, design mitigation
9	Slope stability	Running Sand	3	4	12	Assess, design, stabilise
10	Temporary Excavation	Running Sand	4	4	16	Assess, dewater/shore
11	Obstructions	Existing Foundation	2	4	8	Locate, avoid/remove/cap
12	Ground Gas	Organic matter	4	4	16	Assess and mitigate
13	Unstable ground	Earthquake	2	2	4	Not required

Risk Level

≤4	Negligible	no specific action required
5 to 7	Low	review to see if further risk reduction is possible by low cost options
8 to 11	Medium	Consider alternate design/construction options; residual risks noted.
≥12	High	Seek alternate solutions; specify precautions and inform designer

Assessment will generally be carried as part of the ground investigation and the outcomes are discussed in Section 4 below.

With regard to the risk of subsidence due to mining of coal, the Coal Authority (CA) report for the site [16], states that the site is not within the zone of likely physical influence on the surface from past or present workings, and is not in an area likely to be affected by future workings. An extract of the CA Development Risk Map for Neath Port Talbot is presented as Figure 3. Based on the CA report and Development Risk Map, it may be considered that the risk due to mine workings is low.

2.12 Potential Contaminant Sources

Sections 2.4, 2.5 and 2.6 have identified a number of potential sources of contamination in the vicinity of the site. Sources within 500 m of the site generally are relatively small in scale (electrical sub stations, storage tanks etc), and tend to be relatively recent (post 1950). As such their ability to impact the site is considered to be comparatively low. Such sources may provide locally raised levels of contaminants but would not be expected to impact the whole site.

A larger source may be the previous use of the north western part of the site, which formerly housed the lido building and which may have greater potential to impact the site due to storage of chemicals or fuel.

The presence of made ground in the south eastern part of the site used mainly as a carpark, may have given rise to the placement of blast furnace slag which could contain high levels of sulphate and heavy metals.

The influence of major industrial sites located 1.5 km to 3 km from the site should also be considered. These sites have the potential to significantly impact the site should a suitable pathway mechanism exist.

2.13 Potential Pathways and Receptors

A preliminary assessment of contaminant pathways and receptors is provided based on the desk study information available for current and former adjacent site usages and assuming that the site will be developed for residential use.

Table 2.9: Potential Pathway-Receptor Links

Source	Pathways	Receptors	Anticipated Risk
On site	Dermal Contact Ingestion Groundwater migration Excavation/Transport Construction Airborne	Construction Workers	Low
		Occupiers	Moderate
		Buildings	Moderate
		Beach Front	Negligible
		Sea	Negligible
Off site	Groundwater migration Airborne Construction fill	Aquifers	Negligible
		Occupiers	Low
	Groundwater migration Airborne Construction fill	Construction Workers	Low

Petrol Filling Station			
Underground Tanks			
Major Industrial Sites		Buildings	Negligible
Railway			

The groundwater pathway for offsite contaminant source to on-site receptors assumes that the principal sources are located downstream of the site location and hence have low or negligible effect on the site. Airborne deposition and accumulation on-site of contaminants from off-site sources may therefore prove the most likely pathway.

3 FIELDWORK

3.1 Introduction

Site investigation works were undertaken between the dates of 16th February and 2nd March 2015.

The scope of the ground investigation, location and depth of types of exploratory holes, was determined by HCL. Supervision of the site investigation and the logging of all investigation positions was undertaken by a suitably experienced HCL engineers.

The original scope of the investigation is summarised in Table 3.1.

Table 3.1: Original Scope of Investigation

Location (s)	Method	Target Depth (m bgl)	Rationale
BH01–BH03	CP	25	Understand sequential geology in area, obtaining level of rockhead if possible; determine soil geotechnical parameters, assess potential contamination and determine long term gas and water levels.
WS141–WS148	DS	5	Determine soil geotechnical parameters, assess potential contamination and determine long term gas and water levels.
TP121 – TP137	TP	3	Obtain ground conditions near surface, investigating likelihood of contamination.

Notes

TP = Trial Pitting, CP = Cable Percussive boring, DS = Dynamic Sampling

Standards and procedures adopted during the investigation are detailed in Appendix A.

3.2 Exploratory Hole Locations

The co-ordinates and elevations of the exploratory hole locations were obtained by John Vincent Surveys using a GPRS system allowing an accuracy +/-50 mm.

An exploratory hole location plan is presented in Figure 4 with the corresponding exploratory hole logs presented within Appendix B. The co-ordinates and elevations of the ground surface at each exploratory hole location is noted on the corresponding exploratory hole log.

3.3 Cable Percussive Boreholes

Three cable percussive boreholes were undertaken between 16th February and 2nd March 2015 using two Dando 2000 drilling rigs.

The completed scope of cable percussive work is summarised in Table 3.2 below. Cable percussion boring was advanced using standard tools and utilised two casing strings in each borehole, boring commenced using a nominal 200 mm diameter casing and completed with 150 mm diameter hole as noted on the exploratory hole logs.

Standard penetration tests (SPT) were undertaken in the cable percussive boreholes nominally at 1.0 m intervals to depths of 5 m bgl and then at 1.5 m interval to the base of the borehole. The resulting SPT N-values are presented on the relevant borehole logs. Where the penetration resistance was low, generally below 5 blows per 300 mm, the SPT was 'double driven' by driving and recording the blows for an additional 300 mm of penetration without withdrawing the test apparatus. This allowed for an assessment of soil disturbance in the base of the borehole to be made, as loose or soft soils may be prone to excessive disturbance during the drilling operations. Such tests indicated on the logs with an asterix.

Table 3.2: Cable Percussive Borehole Summary

Exploratory Hole ID	Achieved Depth (m bgl)	Notes
BH101	26.82	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Marine Beach Deposits. Dual installation installed.
BH102	27.45	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Marine Beach Deposits. Dual installation installed.
BH103	30.40	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Glacial Till. Dual installation installed.

3.4 Dynamic Sample Holes

Dynamic sampling was undertaken at nine locations. This element of fieldwork was completed between 17th February 2015 and 18th February 2015.

Drilling was completed using a Dart 224 drilling rig and the completed scope of sampling is summarised in Table 3.3 below.

Table 3.3: Windowless Sampling Termination Depths

Exploratory Hole ID	Termination Depth (m bgl)	Notes
WS141	4.45	Terminated on engineers instruction and backfilled with bentonite.
WS142	4.45	Terminated on engineers instruction and backfilled with bentonite
WS143	2.34	Hit refusal on SPT (c) test at 2 m. Hole terminated and moved to location WS143A. Backfilled
WS143A	2.00	Monitoring installation to 2.0 m
WS144	5.45	Monitoring installation to 5.0 m.
WS145	7.24	Terminated on engineers instruction and backfilled with bentonite
WS146	5.45	Monitoring installation to 5.0 m.
WS147	5.45	Monitoring installation to 5.0 m.

Exploratory Hole ID	Termination Depth Notes (m bgl)
WS148	5.43 Monitoring installation to 5.0 m.

3.5 Trial Pitting

Machine excavated trial pitting was undertaken at 17 locations between the dates of the 16th February 2015 and the 19th February 2015. Trial pitting was completed using a JCB 3X (a breaker was used at applicable locations where concrete or paving was present at the surface). The completed scope of pitting is summarised in Table 3.4 below.

Table 3.4: Trial Pitting Termination Depths

Exploratory Hole ID	Termination Depth (m bgl)	Notes
TP121	2.6	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 2.6m to prevent undermining surrounding land.
TP122	2.7	Severe collapse with repeated excavation below 1.4 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP123	2.7	Severe collapse with repeated excavation below 1.2 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP124	3.2	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 3.2 m to prevent undermining surrounding land.
TP125	3.4	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 3.4 m to prevent undermining surrounding land
TP126	3.2	Severe collapse with repeated excavation below 1.05 m; excavation terminated at 3.2 m to prevent undermining surrounding land
TP127	2.4	Yellow pipe encountered at 0.62 m. No emissions from pipe, no bedding observed surrounding pipe. Possible waste pipe or redundant gas pipe. Severe collapse with repeated excavation below 1 m; excavation terminated at 2.4 m to prevent undermining surrounding land.
TP128	3.6	Severe collapse with repeated excavation below 1.05 m; excavation terminated at 3.6 m to prevent undermining surrounding land.
TP129	3.6	Severe collapse with repeated excavation below 1.2 m; excavation terminated at 3.6 m to prevent undermining surrounding land.
TP130	2.6	Severe collapse with repeated excavation below 0.8 m; excavation terminated at 2.6 m to prevent undermining surrounding land.
TP131	2.7	Severe collapse with repeated excavation below 0.6 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP132	3.4	Severe collapse with repeated excavation below 1.4 m; excavation terminated at 3.4 m to prevent undermining surrounding land.
TP133	2.8	Severe collapse with repeated excavation below 1 m; excavation terminated at 2.8 m to prevent undermining surrounding land.

Exploratory Hole ID	Termination Depth (m bgl)	Notes
TP134	3.1	Corroded steel mesh reinforcement encountered at 1.05 m depth. Concrete foundation exposed at 1.1 m (1.4 m visible length). Severe collapse with repeated excavation below 1.4 m; excavation terminated at 3.1 m to prevent undermining surrounding land.
TP135	2.8	Impersistent clay horizons at 0.80 m depth. Severe collapse with repeated excavation below 0.95 m; excavation terminated at 2.8 m to prevent undermining surrounding land.
TP136	2.75	Timber length encountered at 1.3 m depth. Aligned horizontally. Severe collapse with repeated excavation below 1.35 m, excavation terminated at 2.75 m to prevent undermining surrounding land.
TP137	3.4	Severe collapse with repeated excavation below 2 m, excavation terminated at 3.4 m to prevent undermining surrounding land.

3.6 Ground Instability

During the site investigation, all of the trial pits undertaken were unstable typically below depths of 1 m to 1.5 m. The instability occurred in the absence of groundwater. Descriptions of short-term ground instability were made on the relevant log and are summarised in Table 3.4.

3.7 Obstructions and Excavation Difficulties

During the ground investigation, obstructions and excavation difficulties were encountered in a number of the investigation positions as presented on the engineering logs.

Surface obstructions were generally broken out using a hydraulic breaker attached to the arm of the JCB excavator. Seven trial pits and four dynamic sampling locations required breaking out in order to advance the exploratory hole.

During the cable percussion drilling, a condition of blowing sand was encountered. This occurred when the hydraulic head of water was insufficient to counter-act the uplift force due to removal of material within the borehole. This condition is analogous to running sand conditions in open excavations.

Boreholes that progressed below 25 m bgl encountered very dense coarse gravel, cobbles and boulders which proved necessary to chisel.

3.8 Installations / Backfilling

Backfill and installations were carried out as described in the table below:

Table 3.11: Installation and Backfill details

Exploratory Hole ID	Response Zone (m bgl)	Response zone detail and strata screened
BH101	24.5 to 26.8	19 mm ID piezometer pipe installed from gl to 26.8 m. 50 mm ID standpipe installed from gl to 6 m (1 m plain over 5 m)

Exploratory Hole ID	Response Zone (m bgl)	Response zone detail and strata screened
		slotted). Concrete gl to 0.3 m bgl; bentonite seal 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 5 m bgl, bentonite pellet 6 to 26 m bgl. Gravel (6 mm) 24.5 to 26.82 m bgl.
BH102	25.0 to 27.45	19 mm ID piezometer pipe installed from gl to 26.82m. 50 mm ID standpipe from gl to 6 m (1 m plain over 5 m slotted). Concrete gl to 0.3 m bgl, bentonite seal 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 6.0 m bgl, bentonite 6.0 to 25.0 m bgl. Gravel (6 mm) 25 to 27.45 m bgl.
BH103	28.6 to 30.4	19 mm ID piezometer pipe installed from gl to 30.40 m. 50 mm ID standpipe from gl to 7 m (1 m plain over 6 m slotted). Cement seal gl to 0.3 m bgl, bentonite 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 6 m bgl, bentonite 6 to 28.6 m bgl. Gravel (6 mm) 28.6 to 30 m bgl.
TP121-TP137	N/A	Backfilled with excavated material and compacted with JCB3X.
WS141	N/A	No installation
WS142	N/A	No installation
WS143	N/A	No installation
WS143A	0-2	50 mm ID standpipe from gl to 2 m (1 m plain over 1 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1.0 -2.0 m bgl.
WS144	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0m bgl, gravel (6 mm) 1-5 m bgl.
WS145	N/A	No installation
WS146	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.
WS147	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.
WS148	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.

3.9 Land Gas and Groundwater Monitoring

Land gas and groundwater monitoring was undertaken on three return visits on 25th March, 9th April 2015 and 22nd May 2015. Additional visits were made to the site for monitoring as access to parts of the site was not possible due to damage to site compound locks.

The results of each monitoring visit are presented within Appendix C

4 LABORATORY TESTING

Geotechnical and chemical laboratory testing was undertaken on selected samples obtained from the exploratory holes with the full results included in Appendix D and E. Testing of all samples was scheduled by a HCL Geotechnical and Geo-environmental Engineer with testing undertaken by a HCL approved laboratory.

4.1 Geotechnical Laboratory Testing

The geotechnical tests detailed in Table 4.1 were carried out in accordance with BS1377:1990 Methods of test for soils for civil engineering purposes [10] and BRE Special Digest 1:2005 Concrete in Aggressive Ground [13]. Results of the geotechnical laboratory testing are presented in Appendix D.

Table 4.1: Geotechnical Testing

Type of Test	Number of Samples
Moisture Content	27
4 Point Liquid and Plastic Limit	6
Particle Size Distribution - Wet Sieve	18
Sedimentation (hydrometer)	3
One dimensional consolidation (4 day)	4
Quick undrained Triaxial Compression (single)	4
BRE Suite	3
Water Soluble Sulphate 2:1 Extract	12
pH	12
Loss of ignition	5
Total Sulphur Content	9
Chloride Content	9

4.2 Geo-Environmental Laboratory Testing

Tables 4.2 and 4.3 detail the chemical testing undertaken on soil and water samples obtained during the ground investigation. Results of the chemical laboratory testing are presented in Appendix E.

Table 4.2: Geo-environmental Soil Testing

Type of Test	Number of Samples
Heavy metal suite	33
Inorganic compounds	33
Total Phenol	33
PAH	33
TPH-CWG	1
BTEX	1

Table 4.2: Geo-environmental Water Testing

Type of Test	Number of Samples
Heavy metal suite	4
Inorganic compounds	4
Total Phenol	4
PAH	4
TPH-CWG	4

5 GROUND CONDITIONS

5.1 General Sequence of Strata

A summary of the strata encountered by the exploratory holes is provided in Table 5.1 below and a cross section showing the distribution of the various strata below the site is presented within Figure 5.

Table 5.1: Summary of Ground Conditions

Stratum	Thickness Min / Max / Avg m	Level Range (max/min) m OD	Comment
MADE GROUND and TOPSOIL	0.12 / 2.90 / 0.98	10.73 to 7.72	Topsoil only encountered BH102, BH103, WS148 and TP1127
BLOWN SAND	5.70 / 10.90 / 7.76	9.16 to -3.18	Encountered in all holes; thickness proven only in BH101 BH102 and BH0103
TIDAL FLAT DEPOSITS	9.00 / 14.10 / 12.30	2.74 to -11.06	Encountered in BH101, BH102 and BH103
MARINE BEACH DEPOSITS	5.00 to 8.30	-11.06 to -21.93	Only penetrated in BH103 and historic BGS bores.
GLACIAL TILL	7.93 to 10.06	-16.06 to -31.99	Encountered in BH103 and historic BGS bores.
SW Middle Coal Measures	Not proven	Below -25	From historic BH data only

The findings of the ground investigation are generally in agreement with the geological mapping and historic boreholes located near to the site and which are shown in the geological cross sections in Figure 2 as well as in the section presented in Figure 5.

5.2 Topsoil

Topsoil was generally absent over the site area and only a thin cover of topsoil was observed where present. Topsoil was typically encountered in areas previously used for grass lawns (BH102, BH103, TP123 and WS148).

5.3 Made Ground

Made ground was typically encountered at the surface in the majority of exploratory holes. In the south-east region, the previous land use had been mainly open ground for car parking, and in this area the made ground was predominantly some 0.5 m to 0.8 m thick. The made ground in this region generally comprised granular fill with a high proportion of aerated slag with a wide range of grain sizes up to small boulder size (350 to 400 mm).

In the north-west region previously occupied by the Lido, the made ground generally comprised either a concrete or bitumen surface that required breaking out over granular fill with high slag

content. This filled layer was generally underlain by a mixed layer derived from the underlying Blown Sand that had been disturbed and replaced with minor inclusions of brick and or slag.

Within the former Lido pool area, the trial pits indicated a layer of coarse and very coarse demolition rubble and in this area the thickness of made ground appears to increase matching the levels of former construction (2.9 m of made ground encountered in BH102).

A limited number of SPTs were recorded in the made ground and gave variable results with N-values ranging between 10 blows per 300 mm and refusal (full penetration not achieved after more than 50 blows).

Laboratory testing indicated that moisture contents were variable between 6% and 49% (average of 10 tests being 17%).

Chemical tests for aggressive ground conditions are summarised in Table 5.2

Table 5.2: Made Ground Chemical Testing

Test	Units	No of determination	Average	Min	Max	SD
Acid soluble Sulphate	% SO ₄	2	0.07	0.06	0.08	-
Water soluble Sulphate	g/l SO ₄	8	0.06	0.01	0.16	0.05
Chloride	% NaCl	No chloride present				
pH		11	8.15	6.7	10.16	1.08
Total Sulphur	%	8	0.08	0.05	0.11	0.02
Potential Sulphate	%	8	0.23	0.15	0.33	0.07
Loss on ignition	%	2	1.25	0.6	1.9	-

The above testing suggests that the soils are within Design Sulphate Class DS2 of the BRE SD1 [13] system and that the assessed chemical environment for concrete (ACEC) is AC2. Therefore limited special measures will be required for the design of concrete that is in contact with the ground.

5.4 Blown Sand

The area now occupied by the site was once part of an extensive system of aeolian sand dunes that was historically known as Aberavan Burrows. It may be anticipated that as with other such dune formations, the surface profile of the dunes would have been highly irregular and that in order to build on this surface it would be necessary to excavate, fill and level the surface to the desired profile. It is also possible that the prepared surface was stabilised with slag prior to construction.

The blown sand encountered during the investigation was typically described as medium dense pale brown, orange-brown to yellow-brown slightly silty fine to medium SAND with occasional cemented laminae up to 30 mm thick and rare coarse gravel size grey mudstone and shell fragments Occasional closely spaced impersistent lenses up to 10 mm thick of soft blue-grey organic silty clay are indicated in places.

Laboratory testing undertaken on the strata included particle size distributions and a summary of the grading curves obtained is presented in Figure 6a. The tests confirm that the Blown Sand are highly uniform fine to medium sand with typically less than 5% coarse sand to medium gravel and less than 5% silt and clay.

Chemical test for aggressive ground conditions were undertaken on four specimens; the results indicate that pH is between 8.1 and 8.7, soluble sulphates are low at 10 mg/l to 20 mg/l and that total potential sulphate is between 0.21% and 0.24%. At these levels, the results suggest that the soils are within Design Sulphate Class DS1 of the BRE SD1 and that the assessed chemical environment for concrete (ACEC) is AC1. However more aggressive conditions were noted in the assessment for made ground and the requirements for the design of concrete that is in contact with the ground should be based on those values.

SPT N-values were determined for the strata and gave an absolute range between 3 blows per 300 mm and 93 blows per 300 mm (the latter value determined by extrapolation from penetration at refusal). The distribution of SPT N-value with depth is shown in Figure 8, from which it is clear that the majority of data falls below an N-value of 20 blows and further, the data suggests the SPT value does not significantly improve over the range 10 m OD to 5 m OD; over this range a cautious estimate of the typical N-value may be around 10 blows per 300 mm which corresponds to an angle of shearing resistance of 30°. High determinations of SPT N-value are likely to reflect the presence of gravel or cobble size clasts incorporated within the material or weakly cemented horizons.

The stability of the sand in open excavation was poor as proved by the trial pits where repeated sidewall collapse limited the depth of excavation.

5.5 Tidal Flat Deposits

The Tidal Flat Deposits are indicated to consist of interlayered sand, silt and clay units which locally form distinct lenses or beds several metres thick but which are individually interlaminated with sand, silt or clay. In such mixed soils, the engineering properties are usually dominated and controlled by the weaker less competent materials, generally these are the clay layers.

A number of UT100 samples were taken of the Tidal Flat Deposits, however it was noted that due to the soft and interlaminated nature of the soil sample disturbance appeared to be relatively severe and therefore some caution will be required in assessing the results of tests from the samples.

Eight particle size distribution analyses were undertaken on soil samples from the Tidal Flat Deposits, and are summarised in grading envelope presented as Figure 6b. Most of the test results indicate a high proportion of fine material (silt and clay combined), with between 48% and 93% silt and clay content. Generally the clay content is between 15% and 30%, which is normally a sufficiently high percentage of clay to allow this material to dominate the soil's behaviour. One particle size distribution lies outside of the main envelope; this sample is assumed to be from a sand lens within the Tidal Flat Deposit is considered to represent a layer of aeolian sand within the Tidal Flats and indicates the range of materials and processes being deposited in a littoral environment over time.

The clay is described as soft to firm grey, blue-grey green-grey slightly organic slightly sandy and silty with occasional lenses of peat. A number of classification test results are summarised and presented as Figure 7; the tests indicate that the moisture content of the soil lies approximately midway between the range of plastic and liquid limits and that the soil is normally consolidated to lightly over consolidated and of intermediate plasticity.

The average SPT N-value for the Tidal Flat Deposits is 20 blows per 300 mm, however, inspection of the plot of SPT data with reduced level presented in Figure 8 indicates that the SPT N-values decrease from around 25 blows per 300 mm at 3 m OD to about 8 blows per 300 mm at -10 m OD. Therefore some caution in selection of SPT N-values for design is recommended.

N-values of around 10 blows per 300 mm equate to approximate undrained shear strengths of between 45 kPa and 50 kPa; these values are considerably higher than the determined undrained shear strength from samples tested in triaxial tests which indicate shear strengths of less than 10 kPa.

The one-dimensional consolidation tests reveal coefficients of volume compressibility of between 0.21 m²/MN and 0.28 m²/MN for pressure ranges up to 350 kPa suggesting that this strata is normally or lightly consolidated and liable to settle under high loads.

5.6 Marine Beach Deposits

The Beach deposits are described as dense grey clayey silty sandy gravel with medium cobble content. Gravel and cobbles are sub-angular to rounded often flat to tabular interpreted to be glacial deposits worked by coastal processes.

SPT N-value range from 34 blows per 300 mm to more than 100 blows per 300 mm (based on extrapolated from penetration at refusal) and correspond to an angle of shearing resistance of at least 37°.

5.7 Glacial Deposits

The glacial deposits are described as very stiff to hard dark grey to grey-brown slightly sandy gravelly clay with occasional to frequent cobbles. Coarse fragments are sub-rounded to sub-angular sandstone. SPT N values are greater than 50 indicating undrained shear strengths in excess of 250 kPa.

5.8 Groundwater

Groundwater was encountered both during the investigation and within installations within boreholes. Generally the observations of groundwater made during the investigation are transitory and do not fully represent the actual long term conditions at the site. Post fieldwork observations should therefore be used to confirm the long term situation.

The highest level of water in post fieldwork observations between March and May 2015 were found to be between 6.76 m OD (BH101 – east site) and 4.42 m OD (BH102 – west side of site). The levels observed are in agreement with the historic levels recorded during 1952 which indicate that the groundwater level was around 6 m OD.

During the post site observations and during the fieldwork, readings of groundwater were taken several times during the day to see if any correlation and change in level with tidal cycle occurred. The results were inconclusive and further monitoring over a full 24 or 48 hr period is recommend to establish this relationship.

6 CONTAMINATION CHARACTERISATION

6.1 Human Health Risk Assessment

6.1.1 Soil Screening Values

The following section details the approach undertaken with regards to selecting the appropriate Soil Screening Values (SSVs).

At the first tier of risk assessment, “Tier 1”, sometimes referred to as soil screening, or Generic Risk Assessment, the relevant scientifically based authoritative criteria to assess soils are the Soil Guideline Values (SGV) published during and post 2009. These were derived using the Contaminated Land Exposure Assessment (CLEA v1.06) model by the Environment Agency [16]. This report follows this approach. To date, SGV for eleven contaminants (arsenic, nickel, mercury, selenium, cadmium, benzene, toluene, ethylbenzene, xylene, dioxins, polychlorinated biphenyls, and phenol) have been published. The Industry (LQM/CIEH and EIC) has developed Generic Assessment Criteria (GAC) for other substances which are widely used.

An SGV (or GAC) represents a cautious estimate of concentration of contamination in soil at which there is considered to be no risk to human health or a minimal chronic (long term) health risk. This however, does not mean an unacceptable risk actually exists at the recorded concentrations – there may be site-specific conditions that prevent the risk reaching an unacceptable level. The SGV/GAC therefore provides a value of soil contamination above which triggers further actions that should be undertaken to make sure that human health is protected; such actions may be further investigation or simple forms of remediation or investment in detailed quantitative risk assessment. They are not statutory standards that must not be exceeded. Although an SGV is an authoritative, scientifically based value published by the Environment Agency, a GAC has no less science applied; it is however derived by a non-Environment Agency source.

At the beginning of 2015, LQM/CIEH published updated GAC values called Suitable 4 Use Levels (S4ULs) [19]¹. These S4ULs represent minimal risk to receptors. They have been derived using the CLEA v1.06 model / methodology but the exposure model has been revised to represent the current assumptions published by Defra in 2014 [19]. These are considered to be the most up to date GACs and therefore have been used within the assessment that follows.

In the case of Lead, the withdrawn SGV (450mg/kg) had tended to be utilised, as no other published GAC was available. In 2014, Category 4 Screening Levels (C4SLs) were derived / published with regards to the Part 2A regime and are considered to represent low risk. For the assessment of Lead, the C4SL has been used as it is deemed more appropriate to use this value (200mg/kg) for the initial screen than the withdrawn SGV.

For organic contaminants SGVs/GACs are dependent on the Soil Organic Matter (SOM) content, with an increase in SOM corresponding with an increase in SGV/GAC. The SGV/GACs/S4ULs have been derived at 1%, 2.5% and 6% SOM, to correspond with low organic Made Ground (1%) and topsoil (6%) and intermediate material (2.5%). Accordingly, for

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conservatism, this assessment herein has been undertaken using SSVs calculated for a 1% SOM.

The Afan Lido site is being promoted by the Council as a mixed use development, including elements of residential, tourism and recreational uses and therefore SSVs for a residential with plant uptake scenario has been considered appropriate for this assessment. This is the most standard sensitive land use and therefore provides a precautionary approach to Tier 1 screening.

6.1.2 Averaging Area

For the initial screening process the whole site has been considered as one averaging area, however the chemical results have been separated into their different strata (ie Made Ground and natural soils).

6.2 Soil Assessment – Tier 1 Screening

Three cable percussive boreholes, eight dynamic sample exploratory holes and 17 trial pits were undertaken across the site. In total 33 samples (29 Made Ground and 4 Natural Ground) were taken from these exploratory holes and analysed for a suite of organic and inorganic contaminants. Asbestos screening and calorific value were also scheduled on samples.

6.2.1 Inorganics

The following tables present a summary of the inorganic results for the Made Ground and natural soils.

Table 6.1: Summary of Analytical Chemical Testing Results for Made Ground (Inorganic)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No) / Location
Arsenic	29	8.3	1200	37 ⁽¹⁾	YES – WS145 / TP132 / TP137 / TP128 / TP133 / WS142 / WS148 / WS147
Boron	29	0.3	2.6	290 ⁽¹⁾	NO
Cadmium	29	< 0.2	64	11 ⁽¹⁾	YES – TP132 / TP133 / WS147
Chromium VI	29	< 4.0	< 4.0	6 ⁽¹⁾	NO
Chromium	29	2.6	41	910 ⁽¹⁾	NO
Copper	29	7.7	3900	2400 ⁽¹⁾	NO
Lead	29	7.8	2400	200 ⁽²⁾	YES – WS145 / TP132 / WS141 / TP128 / WS142 / WS148 / WS147 / TP133 / BH101 / TP126 / TP137
Mercury	29	< 0.3	< 0.3	40 ⁽¹⁾	NO

Nickel	29	4	100	180 ⁽¹⁾	NO
Selenium	29	< 1.0	3.3	250 ⁽¹⁾	NO
Zinc	29	35	47000	3700 ⁽¹⁾	YES – TP132 / WS148 / WS147 / TP133
pH (pH Units)	29	8.0	10.7	6-9	YES – TP136

1 LQM/CIEH – S4ULs published values (2nd Edition)

2 Defra - C4SL

The above table illustrates that there are exceedances of several inorganic compounds (arsenic, cadmium, lead and zinc) within the Made Ground. The majority of exceedances are located in the northern section of the site. Many of the exploratory holes encountered slag fragments within the soil matrix and this could be the source of the elevated contaminants.

One pH value was recorded above the upper threshold of 9, which indicated that the made ground soil in TP136 is alkaline in nature. Across the site the pH is generally neutral to slightly alkaline.

Table 6.2: Summary of Analytical Testing Results for Natural Ground (Inorganic)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSVs (mg/kg)	Exceedances (Yes / No) / Location
Arsenic	4	14	53	37 ⁽¹⁾	YES – TP123
Boron	4	0.3	0.3	290 ⁽¹⁾	NO
Cadmium	4	< 0.2	< 0.2	11 ⁽¹⁾	NO
Chromium VI	4	< 4.0	< 4.0	6 ⁽¹⁾	NO
Chromium	4	3.2	6.4	910 ⁽¹⁾	NO
Copper	4	7.8	40	2400 ⁽¹⁾	NO
Lead	4	7.5	42	200 ⁽²⁾	NO
Mercury	4	< 0.3	< 0.3	40 ⁽¹⁾	NO
Nickel	4	5.6	6.5	180 ⁽¹⁾	NO
Selenium	4	< 1.0	< 1.0	250 ⁽¹⁾	NO
Zinc	4	35	60	3700 ⁽¹⁾	NO
pH (pH Units)	4	8.1	8.4	6-9	NO

1 LQM/CIEH – S4ULs published values (2nd Edition)

2 Defra - C4SL

The above table illustrates that whilst the Made Ground has elevated contaminants, the natural soils are generally below the appropriate SSVs. There is one exceedance of arsenic in TP123 at 0.5m which is within a stratum described as loose pale yellow-brown fine to medium SAND. TP123 is located on the south western part of the site.

6.2.2 Organics

The following tables present a summary of the organic results for the Made Ground and natural soils.

Table 6.3: Summary of Analytical Testing Results for Made Ground (PAH)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No) / Location
Naphthalene	29	< 0.05	0.74	2.3 ⁽¹⁾	NO
Acenaphthylene	29	< 0.10	1.7	170 ⁽¹⁾	NO
Acenaphthene	29	< 0.10	0.87	210 ⁽¹⁾	NO
Fluorene	29	< 0.10	2.7	170 ⁽¹⁾	NO
Phenanthrene	29	< 0.10	14	95 ⁽¹⁾	NO
Anthracene	29	< 0.10	3.4	2400 ⁽¹⁾	NO
Fluoranthene	29	< 0.10	25	280 ⁽¹⁾	NO
Pyrene	29	< 0.10	18	620 ⁽¹⁾	NO
Benzo(a)anthracene	29	< 0.10	12	7.2 ⁽¹⁾	NO
Chrysene	29	< 0.05	11	15 ⁽¹⁾	NO
Benzo(b)fluoranthene	29	< 0.10	9.7	2.6 ⁽¹⁾	YES – BH101 (2 samples)
Benzo(k)fluoranthene	29	< 0.10	5.9	77 ⁽¹⁾	NO
Benzo(a)pyrene	29	< 0.10	8.1	2.2 ⁽¹⁾	YES – BH101 (2 samples)
Indeno(1,2,3-cd)pyrene	29	< 0.10	4.5	27 ⁽¹⁾	NO
Dibenzo(a,h)anthracene	29	< 0.10	1.3	0.24 ⁽¹⁾	YES – BH101 (2 samples) / TP133
Benzo(ghi)perylene	29	< 0.05	4.6	32 ⁽¹⁾	NO

¹ LQM/CIEH – S4ULs published values (2nd Edition)

The above table shows that generally the PAH compounds are below the SSVs for a residential with plant uptake, however exceedances of Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene were recorded in BH101 and Dibenzo(a,h)anthracene in TP133.

In BH101 two samples were analysed from the shallow Made Ground (0.5m and 1.0m depth). Both samples showed exceedances but the concentration within the deeper sample is lower than the shallower sample.

In both strata of BH101 and in TP133, gravels of slag are described and this could be the potential source of the elevated PAH compounds.

One made ground sample was tested for TPHCWG / BTEX but and was below the appropriate SSVs.

Table 6.4: Summary of Analytical Testing Results for Natural Ground (PAH)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No)
Naphthalene	4	< 0.5	< 0.5	2.3 ⁽¹⁾	NO
Acenaphthylene	4	< 0.10	< 0.10	170 ⁽¹⁾	NO
Acenaphthene	4	< 0.10	< 0.10	210 ⁽¹⁾	NO
Fluorene	4	< 0.10	< 0.10	170 ⁽¹⁾	NO
Phenanthrene	4	< 0.10	< 0.10	95 ⁽¹⁾	NO
Anthracene	4	< 0.10	< 0.10	2400 ⁽¹⁾	NO
Fluoranthene	4	< 0.10	< 0.10	280 ⁽¹⁾	NO
Pyrene	4	< 0.10	< 0.10	620 ⁽¹⁾	NO
Benzo(a)anthracene	4	< 0.10	< 0.10	7.2 ⁽¹⁾	NO
Chrysene	4	< 0.05	< 0.05	15 ⁽¹⁾	NO
Benzo(b)fluoranthene	4	< 0.10	< 0.10	2.6 ⁽¹⁾	NO
Benzo(k)fluoranthene	4	< 0.10	< 0.10	77 ⁽¹⁾	NO
Benzo(a)pyrene	4	< 0.10	< 0.10	2.2 ⁽¹⁾	NO
Indeno(1,2,3-cd)pyrene	4	< 0.10	< 0.10	27 ⁽¹⁾	NO
Dibenzo(a,h)anthracene	4	< 0.10	< 0.10	0.24 ⁽¹⁾	NO
Benzo(ghi)perylene	4	< 0.05	< 0.05	32 ⁽¹⁾	NO

¹ LQM/CIEH – S4ULs published values (2nd Edition)

The table above shows that whilst exceedances were encountered in the Made Ground, no PAH compounds were above the SSVs in the natural soils.

6.3 Asbestos

All the samples were screened for asbestos fibres. Asbestos was detected in two out of 33 samples; TP133 at 0.4m (Crocidolite – loose fibres) and TP134 at 0.2m (Chrysotile – loose fibres). Both are from the Made Ground (silty sandy Gravel) and no fibres were visible during the investigation. However it is noted that rockwool fragments were identified in the demolition rubble located in TP134 at shallow depth.

It is noted that a shallower sample was analysed from TP133 (0.2m) and no asbestos fibres were detected.

6.4 Calorific Value / Loss on Ignition

Five samples from the made ground have been analysed for Loss on Ignition (LOI) and Calorific Value (CV). The samples targeted were those containing slag fragments to assess whether they could ignite under the appropriate conditions.

The loss of ignition values ranged between 0.85 and 6%, which indicates that during the analysis up to 6% of the material has been lost and could be available to combustion. As a

comparison the LOI threshold for material to be accepted at a hazardous landfill is 10%. This would indicate that the risk from the material on the site is generally low.

CV is the quantity of heat which can be released from a sample after complete combustion in excess oxygen under 30 atmosphere pressure. It is used as an initial screen to determine the potentially combustibility of material.

The results of the CV analysis ranged from 0.025 to 3.2357 MJ/kg.

It is suggested that there is an unacceptable risk of smouldering when the CV of the soil / material exceeds 7MJ/kg [20]. The samples on the site are all below this threshold with the maximum being approximately half. It is also noted that the potentially combustible material is within a soil matrix which is likely to reduce the risk of combustion.

6.5 Groundwater Risk Assessment

Groundwater samples have been collected from BH102 and BH103 during two monitoring rounds (25th March 2015 and 22nd May 2015).

Four groundwater samples were tested for a suite of contaminants including inorganic and organic contaminants to assess if there is any impact on the underlying groundwater beneath the site. The laboratory results can be found in Appendix E.

6.5.1 Water Quality Standards

To assess the groundwater in terms of its potential as a source of contamination, each contaminant concentration has been compared against appropriate Water Quality Standards (WQS). As this site is located next to the coast, the groundwater is likely to be impacted by saline water and therefore where available saline WQS have been adopted. The UK Statutory Guidance for saltwater is considered to be the most appropriate. Where no saline WQS are available for a particular contaminant then either the Environmental Quality Standards (EQS) for freshwater or UK Drinking Water Standards (DWS) will be used to provide an indication of the water quality. The saline WQS have been sourced from Environment Agency Chemical Database (<http://evidence.environment-agency.gov.uk/ChemicalStandards/Home.aspx>)

6.5.2 Metals and Other In-organics

All sample results were below the appropriate saline WQS with the exception of copper and selenium.

Copper was found to be elevated in both groundwater samples taken from the first monitoring round in March. Concentrations were 6.4ug/l (BH102) and 9.1ug/l (BH103) against a WQS of 5ug/l. However the samples taken from the following monitoring round both had concentrations of 2.8ug/l which are below the WQS. This indicates that the previous slightly elevated concentrations recorded are not likely to be of concern.

There were two contaminants where saline guidance values were not present; boron and selenium. For these contaminants, EQS value for boron and DWS for selenium was used.

All results for boron were below the EQS value, however the DWS value for selenium (10 ug/l) was very slightly exceeded in BH102 with a concentration of 11 ug/l on the 22nd May. Given the very minor exceedance, selenium is not considered to be a concern.

6.5.3 Hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAH)

Groundwater samples were tested for speciated PAHs and all the results were below the limit of detection (10ug/l).

Total Petroleum Hydrocarbons

Groundwater samples were tested for TPH and all the results were below the limit of detection (10ug/l).

BTEX

Groundwater samples were tested for BTEX compounds and all the results were below the limit of detection.

Based on the above, hydrocarbons are not considered to be contaminants of concern.

6.6 Gas Risk Assessment

Ground gas monitoring was undertaken in 7 locations during monitoring visits undertaken on 25th March, 9th April 2015 and 22nd May 2015.

Carbon dioxide concentrations ranged from less than detection to 1.4% volume. Methane concentrations were always recorded below the limit of detection (0.1 % vol). Flow rates were below the limit of detection.

CIRIA guidance [13] has been used to inform the ground gas assessment which adopts the method proposed by Wilson and Card (Situation A) and NHBC (Situation B). For both approaches, the ground gas concentration and borehole flow rate are used to calculate a Gas Screening Value and define a Characteristic Situation (CS) (Situation A) or traffic light scenario (Situation B).

A Gas Screening Value (GSV) is calculated using the following equation:

$$GSV (l/h) = \text{borehole flow rate (l/h)} \times \text{ground gas concentration (v/v \%)}$$

As the flow rate has been recorded as below the limit of detection (<0.1l/h) in all boreholes during all monitoring visits, this has been used as 0.1l/h in order to calculate GSVs for both methane and carbon dioxide. Using the maximum concentrations recorded during the Hyder monitoring visits, the GSVs are as follows:

- Methane GSV = 0.0001 l/h
- CO₂ GSV = 0.0014l/h

The above indicates the gas regime on the site is considered to be Characteristic Situation (CS) 1- very low risk.

7 Conceptual Model – Contaminant Linkages

7.1 Introduction

The aim of this conceptual model and risk assessment is to provide an identification of the risks to, proposed future site users, controlled waters and the surrounding area posed by any contamination present on site. The assessment is based on identification of 'contaminant linkages', i.e. contaminant source-pathway-receptor relationships.

It should be noted that for the purposes of this report, assessment of risks relating to the current site use have not been considered. As mentioned previously in this report, the majority of the site will be residential development and therefore the assessment has been undertaken with this in mind. The sections below identify the potential receptors / pathways and contaminant sources for the proposed land use.

7.2 Contaminant Sources

Based on the chemical data currently available and the assessment against SSVs for a residential with plant uptake scenario the following determinands have been identified to be contaminants of concern;

Soils

- Inorganics – arsenic, cadmium, lead and zinc
- Organics – Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene
- Asbestos;
- Ground Gases

7.3 Risk Assessment Methodology

Risk assessment is the process of collating known information on a hazard or set of hazards (to determine the potential severity of any impact) along with details on the likelihood of impact on detailed receptors. Risks are generally managed by isolating the sensitive receptor or by intercepting or interrupting the exposure pathway, thus no pollutant linkages are formed and there is no risk. The following risk assessment focuses on the potential contaminants identified on the site in the context of the proposed development of the site.

CIRIA guidance [15] states that the designation of risk is based upon a consideration of both:

- The likelihood of an event (probability); (takes into account both the presence of the hazard and the receptor and the integrity of the pathway).
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor)

Under such a classification system the following categorisation of risk has been developed and the terminology adopted as follows:

Table 7.1: Summary of Risk Classification Categories

Term	Description
Very High Risk	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High Risk	Significant Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate Risk	It is possible that without appropriate remedial action, harm could arise to a designated receptor but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.
Low Risk	It is possible that significant harm could arise to a designated receptor from an identified hazard but it is likely that at worst this harm if realised would normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

7.4 Contaminant Linkages

Based on the contaminant sources and the potential receptors and pathways identified in previous sections, the following tables provides an assessment of each identified contaminant linkage to establish the potential risk to the sensitive receptors for each proposed land use.

It should be noted that risks to construction workers have not been considered within the assessment below as contamination risks to construction / site workers are not appraised by chronic (long term) exposure human health risk assessments. Site specific construction workers risk assessment and appropriate health and safety practices to adequately mitigate the potential risks are recommended for any future works. Works should be conducted in accordance with the CDM Regulations (2015) or any other relevant guidance.

During site construction works, site workers should remain vigilant to the possible risk of encountering isolated areas of contaminated soils and asbestos containing material. Should potentially contaminated material be encountered, further testing will be required to assess the risks to the health and safety of site workers and the environment.

Table 7.2: Summary of Contaminant Linkages – Residential with plant uptake scenario

CL No.	Contaminant Source	Sensitive Receptor	Pathway	Hazard (Severity)	Likelihood	Potential Risk	Comments
CL1	Inorganic contaminants (arsenic, cadmium, lead and zinc), PAH Compounds including benzo(a)pyrene (BaP), in Made Ground	Human Health	Ingestion / Inhalation / Dermal Contact / Veg uptake	Chronic damage, carcinogenic compounds (Medium)	Likely Contaminant concentrations have been found to be elevated. For a residential scenario with private gardens, a large proportion of the site would be soft landscaping and therefore it is likely that receptors would come into contact with such near surface soils if no remediation/mitigation is undertaken.	Moderate	Contamination has been encountered in the near surface soils. The level of remediation / mitigation required will depend on the overall design of the development but some basic cover protection is warranted, focused in soft landscaping areas.
CL2		Controlled Waters (Groundwater and Surface water)	Leaching and migration into water environment	Reduction of water quality, although unlikely to be a potable resource due to proximity of the sea. (Mild)	Unlikely. Contaminant concentrations recorded in the groundwater samples were generally below the WQS and therefore leaching of contaminants does not appear to be occurring to significant quantities	Very Low	
CL3		Buildings / Services	Contact of contaminants with buildings and structures (excluding potable water supply pipes)	Damage to structures (Mild)	Unlikely. Identified contaminants are unlikely to cause significant damage to buildings. .	Very Low	None
CL4	Asbestos	Human Health	Inhalation of fibres	Chronic damage, carcinogenic compounds (Medium)	Low to Likely. Asbestos fibres have been detected in two sample locations within the development area. These were encountered within the soil matrix. Inhalation of fibres could occur if disturbed causing a risk to site end users if left on site. Low likelihood relates to majority of sampling positions where no asbestos was encountered.	Moderate / Low to Moderate	Mitigation / remedial action / watching brief will be required prior to development to ensure that the risk from asbestos is mitigated. Probably basic cover system in areas of soft landscaping. It is noted that this is not a widespread issue across the site, however as fibres have been detected it is possible that asbestos is present in other locations across the site.

CL No.	Contaminant Source	Sensitive Receptor	Pathway	Hazard (Severity)	Likelihood	Potential Risk	Comments
CL5	Ground Gases	Human Health / Buildings	Asphyxiation / build up in confined spaces / explosion	Irreversible damage (Severe)	Low. Low gas concentrations / flow rates have been recorded on site to date	Moderate	Further gas monitoring may be required to ensure that the gas regime is appropriate.

Based on the information available, contaminant linkages have been identified. The risk to human health is considered to be moderate to high due to the elevated concentrations predominately of metal compounds, including arsenic and lead present within the made ground soils. There is also considered to be a moderate / moderate to low risk from asbestos fibres that have been detected within the soil matrix. Further characterisation may be required.

It should be noted that due to the nature of the shallow soils i.e. made ground containing slag gravel, it is unlikely to be considered suitable for planting vegetation / soft landscaped areas and therefore some form of remediation such as a cover system is likely to be required within the design of these areas.

There is a moderate risk to human health from ground gases based on the results to date.

8 Engineering Considerations

8.1 Foundations

8.1.1 Shallow Foundations

Shallow spread foundations may be suitable for low-rise development (1 to 4 storey buildings) provided foundations can be located in the Blown Sand, and where the depth of foundation is at least 0.9 m below the finished ground level. To maintain foundation capacity, the depth of foundation should where possible be set at a level that remains above the long term groundwater table by at least the effective size of the foundation; for this site the ground water is around 7 m OD, therefore foundation depths should be no lower than 8 m OD for strip footings or square footings of 1 m width. Where these conditions are met, the allowable bearing resistance of the ground should be at least 80 kPa.

The minimum thickness of Blown Sand determined by the ground investigation is 5.70 m; therefore to limit imposing significant stress on the underlying Tidal Flat Deposits, foundations size and width should be kept to a minimum and should not exceed an effective width of 2.0 m. Where larger foundation size is required, or where the foundation stress bulb will impact the Tidal Flat Deposits or groundwater table, then a detailed assessment of foundation conditions will be necessary or consideration should be given to using piled foundations.

8.1.2 Piled Foundations

For larger structures with high foundations loads conventional piled foundations end bearing in the Marine Beach Deposits or Glacial Deposits are recommended. The use of driven piles is not recommended due to the risk of disturbance to neighbouring site users or the risk of causing liquefaction of the saturated silt layers within the Tidal Flat Deposits. Cased bored piles are considered a suitable solution but the advice of a specialist piling contractor should be sought as to the most suitable solution.

Bored piles are likely to be at least 20 m long but will be capable of supporting loads in the region of 1000 kPa. Some allowance for negative skin friction developed in the Tidal Flat Deposits may be required depending on the final levels adopted at the site.

An alternate solution to deep bored concrete piles may be the use of a screw-pile foundation. Screw piled foundations are relatively easy and rapidly installed and because they are installed with little ground disturbance can develop comparatively high load capacity in poor ground conditions. The foundation option is also highly attractive in terms of sustainability as the systems permits comparatively easy removal and the steel can be recycled.

8.1.3 Reuse of Existing Foundations

The former Lido building was supported on a piled foundation. The construction details of the piles is unknown and therefore the capacity for reuse of the existing foundation solution remains unknown. In order to consider the existing piles for reuse the following actions are recommended:

- A specific foundation reuse desk study is undertaken to validate the existing pile properties,
- A test programme is established to determine any pile defects using non-destructive methods,

- assessment of any material deterioration,
- the load-bearing capacity of the piles is established either by reverse calculation and/or pile capacity testing.

In addition, the design of the new superstructure will need to adopt a reuse philosophy which will require a series of mitigation methods including:

- design of a robust superstructure to reduce the impacts of a single pile failure,
- adoption of an appropriate level of caution applied to the reuse load-carrying capacity,
- consideration of a partial reuse scheme with a robust foundation design.

8.2 Temporary works

8.2.1 Excavation stability

During the ground investigation a number trial pits were found to be unstable at comparatively shallow depth and at levels above the groundwater table. It is therefore expected that all excavations on site will likely require careful consideration from a stability point of view and will likely require some form of immediate support.

8.2.2 Dewatering

It is unlikely that dewatering of excavations will be required for conventional shallow foundation. However, should deep excavations extending below 7 m OD be required then dewatering will be required. A well pointing system is recommended to prevent fine sands and silts from blowing and causing significant stability issues. Settlement resulting from any dewatering processes will require careful planning to determine the effects on adjacent structures and the settlement of the soils beneath the site.

9 Geotechnical Risk Register

A geotechnical risk register is presented in Table 9.1 below to identify possible residual geotechnical risks that may be present on site, occur during the design and/or development of the site

Table 9.1: Geotechnical Risk Register

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation Measures
Laterally variable ground conditions (including sudden lateral changes in ground conditions) The ground investigation to date has been exploratory. Other ground conditions are likely to be encountered that have not been revealed by this ground investigation.	Ground conditions weaker than anticipated causing structural damage to buildings Differential settlement In sufficient bearing capacity Structural damage to buildings	Medium	High	High	Once the proposed development of the site has been confirmed, a main ground investigation should be commissioned to confirm the ground conditions. Reinforced concrete foundations are recommended to minimise the risk of differential settlement of foundations over
Unstable excavations - unsupported excavations are indicated to be unstable	Programme delays Injury or death of workers Damage to plant and equipment Damage to corporate reputation	High	High	High	Allowance should be made for the use of adequate excavation supports during the planning and development of the site
Settlement of buildings on shallow foundations in excess of tolerance	Differential settlement Damage to services Structural damage	High	High	High	Bearing and settlement checks should be undertaken during the design phase for the preferred foundation solutions.
Foundation positions corresponding with trial pit locations	Localised differential settlement of foundations Structural damage	High	Medium	High	The positions of trial pits should be noted during the design phase. Allowance should be made to remove any disturbed materials present beneath founding depth and replacement with a suitable compactable fill material. Reinforced foundations are recommended to minimise local differential settlement.
High Ground Water Levels – Some ground water monitoring has been carried out, but unlikely to indicate worst case conditions.	In sufficient bearing capacity of foundations Blowing of sands beneath groundwater level causing	Low	High	Medium	Further groundwater monitoring is recommended to determine the worst case ground water conditions and determine whether the groundwater is tidal.

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation Measures
Obstructions in the ground – The foundations to the historical buildings may be present with the ground.	Differential settlement from proposed foundations straddling historical foundations. Programme delays arising from the need to remove existing foundations. Obstructions for further investigations.	High	Medium	High	Adopt a reuse design policy for existing piled foundations or existing foundations should be removed and the resulting excavations backfilled with a suitable compactable granular fill.
Contaminated land – Pollution linkages are indicated to exist	Ill health or death of site end users and/or construction workers Damage to corporate reputation	High	Low	Medium	See Table 7.2

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Figures



Figure 1. Site Location

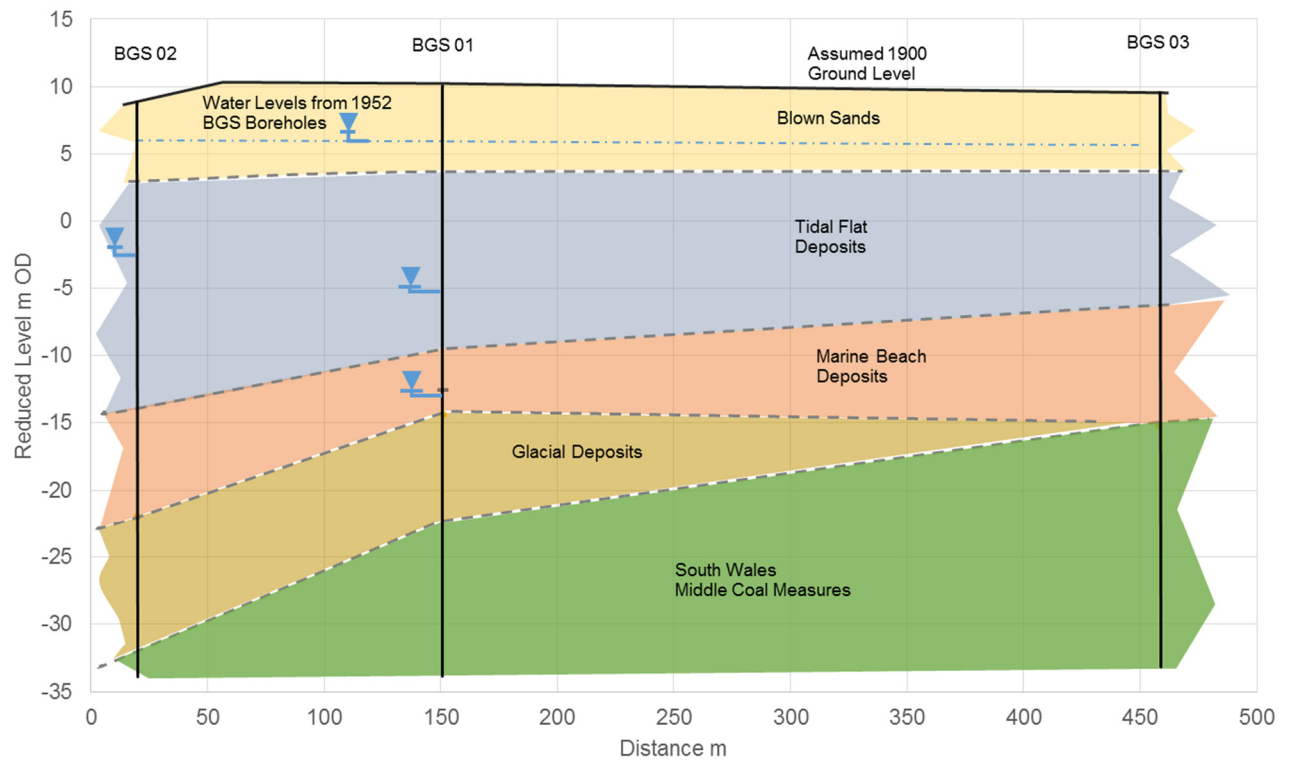


Figure 2 Geological Section from Historic Borehole Information

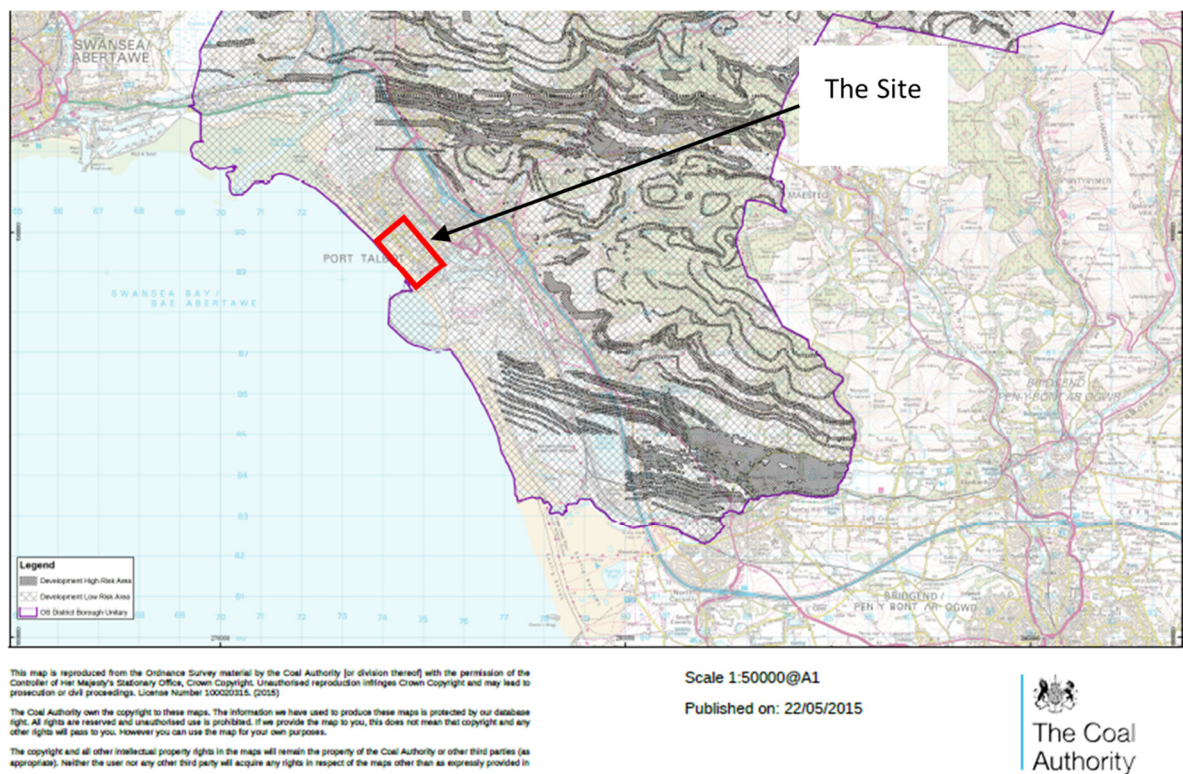
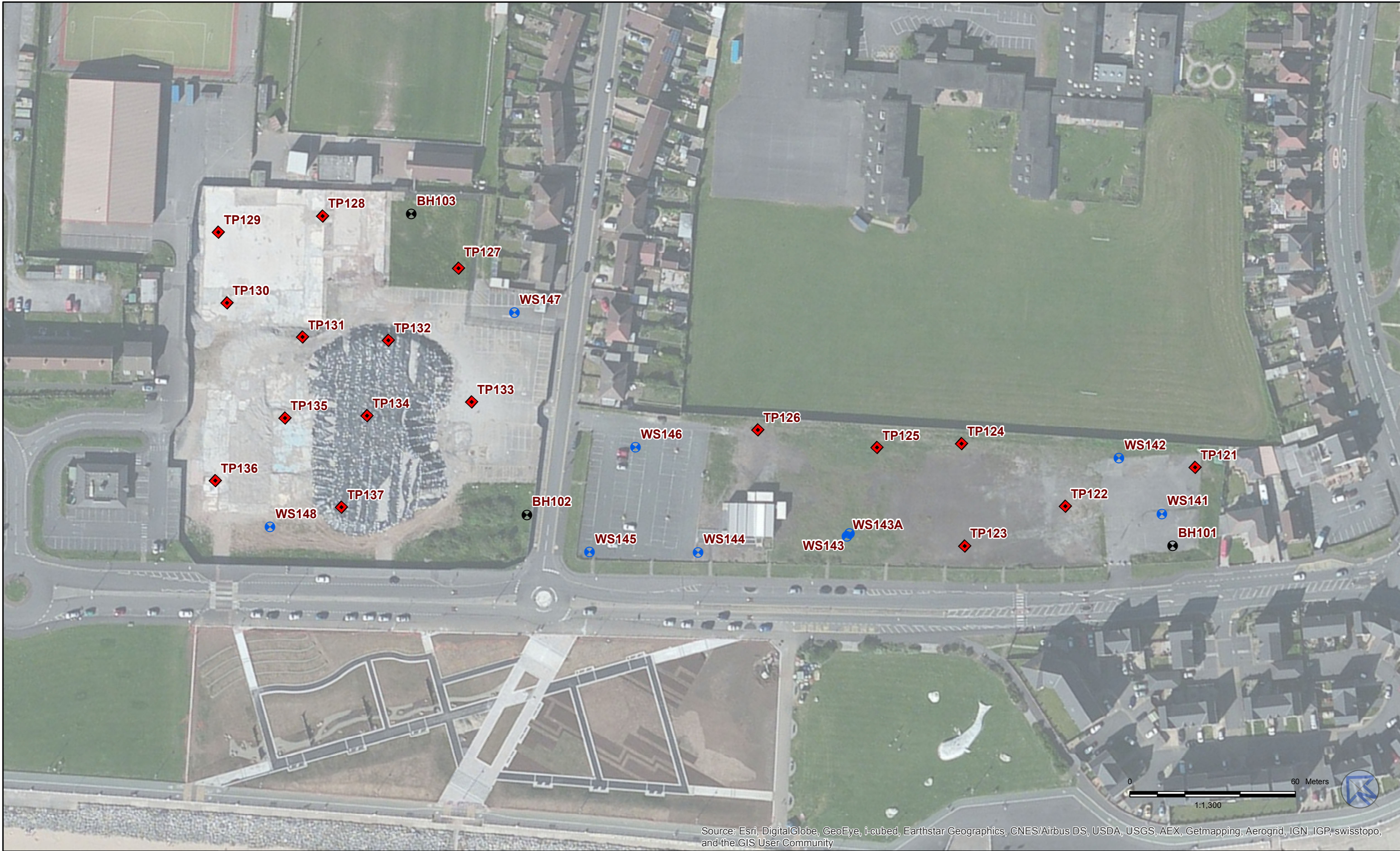


Figure 3 Part of Coal Authority Development Risk Map for Neath Port Talbot

Figure 4 Exploratory Hole Plan





Legend As built CP As built TP As built WS		Disclaimer © Crown copyright and database rights 2015	Status PRELIMINARY/CONFIDENTIAL		Project Afon Lido	Hyder
			Scale 1:1,300	Current Issue Signatures Drawn S.R. Checked M.G. Approved G.W. © Copyright reserved		
01	VERSION 1	20/03/2015	Original Size A3	Height Datum NEWLYN	Title As Built Exploratory Hole Location Plan	Drawing No. 0101
Issue	Description	Date	Grid O.S	Filename: 0101-UA007442-01-Exploratory Hole Location Plan		Project No. UA007442
					Issue 01	

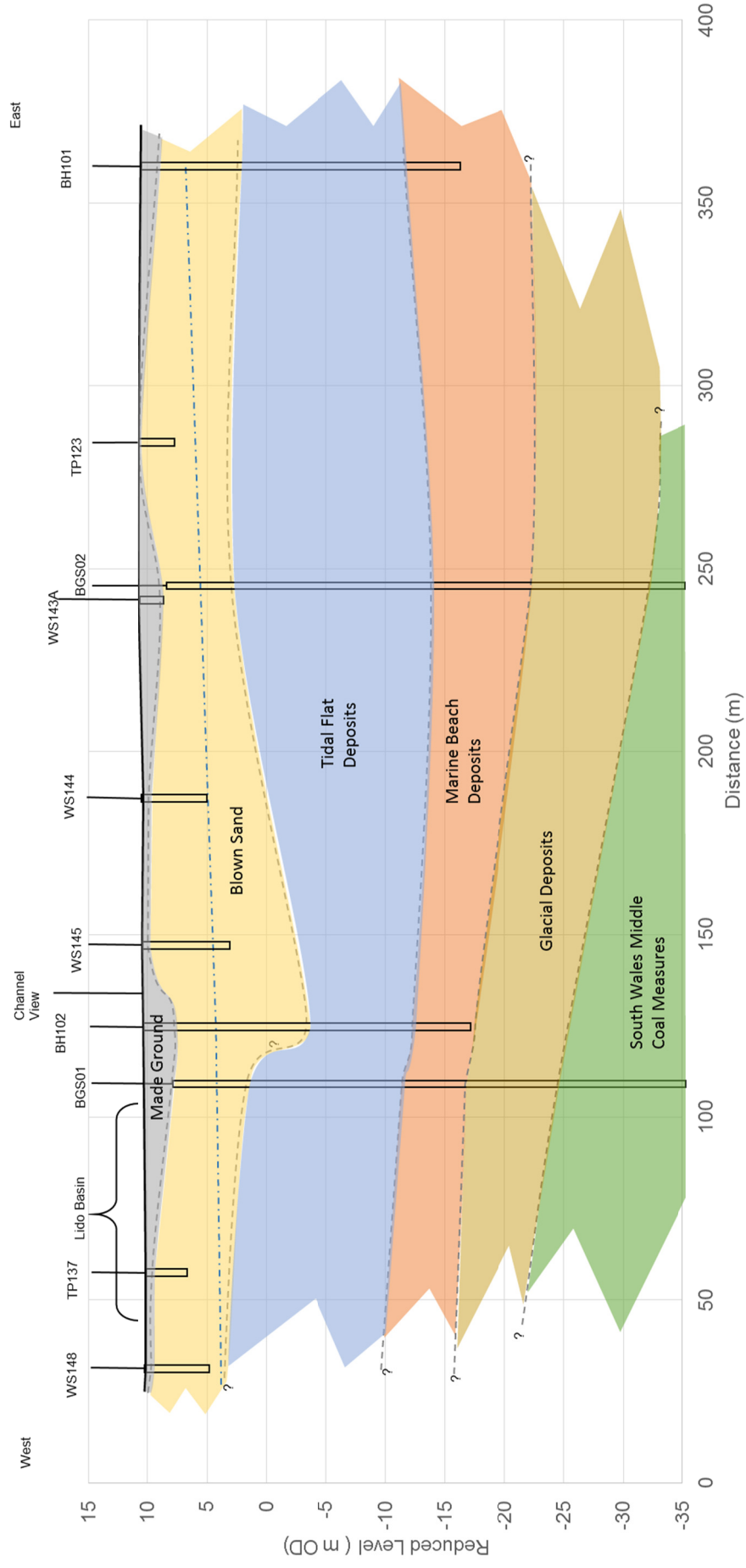


Figure 5. Geological Cross Section for Afan Lido Site

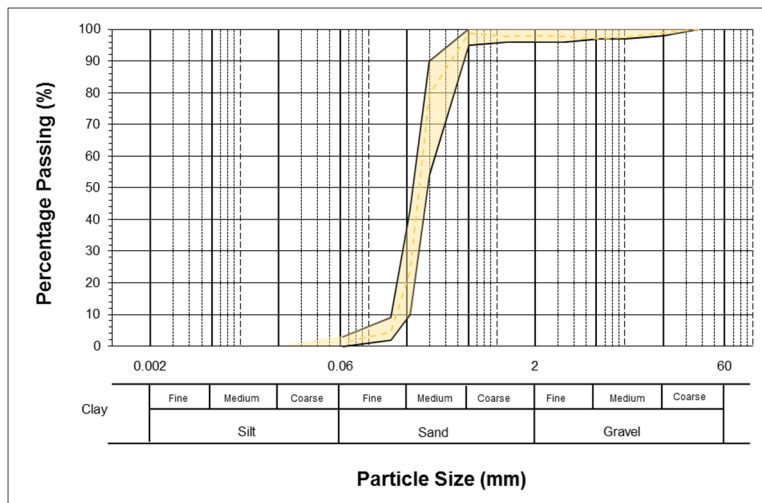


Figure 6a Particle Size Distribution – Blown Sand

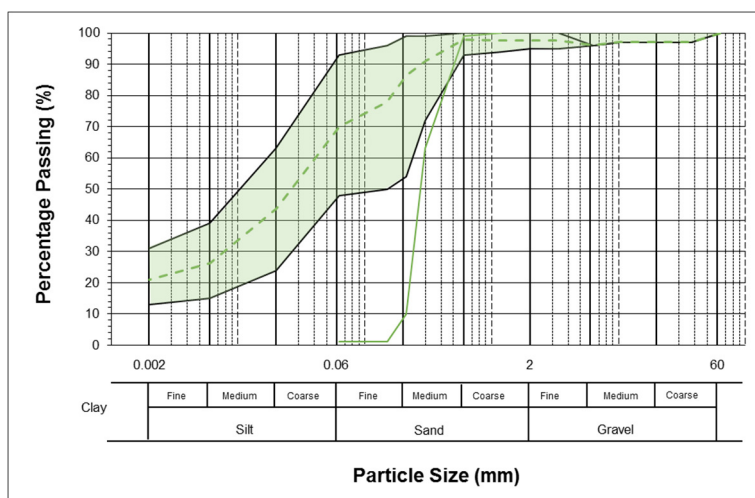


Figure 6b Particle Size Distribution – Tidal Flat Deposits

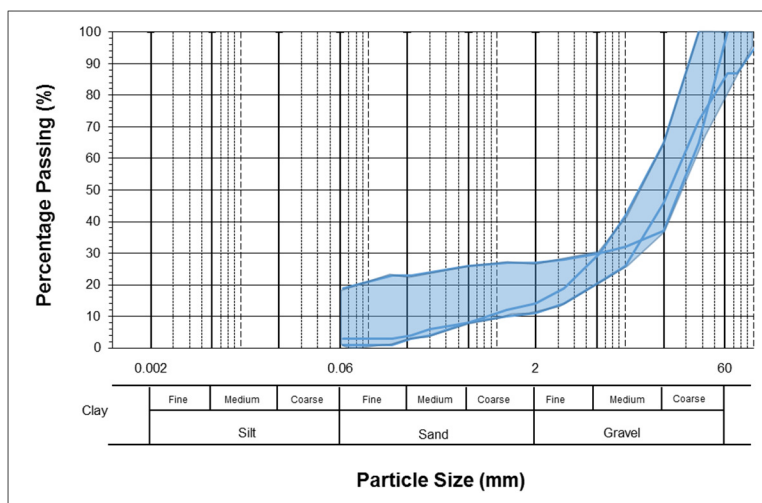


Figure 6b Particle Size Distribution – Marine Beach Deposits

Figure 6. Summary Particle Size Distributions

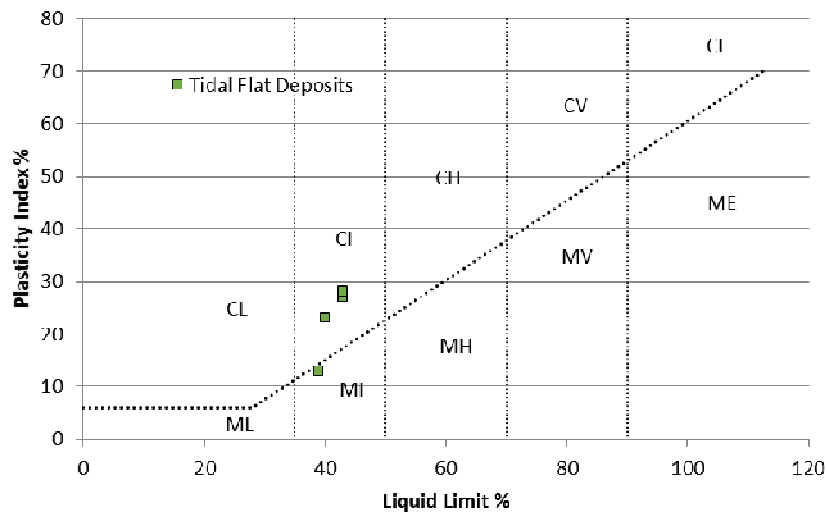
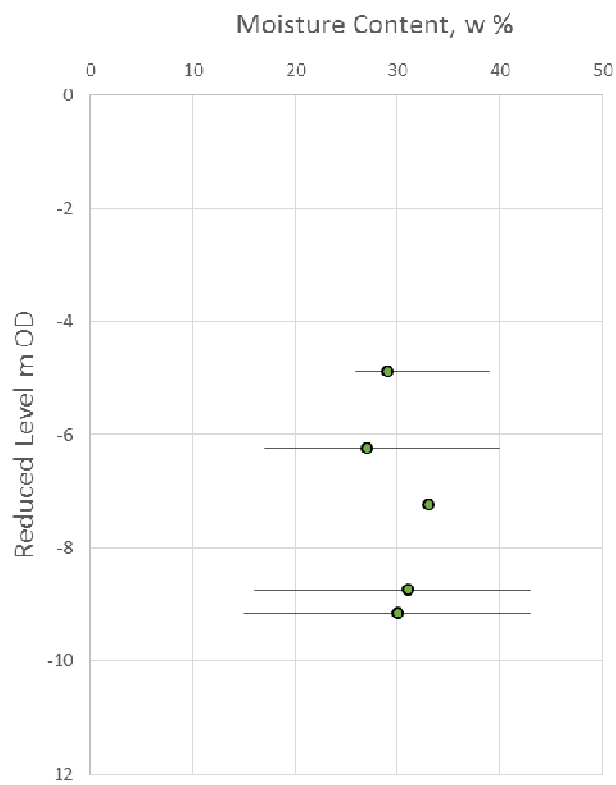


Figure 7. Summary of Classification tests for Tidal Flat Deposits

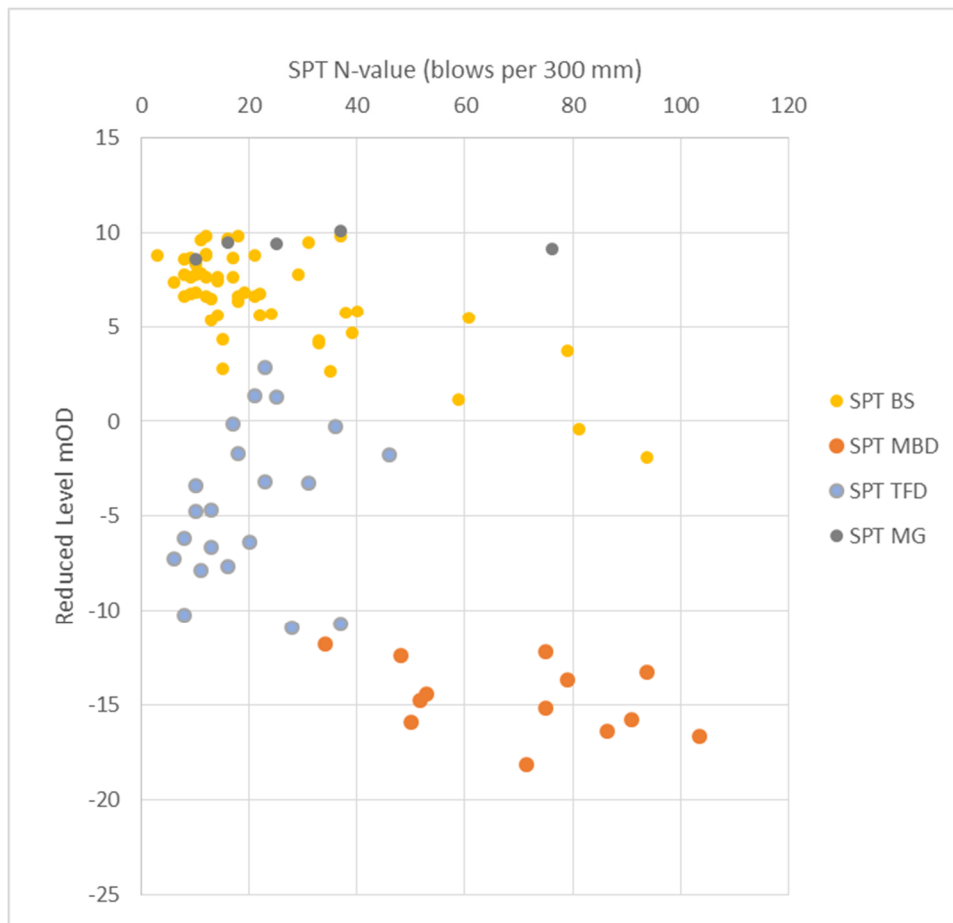


Figure 8. Standard Penetration Tests

Appendix A

Standard Procedures

Investigative Procedures

A.0 General

All ground investigation field work was carried out in general accordance with the recommendations of BS5930:1999+A2:2010 'Code of Practice for Site Investigation' [4] and BS10175 'Investigation of Potentially Contaminated Sites: Code of Practice' [5].

A.1 Routine Sampling

Representative bulk samples, disturbed and undisturbed samples of all strata encountered were recovered as part of the works. These samples were taken in line with the recommendations of BS5930:1999+A2:2010 'Code of Practice for Site Investigation' [4] and are stored in sealed plastic bags, tubs and liners following logging by a suitable Geotechnical Engineer ahead of laboratory testing.

A HCL Geotechnical Engineer logged all exploratory holes in accordance with the recommended procedures in accordance with EN 1997-2:2007 Eurocode 7, provided within:

- BS EN ISO 14688-1:2002 Geotechnical investigation and testing – Identification and Classification of soil – Part 1: Identification and Description [6]; and
- BS EN ISO 14688-2:2004 Geotechnical investigation and testing – Identification and Classification of soil – Part 2: Principles for a classification [7].

This International Standard partially supersedes document BS5930:1999+A2:2010 "Code of Practice for Site Investigations".

A.2 *In Situ* Geotechnical Testing

All *in situ* testing was carried out in accordance with BS EN ISO22475-1:2006 Geotechnical investigation and testing - Sampling methods and groundwater measurements [8], EN ISO22476-2:2005 Geotechnical Investigation and Testing – Field Testing [9] and TRRL PN INT277-04 Dynamic Cone Penetrometer Test and Analysis [24].

A.3 Groundwater

Where groundwater was encountered, measurements and samples were taken in accordance with BS EN ISO22475-1:2006 Geotechnical investigation and testing - Sampling methods and groundwater measurements [8].

A.4 Land Gases

Land gas monitoring was undertaken in accordance with BS 8576 : 2013 - Guidance on Ground Investigations for Ground Gas [15].

The concentrations of the land gases methane, carbon dioxide, carbon monoxide and hydrogen sulphide were measured using a fully calibrated gas monitor.

A.5 Buried Services

Service clearance was undertaken in accordance with HCL's common operating practice COP SA1. This document details the methods and safe working practices used to undertake excavations safely. Prior to breaking ground, services plans were consulted and the area scanned using a Cable Avoidance Tool (CAT) with detected signals marked on the ground. For all investigation positions, other than for machine excavated trial pits, hand excavated inspection pits are completed to 1.20mbgl prior to the use of drilling and boring plant.

Appendix B

Exploratory Hole Logs

SAMPLE TYPES

B	Bulk disturbed sample	ES	Environmental soil sample	SPT	SPT split spoon sample
C	Core sample	EW	Environmental water sample	U	Undisturbed sample
CBR	Disturbed sample from CBR test area	G	Gas sample	UT	Undisturbed thin wall sample
D	Small disturbed sample	L	Liner sample	W	Water sample

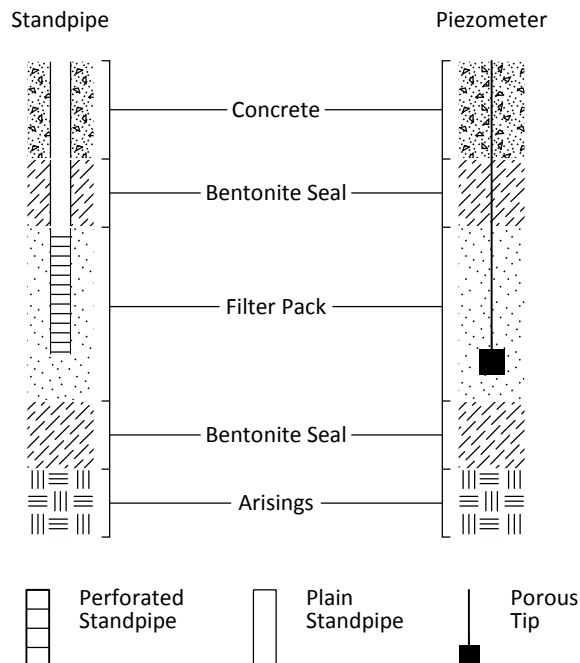
IN-SITU TESTING

SPTs	Standard Penetration Test (using a split spoon sampler) *
SPTc	Standard Penetration Test (using a solid 60 degree cone) *
N	Recorded SPT 'N' Value
-/-	Blows/Pentration (mm) after seating blows totaling 150mm
MX	Mexi Probe Test (records CBR % value)
HV	Hand Shear Vane test (undrained shear strength quoted in kPa)
PP	Pocket Penetrometer test (kg/m ³)
()	Denotes residual test value
PID	Photo Ionisation Detector (ppm)
Kf / Kr	Permeability Test (f = falling head, r = rising head)
HPD	High Pressure Dilatometer Test (pressure meter)
PKR	Packer / Lugeon Permeability Test
CBR	California bearing ratio test

ROTARY CORE DETAILS

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation (% of intact core >100mm)
IF	Fracture Spacing (average fracture spacing; in mm, over indicated length of core) **
NI	Non-Intact core

INSTALLATION & BACKFILL DETAILS



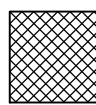
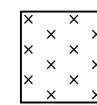
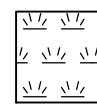
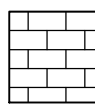
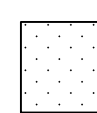
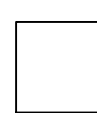
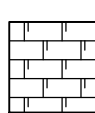
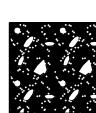
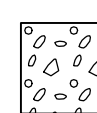
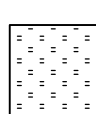
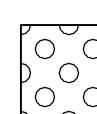
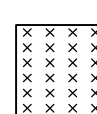
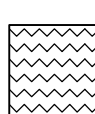
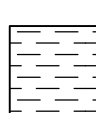
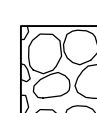
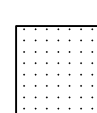
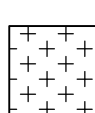
GROUNDWATER

	Groundwater strike; 1st, 2nd etc (number denotes strike order)
	Standing water level after 20 minutes; 1st, 2nd etc (number denotes level order)
	Seepage

STRATUM BOUNDARIES

—	Unit boundary
- -	Estimated unit boundary
- . -	Graduated unit boundary

STRATA LEGENDS - Note: Composite strata types are shown by combining symbols

	Made Ground		Silt		Peat		Limestone
	Concrete		Sand		Void		Chalk
	Tarmacadam		Gravel		Mudstone		Coal
	Topsoil		Cobbles		Siltstone		Metamorphic rock
	Clay		Boulders		Sandstone		Igneous rock

* Where a single value is quoted this is the 'N' value for a complete test signifying 300mm of penetration following a seating drive of 150mm. Where this full penetration is not achieved the number of blows is quoted for the penetration below the test total of 300mm, e.g.: 50/75. Where total penetration is less than the seating driving this is indicated by the prefix '+' and the number of blows for total penetration, e.g.: +50/75.

** Where spacing varies significantly, the minimum, average and maximum are shown

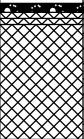
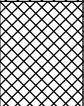
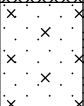
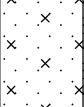
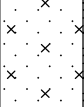
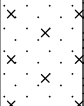
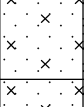
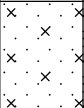
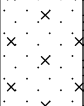
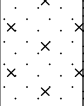
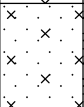
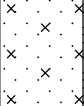


Percussive Borehole Log

BH101

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.76	16-02-15	1 of 3
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274814.5	189312.1	23-02-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO\UA007442.GPJ AGS 3.1.GDT <<DrawingFilesSpec>> 30/06/2015 14:24:24

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA							Install/Backfill			
Depth	Type/No.	Depth	Type/No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
0.20	ES							BLACK BITUMINOUS PAVING		10.70								
0.50	ES							MADE GROUND: Pink brown slightly sandy GRAVEL of fine to medium angular limestone (type 1 sub-base).		0.06	10.66	10.62						
1.00	ES							MADE GROUND: Grey slightly silty sandy GRAVEL of fine to medium irregular aerated slag.		0.10	(0.76)	0.14						
1.00-1.20	B1							MADE GROUND: Pale brown locally grey-brown gravelly fine to medium SAND with low cobble and boulder content. Gravel is subrounded sandstone and aerated slag, cobbles and boulders are half bricks and blocky sandstone fragments.		0.90	9.86							
		1.30	SPTs	N=16	dry			MADE GROUND: Medium dense dark slightly silty fine to medium SAND with moderate hydrocarbon odour. Drillers report gravel size fragments of demolition rubble.			(0.70)	1.60	9.16					
1.90-2.20	ES							Loose to medium dense pale brown slightly silty fine medium SAND. Rare coarse gravel and cobble size subangular sandstone fragments. No evidence of contamination from overlying layer. (BLOWN SAND)										
1.90-2.20	B3	2.00	SPTs	N=3	dry													
		2.45	SPTs	N=8*	dry			2.00 - 4.00 Becoming loose, slightly silty to silty sand towards 2.00 m depth with closely spaced thin yellow-brown fine to coarse sand lenses.										
2.90-3.20	B5																	
		3.00	SPTs	N=10	dry													
3.90-4.20	B7																	
		4.00	SPTs	N=9														
4.90-5.20	B9																	
		5.00	SPTs	N=38	4.4													
6.30-6.60	B11							Dense pale brown slightly silty fine to medium SAND. Locally with rare gravel (possibly cavings from above). (BLOWN SAND)										
		6.50	SPTs	N=33	4.7			4.90 - 7.50 Rare coarse gravel size aerated low density irregular slag/clinker embedded in sand between 4.90m and 5.20m depth.										
								Rare coarse sand fine gravel size slag/clinker fragments continue from 5.20m to 7.50m depth. Sand is dense over this depth range										
						16/02/2015 17:00	7.50											
						17/02/2015 08:00	7.50											
7.90-8.20	B13							Loose pale brown silty fine to medium SAND. (BLOWN SAND).										
8.30-8.60	B15	8.00	SPTs	N=15	6.7													
9.40-9.60	B16							Interbedded soft green-grey silty CLAY and medium dense locally pale brown mottled silty fine to medium and locally coarse SAND. Rare fine gravel size subrounded elongate mudstone. Closely spaced horizons up to 50 to 150 mm thick of soft blue to green-grey slightly organic silty clay containing rare decomposed thin roots. (TIDAL FLAT DEPOSITS).										
		9.50	SPTs	N=25	9.1													
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED			
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.00	Inspection Pit		22.50	24.00	2:00	16/02/2015 12:00	4.50	4.00	3.90	n/s	200	13.50	200	13.50			
1.00	26.82	Cable Percussion		24.00	25.45	6:00						150	26.82	150	26.50			
Remarks																Termination Depth:		
BH completed at 26.82 m; dual installation as detailed.																26.82m		
*Double driven SPT: N value for 2nd drive.																		



HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW



Percussive Borehole Log

BH101

Project Afan Lido	Project No. UA007442-04	Ground Level (m AOD) 10.76	Start Date 16-02-15	Sheet 2 of 3
Client Neath Port Talbot County Borough Council	Easting (OS) 274814.5	Northing (OS) 189312.1	Finish Date 23-02-15	Scale 1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3.1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:24

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA				Install/Backfill						
Depth	Type/No.	Depth	Type/No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
10.90-11.20	B18	11.00	SPTs	N=36	8.4		Interbedded soft green-grey silty CLAY and medium dense locally pale brown mottled silty fine to medium and locally coarse SAND. Rare fine gravel size subrounded elongate mudstone. Closely spaced horizons up to 50 to 150 mm thick of soft blue to green-grey slightly organic silty clay containing rare decomposed thin roots. (TIDAL FLAT DEPOSITS). (continued)		(3.40)									
							11.00 - 11.70 Becoming dense towards 11.00m depth		11.70	-0.94								
12.40-12.70	B20	12.50	SPTs	N=46	8.6		Dense mid-brown and locally green-grey mottled silty fine/medium SAND. Occasional fine to coarse gravel size shells and shell fragments. (TIDAL FLAT DEPOSITS).											
13.30-14.10	B22	14.00	SPTs	N=31	6.6	18/02/2015 08:00 13.50 4.60	13.80 - 15.50 Occasional lenses up to 10 mm thick of soft green-grey slightly organic silty clay below 13.80m depth		(3.90)									
15.00-15.30	B24	15.50	SPTs	N=10		19/02/2015 08:00 15.00 4.20	Loose to medium dense green-grey very silty fine SAND with very closely spaced horizons of soft green-grey and dark grey mottled slightly organic silty clay. Clay generally thinly bedded (<200mm), occasionally up to 300 mm. (TIDAL FLAT DEPOSITS).		15.60	-4.84								
17.00-17.45	UT26			18blows					(2.40)									
17.40-17.80	B28	17.40	SPTs	N=13														
18.00-18.70	B30	18.00	SPTs	N=6					18.00	-7.24								
		18.45	SPTs	N=9*			Soft to firm green-grey slightly organic silty CLAY with very closely spaced lenses of peaty organic silt up to 5mm thick and pale mid grey sandy silt and silty fine sand horizons. Green grey organic silty clay horizons becoming dominant towards 21.00m depth. (TIDAL FLAT DEPOSITS)											
19.50-19.95	UT31			9blows					(3.00)									
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS				HOLE/CASING DIAMETER		WATER ADDED						
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
Remarks																Termination Depth:		
BH completed at 26.82 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																26.82m		



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All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW



Percussive Borehole Log

BH101

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.76	16-02-15	3 of 3
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274814.5	189312.1	23-02-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3.1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:25

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA					Install/ Backfill					
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
21.00-21.30	B33	21.00	SPTs	N=8	20/02/2015 08:00	21.30 4.30	Soft to firm green-grey slightly organic silty CLAY with very closely spaced lenses of peaty organic silt up to 5mm thick and pale mid grey sandy silt and silty fine sand horizons. Green grey organic silty clay horizons becoming dominant towards 21.00m depth. (TIDAL FLAT DEPOSITS) <i>(continued)</i>		21.00 -10.24									
		21.45	SPTs	N=9*			Soft to firm grey slightly organic clayey SILT with very closely spaced partings containing dark-brown organic speckling and occasional decomposed thin roots surrounded by dark grey discolouration. (TIDAL FLAT DEPOSITS)		(0.80)									
21.90-22.30	B34						Soft green-grey and brown mottled organic clayey SILT with very closely spaced sandy silt horizons and dark brown organic peaty fragments. (TIDAL FLAT DEPOSITS)		21.80 -11.04									
22.40-22.60	B36	22.50	SPTc	N=34			Dense grey clayey sandy GRAVEL with low cobble content. Gravel and cobbles are subangular to rounded often flat to tabular sandstone. (MARINE BEACH DEPOSIT)		(0.60)									
									22.40 -11.64									
23.80-24.10	B38	24.00	SPTc	N=50/160			Very dense grey and grey brown silty very sandy GRAVEL with medium-high cobble content. Gravel and cobbles are subrounded to subangular locally flat to tabular to elongate sandstone, upto 0.15m in size where visible in returns. (MARINE BEACH DEPOSIT))		23.80 -13.04									
25.40-25.60	B39	25.50	SPTc	N=50/290	23/02/2015 08:00	25.45 4.20			(3.02)									
26.30-26.50	B41	26.50	SPTc	N=50/165	23/02/2015 10:00	26.50	End of Exploratory Hole		26.82 -16.06									
DRILLING TECHNIQUE				CHISELLING			WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED			
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
Remarks																Termination Depth:		
BH completed at 26.82 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																26.82m		



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All depths in meters (unless otherwise stated)
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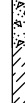
Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.62	23-02-15	1 of 3
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274663.0	189491.1	02-03-15	1:50

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA							Install/ Backfill						
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)											
0.90-1.10	B1	1.20	SPTs	N=25	dry	24/02/2015 17:00	1.40 dry	Grass over TOPSOIL comprising brown slightly gravelly CLAY and SILT with frequent-thin roots. Gravel is fine to medium subangular sandstone.	  	0.16 10.46 (0.40)											
1.10-1.30	B2		0.56 10.06 (0.44)																		
1.20-1.65	D3		1.00 9.62 1.20 9.42 1.40 9.22																		
1.90-2.30	B4	2.00	SPTs	N=10				MADE GROUND: Firm grey-brown and orange brown mottled slightly sandy slightly gravelly CLAY AND SILT with occasional thin roots in upper part (to 0.40m depth) Gravel is fine to coarse subangular limestone and sandstone with medium cobble content of angular flat to irregular limestone up to 0.20m in size below 0.70m depth.	 	(1.50)											
2.00-2.45	D5		MADE GROUND: Medium dense brown and grey-brown very silty gravelly SAND with low cobble content. Silt and sand are predominantly reworked natural soil with occasional dark grey ash inclusions. Gravel and cobbles are subrounded sandstone, irregular slag and clinker and occasional coal fragments. Old broken plastic container and occasional plant remains.																		
2.90-3.20	B6		MADE GROUND: Loose pale brown/orange-brown locally slightly silty fine/medium SAND with rare fine gravel size subangular flat mudstone fragments surrounded by dark grey discolouration.																		
3.00-3.45	D7	3.00	SPTs	N=12				MADE GROUND: Loose pale brown and locally pale grey-brown slightly silty fine to medium SAND. Single gravel size glass and pottery fragments embedded in SPT spoon sample at 2.00-2.45m depth.	 	2.90 7.72											
3.90-4.30	B8		Medium dense pale brown slightly silty fine/medium SAND with closely spaced weakly cemented horizons up to 30mm thick. Rare coarse sand-fine gravel size angular flat dark grey mudstone and shell fragments. (BLOWN SAND).																		
4.00-4.45	D9			(3.60)																	
4.90-5.20	B10	5.00			SPTs	N=14					6.50 4.12										
5.00-5.45	D11		6.50		SPTs	N=33								Dense pale brown and orange-brown slightly silty fine to medium and locally coarse SAND with occasional grey-brown mottling and irregular silty veining. Rare fine to medium subangular flat mudstone gravel (BLOWN SAND).							
6.20-6.60	B12			(3.00)																	
6.50-6.95	D13	8.00			SPTs	N=35	Very dense pale brown slightly fine-coarse SAND with occasional fine to medium gravel size partially decomposed layers and shell fragments. (BLOWN SAND).														
7.90-8.20	B14		9.50 1.12																		
8.00-8.45	D15			9.50	SPTs	N=50/255															
9.40-9.65	B16	9.50			SPTs	N=50/255															
9.50-9.95	D17				SPTs	N=50/255															
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS				HOLE/CASING DIAMETER									WATER ADDED		
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.					Depth	From	To
0.00 1.20	1.20 27.45			24.00 26.50	26.50 27.00	6:00 2:00	25/02/2015 10:30	6.20	6.00	6.00	n/s	200 150	13.50 27.00	200 150	13.50 27.00						
Remarks BH completed at 27.45 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																Termination Depth: 27.45m					



Percussive Borehole Log

BH102

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.62	23-02-15	2 of 3
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274663.0	189491.1	02-03-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO\UA007442.GPJ AGS 3.1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:32

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA								Install/ Backfill		
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
10.90-11.20	B18	11.00	SPTs	N=50/185			Very dense pale brown slightly fine-coarse SAND with occasional fine to medium gravel size partially decomposed layers and shell fragments. (BLOWN SAND). <i>(continued)</i>		(4.30)									
11.00-11.45	D19																	
12.40-12.70	B20	12.50	SPTs	N=50/160		25/02/2015 17:00	12.70											
12.50-12.95	D21																	
13.80-14.20	B22	14.00	SPTs	N=10		26/02/2015 08:00	12.70	Thickly interlaminated soft to firm green-grey and occasionally dark grey mottled slightly organic silty CLAY AND loose-medium dense green grey-brown silty fine to coarse SAND containing occasional fine gravel size shell fragments. Clay horizons appear to be dominant constituent and up to 0.10m thickness. (TIDAL FLAT DEPOSITS)		(1.90)								
14.00-14.45	D23																	
15.50-15.95	UT24			26blows						15.70	-5.08							
16.90-17.20	B25	17.00	SPTs	N=20			Firm green-grey organic sandy (fine) clayey SILT with extremely closely spaced silty sand horizons, closely spaced black peaty veins up to 5mm thick, occasional dark grey mottling and rare decomposed thin roots. (TIDAL FLAT DEPOSITS).		(2.80)									
17.00-17.45	D26																	
18.30-18.60	B27	18.50	SPTs	N=11			Soft to firm grey and grey-brown slightly organic slightly sandy (fine) SILT with extremely closely spaced thin (<10m) horizons green-grey silty fine sand. Extensively disturbed by drilling. (TIDAL FLAT DEPOSITS).		18.50	-7.88								
18.50-18.95	D28																	
19.90-20.20	B29																	
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS						HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
Remarks																Termination Depth:		
BH completed at 27.45 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																27.45m		



HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW

1:50

HYDRA SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO (18032015)\GPJ_AGS 3 - 1 GDT <<DrawingFilesSpec>> 30/06/2015 14:24:32



Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	9.34	17-02-15	1 of 4
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274714.3	189596.2	25-02-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3.1.GDT <<DrawingFilesSpec>> 30/06/2015 14:24:34

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA					Install/ Backfill					
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
0.00-1.00	B4						Grass over TOPSOIL comprising moist brown slightly organic slightly sandy CLAY/SILT with occasional thin roots.		0.20	9.14								
0.20	ES1						MADE GROUND: Medium dense dark grey and green grey silty gravelly SAND with medium cobble content. Gravel and cobbles are irregular concrete, crushed/whole brick and subangular sandstone.		(0.70)									
0.50	ES2								0.90		8.44							
1.00	ES3						Medium dense pale brown/yellow-brown locally slightly silty fine/medium SAND. (BLOWN SAND)		(1.10)									
1.00-1.45	D5	1.00	SPTs	N=10	dry													
1.45-2.00	B6								(1.10)									
2.00-2.45	D7								(1.10)									
2.00-2.45	D7	2.00	SPTs	N=6	dry	17/02/2015 2.00 18/02/2015 08:00			2.00	7.34								
2.45-2.75	D8	2.45	SPTs	N=15*	dry		Medium dense pale brown fine/medium SAND with occasional grey to dark grey silt lenses and irregular thick laminae up to 10mm thick. (BLOWN SAND)		(1.90)									
2.75-3.00	B9																	
3.00-3.45	D10	3.00	SPTs	N=18	dry				(1.90)									
3.45-4.00	B11								(1.90)									
4.00-4.45	D12						Medium dense brown and orange-brown silty fine to medium SAND thickly interlaminated with pale brown to yellow-brown fine to coarse sand. (BLOWN SAND)		3.90		5.44							
4.45-5.00	B13	4.00	SPTs	N=13	dry													
5.00-5.45	D14						3.90 - 6.60 Slightly silty to silty fine to medium sand is frequently weakly cemented in horizons up to 6.60m		(2.70)									
5.00-5.50	B15	5.00	SPTs	N=15	dry													
5.50-6.50	B16								(2.70)									
6.50-6.95	D17	6.50	SPTs	N=23	5.2				6.60	2.74								
6.95-8.00	B18						Medium dense green grey-brown and pale brown fine to medium SAND with occasional fine/medium gravel size shell fragments and very closely spaced impersistent lenses up to 10mm thick of soft blue-grey organic silty clay. (TIDAL FLAT DEPOSITS)		(5.00)									
8.00-8.45	D19																	
8.00-8.50	B20	8.00	SPTs	N=21	5.4				(5.00)									
8.50-9.50	B21					18/02/2015 8.70 17:00 5.40 19/02/2015 8.70 08:00 5.20			(5.00)									
9.50-9.95	D22								(5.00)									
9.50-10.00	B23	9.50	SPTs	N=17	5.3				(5.00)									
10.00-11.00	B24								(5.00)									
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED			
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit		23.00	23.40	1:00	18/02/2015 09:00	5.00	4.20	5.00	n/s	200	12.70	200	12.70			
1.20	30.40	Cable Percussion		24.70	25.00	1:00						150	30.00	150	29.80			
				29.40	29.80													
Remarks																Termination Depth:		
BH completed at 30.40 m; dual installation as detailed.																30.40m		
*Double driven SPT: N value for 2nd drive.																		



HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW



Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	9.34	17-02-15	2 of 4
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274714.3	189596.2	25-02-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO\UA007442.GPJ AGS 3.1.GDT <<DrawingFilesSpec>> 30/06/2015 14:24:35

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA					Install/ Backfill					
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
11.00-11.45	D25	11.00	SPTs	N=18	5.2	19/02/2015 13.00 17:00 5.40 20/02/2015 13.00 08:00 4.50	Medium dense green grey-brown and pale brown fine to medium SAND with occasional fine/medium gravel size shell fragments and very closely spaced impersistent lenses up to 10mm thick of soft blue-grey organic silty clay. (TIDAL FLAT DEPOSITS) (continued)		11.60 -2.26									
11.00-11.50	B26																	
11.60-12.50	B27																	
12.50-12.95	D28	12.50	SPTs	N=23	5.3		Thickly interlaminated medium dense green-grey and pale brown mottled very silty fine to medium SAND with occasional fine/medium gravel sized shell fragments AND soft to firm green grey organic slightly sandy clayey SILT with extremely closely spaced fine sand partings and with rare dark brown-black peaty inclusions (up to medium gravel size). (TIDAL FLAT DEPOSITS)		(2.40)									
13.80-14.10	B29																	
14.00-14.45	D30						14.00	SPTs				N=13	NR	Soft to firm green-grey and green-brown slightly organic sandy (fine) SILT with extremely closely spaced silty fine sand lenses/partings up to 10mm thick. (TIDAL FLAT DEPOSITS) Below 18.40 m becoming thickly interlaminated very silty SAND and sandy SILT in approximately equal proportions.		14.00 -4.66		
15.40-15.60	B31																	
15.50-15.95	D32	15.50	SPTs	N=8	NR													
16.90-17.20	B33																	
17.00-17.45	D34						17.00	SPTs	N=16			NR	(6.40)					
18.40-18.60	B35																	
18.50-18.95	UT36	14blows																
19.90-20.20	B37																	
DRILLING TECHNIQUE			CHISELLING		WATER OBSERVATIONS				HOLE/CASING DIAMETER				WATER ADDED					
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (litr)
Remarks BH completed at 30.40 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																Termination Depth: 30.40m		



HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

Logged By
MWms

Checked By
GRW



Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	9.34	17-02-15	3 of 4
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274714.3	189596.2	25-02-15	1:50

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3.1.GDT <<DrawingFilesSpec>> 30/06/2015 14:24:35

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA							Install/ Backfill			
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	Casing Water	Description	Legend	Depth, Level (thickness)								
20.00-20.45	D38	20.00	SPTs	N=37	4.0	20/02/2015 17:00	20.00	Medium dense grey and green-grey clayey silty sandy GRAVEL with medium cobble content. Gravel and cobbles are mainly subrounded locally flat/tabular sandstone, up to 0.10m in size. (MARINE BEACH DEPOSITS)		20.40 -11.06								
20.45-21.50	B39					23/02/2015 10:00	3.80			(1.10)								
21.50-22.00	B41	21.50	SPTc	N=50/200	7.4					21.50 -12.16								
23.00-23.50	B43	23.00	SPTc	N=50/190	7.2			Very dense grey and grey-brown silty sandy GRAVEL with high cobble content. Sand is fine to coarse. Gravel and cobbles are subrounded to subangular frequent tabular/elongate sandstone and occasional quartz conglomerate. (MARINE BEACH DEPOSITS)		(3.00)								
24.50-25.00	B45	24.50	SPTc	N=50/200	6.8	23/02/2015 17:00	24.50 7.20			24.50 -15.16								
25.70-26.00	B46	26.00	SPTc	N=50/145	7.3	24/02/2015 08:00	24.50 6.80			(4.20)								
27.50-28.00	B50	27.50	SPTc	N=50/210	7.7			Very dense grey brown silty very sandy GRAVEL with medium cobbles. Sand is fine to coarse, gravel and cobbles are subrounded to subangular frequently tabular/elongate sandstone and occasional quartz-conglomerate. (MARINE BEACH DEPOSITS)		28.70 -19.36								
28.70-29.00	B51									(1.70)								
29.00-29.40	D52	29.00	SPTc	N=50/255	8.1													
30.00-30.40	D53					24/02/2015 17:00	29.80 8.10	Very stiff/hard darky grey-grey brown slightly sandy gravelly CLAY with variable cobble content. Coarse fragments are subrounded to subangular sandstone. (GLACIAL TILL).										
						25/02/2015 08:00	29.80 7.20											
DRILLING TECHNIQUE				CHISELLING		WATER OBSERVATIONS					HOLE/CASING DIAMETER			WATER ADDED				
From	To	Technique		Hard From	Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
Remarks																Termination Depth:		
BH completed at 30.40 m; dual installation as detailed. *Double driven SPT: N value for 2nd drive.																30.40m		



HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)

Equipment Used
Dando 2000

Contractor
Hyder Consulting (UK) Ltd

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MWms

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GRW

Sheet
4 of 4

Scale

1:50

Termination Depth:	30.40m
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Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.80	16-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274840.9	189325.5	16-02-15	1:25

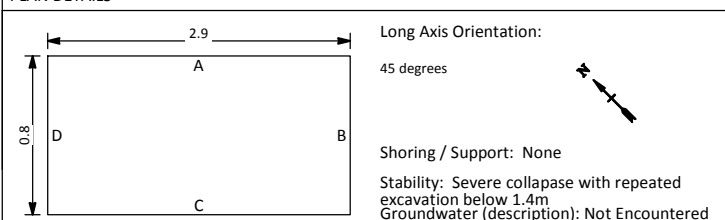
SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)	
0.20	ES1					BLACK BITUMINOUS PAVING		10.74	
						MADE GROUND: Dark grey-brown locally silty, very sandy GRAVEL. Silt and sand are predominantly slag, gravel is fine to coarse subangular aerated slag and occasional brick and sandstone.		0.06 (0.20)	
						MADE GROUND: Pale grey brown sandy GRAVEL with medium cobble content. Gravel and cobbles are irregular aerated slag and consist of fine to medium gravel size fragments.		0.26 10.54	
0.35	B2								
0.50	ES3					MADE GROUND: Brown and occasionally grey-brown locally slightly silty gravelly fine/medium SAND with low-medium cobble content. Gravel and cobbles are subangular aerated irregular slag and are brick and sandstone.		0.40 10.40	
0.60	B4					(0.40)			
						0.80 10.00			
1.20	ES5					Pale yellow-brown fine to medium SAND with closely spaced impersistant lenses grey-brown silty sand. Occasional fine to medium gravel size slag fragments pushed into upper surface. (BLOWN SAND)		(0.80)	
1.40	B6								
						1.60 9.20			
2.00	B7					Pale brown and pale grey-brown locally slightly silty fine to medium SAND. (BLOWN SAND)		(1.00)	
						2.60 8.20			
						End of Exploratory Hole			



Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.83	16-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274798.4	189350.3	16-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA			Install/Backfill
Depth	Type/No.	Depth	Type/No.	Results		Description	Legend	Depth, Level (thickness)	
0.20	ES1					MADE GROUND: Slightly moist dark grey-brown silty very sandy GRAVEL with low cobble content. Silt and sand are predominantly slag, gravel and cobbles are angular to subangular to aerated slag, some projecting from ground surface.		0.11 10.72	
0.30	B2					MADE GROUND: Dark grey-brown and occasionally purple-grey very sandy GRAVEL with medium cobble and medium boulder content. Sand is slag, coarse fragments are angular to subangular locally aerated slag up to 0.30 m in size.		(0.21) 0.32 10.51	
0.50	ES3					Pale brown to yellow-brown and locally pale grey-brown mottled fine to medium SAND with rare dark grey-brown thin silt laminae to 0.55 m depth. (BLOWN SAND)		(1.08) 1.40 9.43	
0.70	B4								
1.00	ES5								
1.30	B6								
2.00	B7					Pale brown locally slightly silty fine to /medium SAND. (BLOWN SAND)		(1.30) 2.70 8.13	
						End of Exploratory Hole			

PLAN DETAILS



Remarks

Termination Depth:
2.70mHCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 9EYAll depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed h:mm (unless otherwise stated)Equipment Used
JCB 3CXContractor
Hyder Consulting (UK) LtdLogged By
MWmsChecked By
GRW

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE:GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO\UA007442 AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:19

Project

Afan Lido

Client
Neath Port Talbot County Borough Council

Project No.
UA007442-04
Easting (OS)
274763.1

Ground Level (m AOD)
10.85
Northing (OS)
189367.2

Start Date
17-02-15

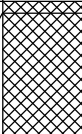
Finish Date
17-02-15

Sheet
1 of 1
Scale
1:25

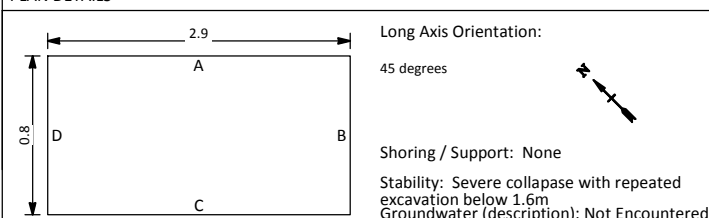
SAMPLES		TESTS			Water Strikes	STRATA				Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)		
0.00-0.10	B1				MADE GROUND: Dark grey-brown slightly silty gravelly SAND with low cobble and boulder content. Cobbles and boulders are present at surface and locally protrude 15 mm to 25 mm. Sand is predominantly slag-based, gravel is fine to coarse angular to irregular slag and occasional brick. Cobbles and boulders are angular irregular slag up to 0.35m in size and occasional brick fragments. Occasional thin roots and organic sandy silt content at top of layer. Pale yellow-brown fine to medium SAND with occasional dark grey-brown thin silt laminae in upper part (to 0.30m depth). (BLOWN SAND)		0.12	10.73		
0.10	ES2						(0.63)			
0.30	B3						0.75	10.10		
0.50	ES4						(1.95)			
1.00	B5				Pale brown fine to medium SAND with closely spaced impersistent weakly cemented very thinly bedded slightly silty sand. (BLOWN SAND)					
1.00	ES6									
1.80	B7									
2.70	B8									
End of Exploratory Hole							2.70	8.15		

PLAN DETAILS		Remarks
	Long Axis Orientation: 45 degrees Shoring / Support: None Stability: Severe collapse with repeated excavation below 1.2m Groundwater (description): Not Encountered	Termination Depth: 2.70m

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	11.10	17-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274789.4	189393.2	17-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA				Install/Backfill
Depth	Type/No.	Depth	Type/No.	Results		Description	Legend	Depth, Level (thickness)		
0.10-0.40	B1					MADE GROUND: Dark grey-brown silty gravelly SAND with frequent thin roots. Silt and sand are slag and organic material. Gravel is fine to medium, angular to subangular slag.		0.04 11.06		
0.20	ES2					MADE GROUND: Dark grey-brown slightly silty SAND AND GRAVEL with low cobble and low small boulder content. Silt and sand are slag. Gravel, cobble and boulders are angular to subangular to irregular slag (often aerated) up to 0.25 m in size.		(0.44)		
0.50	ES3					MADE GROUND: Pale yellow-brown and pale grey-brown mottled slightly gravelly fine to medium SAND with occasional laminae of dark grey silty sand. Gravel is coarse slag fragments mainly present at surface. Slag fragments and dark veining absent below 0.55 m depth.		0.48 10.62		
0.70	ES4						(0.87)			
1.00	ES5						0.85 - 1.05 m zone of frequent grey-brown silty sand inclusions and impersistent lenses of stiff dark green-grey slightly gravelly clay and dark grey-black organic clay and silt.	1.35 9.75		
1.50	B6					MADE GROUND: Soft to firm dark grey-black slightly organic CLAY, thinly interbedded with loose yellow brown fine to medium SAND.		(0.20)		
						Pale brown fine to medium SAND with closely spaced impersistent weakly cemented lenses up to 20mm thick. (BLOWN SAND).		1.55 9.55		
								(1.20)		
2.60	B7						2.75 8.35			
							Pale brown and yellow-brown slightly silty fine to medium SAND with closely spaced thin fine-coarse bedding. (BLOWN SAND).	(0.45)		
3.20	B8					End of Exploratory Hole		3.20 7.90		

PLAN DETAILS



Remarks

Termination Depth:
3.20m

Project

Afan Lido

Client

Neath Port Talbot County Borough Council

Project No.

UA007442-04

Fasting (QS)

274767.5

Ground Level (m AOD)

10.98

Northing (QS)

189414.7

Start Date

17-02-15

Finish Date

17-02-15

Sheet

1 of 1

Scale

1:25

SAMPLES		TESTS			Water Strikes	STRATA				Install/Backfill
Depth	Type/No.	Depth	Type/No.	Results		Description	Legend	Depth, Level (thickness)		
0.10-0.19	ES1					MADE GROUND: Dark grey-brown silty gravelly SAND with frequent thin roots. Sand composed of slag and organic material, gravel is fine to medium angular to subangular irregularly formed slag.		(0.19) 0.19 10.79		
0.20	ES2					MADE GROUND: Dark grey-brown slightly silty very sandy GRAVEL with low cobble and small boulder content. Sand comprises slag. Gravel, cobble and boulder are subrounded to subangular irregularly formed slag (often aerated).		0.32 10.66		
0.20	B3					MADE GROUND: Pale grey and grey-brown slightly silty slightly sandy GRAVEL with low cobble and small boulder content. Sand is slag-based. Gravel and cobbles are irregularly formed aerated low-density slag. Locally with flat and irregular boulder size slag fragements up to 0.40 m in size.		0.46 10.52		
0.35	B4							0.46 10.52		
0.50	ES5					MADE GROUND: Slightly damp pale brown and grey-brown mottled locally slightly silty slightly gravelly fine to medium SAND. Occasional fine to coarse irregular gravel size slag fragments present at surface. Slag fragments absent below 0.60m depth. Grey-brown mottling increasing below 0.85m depth, often composed of silty and weakly cemented fine to medium sand.		(0.49)		
0.60	B6							(0.49)		
1.00	ES7					MADE GROUND: Slightly damp pale brown slightly silty to silty fine to medium SAND with occasional pale grey-brown mottling and imperistent weakly cemented horizons up to 20 mm thick.		(0.50)		
1.50	B8					MADE GROUND: Firm grey green-grey slightly gravelly CLAY. Gravel is fine to medium and locally coarse angular flat to elongate mudstone. Dry pale brown and yellow-brown locally slightly silty fine to medium SAND with closely spaced weakly cemented bedding. Rare gravel of fine to medium subrounded and angular sandstone and angular flat mudstone, surrounded by grey-brown discolouration. (BLOWN SAND).		1.45 9.53		
								1.52 9.46		
2.20	B9					End of Exploratory Hole		(1.88)		
PLAN DETAILS						Remarks				
2.9 0.9 A B C D Long Axis Orientation: 45 degrees Shoring / Support: None Stability: Severe collapse with repeated excavation below 1.6m Groundwater (description): Not Encountered						Termination Depth: 3.40m				

1:25

HYDRO SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE GLB Log SISTRAL PIT LOGEXCL OF WALL SKETCH Z:\GEO TECHNICSGINT\GINT PROJECT FILES\UA077442 AFON LIDO\UA077442 AFON LIDO <<DrawingFileSpec>> 29/08/2015 14:47:21

Project

Afan Lido

Client

Neath Port Talbot County Borough Council

Project No.

UA007442-04

Easting (OS)

274711.5

Ground Level (m AOD)

9.66

Northing (OS)

189570.2

Start Date

18-02-15

Finish Date

18-02-15

Sheet

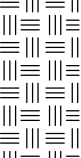
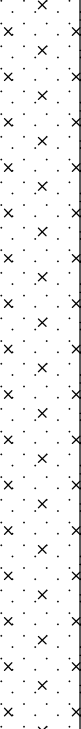
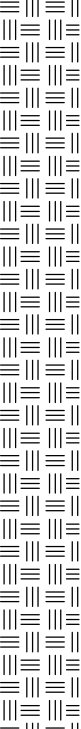
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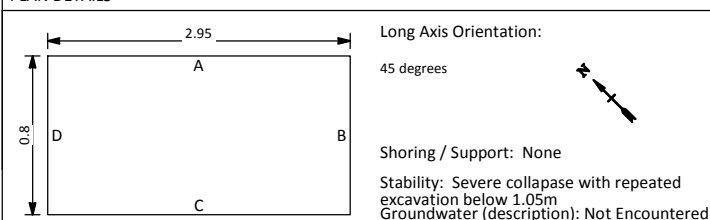
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SAMPLES		TESTS			Water Strikes	STRATA			Install/Backfill	
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)		
0.20	ES1					TOPSOIL: brown slightly organic slightly sandy SILT with frequent thin roots and occasional plastic debris.		0.11	9.55	
0.30	B2					MADE GROUND: Soft to firm pale-mid brown sandy locally slightly gravelly SILT with occasional thin roots. Sand is fine to medium. Gravel is fine to medium subangular elongate limestone and sandstone.			(0.34)	
0.50	ES3					MADE GROUND: Firm orange-brown and locally mottled brown to grey-brown silty slightly sandy slightly gravelly CLAY with rare thin roots. Gravel is fine to medium subangular sandstone. Below 0.6 m with low cobble and boulder content of bitumen, concrete and whole bricks up to 0.25 m in size. Section of waste 60 mm dia of plastic yellow pipe embedded in boulder material aligned S-N through pit at 0.65m depth.			0.45	9.21
0.50	B4								(0.40)	
0.75	ES5							0.85	8.81	
0.90	B6					Pale yellow-brown slightly silty fine to medium SAND with occasional lenses of coarse sand and firm brown slightly sandy clay. (BLOWN SAND)		(0.55)		
1.00	ES7					0.95 - 1.00 Clay lenses absent below 0.95m.				
							1.40	8.26		
2.00	B8					Pale brown locally slightly silty fine to medium SAND. Rare fine subangular flat to elongate mudstone gravel. (BLOWN SAND).		(1.60)		
2.80	B9									
						End of Exploratory Hole		3.00	6.66	
PLAN DETAILS						Remarks				
3.1 1.6 A B C D Long Axis Orientation: 135 degrees Shoring / Support: None Stability: Severe collapse with repeated excavation below 1m Groundwater (description): Not Encountered Termination Depth: 3.00m										

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	9.41	18-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274691.8	189619.1	18-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA				Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)		
0.25	ES1					Strong grey CONCRETE floor slab. 6mm diameter plain reinforcing spanning 2 directions (NW-SE and NE-SW) at 0.30 c/c at 0.16m depth. Polythene damp proof membrane at base.		(0.20) 0.20 9.21		
0.50	ES2					MADE GROUND: Brown locally mottled yellow brown slightly silty slightly gravelly fine to medium SAND with low cobble content. Gravel is fine-coarse crushed brick fragments, irregular aerated slag and sandstone. Cobbles are brick fragments.		(0.23) 0.43 8.98		
0.60	B3					Pale brown and yellow-brown locally slightly silty fine to medium SAND with very closely spaced impersistent lenses of brown silty sand and pale brown silty clay up to 20mm thick (BLOWN SAND)		(0.52) 0.95 8.46		
1.00	B4					Firm brown and orange-brown mottled slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular mudstone. (BLOWN SAND)		1.05 8.36		
1.00	ES5					Pale brown and locally yellow-brown occasionally fine to medium SAND. Rare fine to coarse subangular sandstone and brown clay lenses (BLOWN SAND).		(2.55) 3.60 5.81		
2.00	B6									
3.00	B7									
						End of Exploratory Hole				

PLAN DETAILS



Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth:
3.60m

Project

Afan Lido

Client

Neath Port Talbot County Borough Council

Project No.

UA007442-04

Easting (OS)

274661.6

Ground Level (m AOD)

9.36

Northing (OS)

189642.8

Start Date

18-02-15

Finish Date

18-02-15

Sheet

1 of 1

Scale

1:25

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Project

Afan Lido

Client

Neath Port Talbot County Borough Council

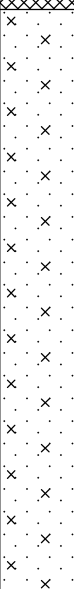
Project No.
UA007442-04
Easting (OS)
274645.1

Ground Level (m AOD)
9.43
Northing (OS)
189623.0

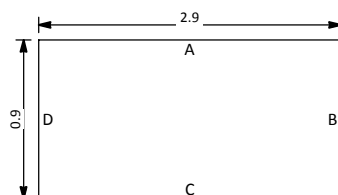
Start Date
19-02-15

Finish Date
19-02-15

Sheet
1 of 1
Scale
1:25

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, <i>Level</i> (thickness)	
0.20	ES1					Strong grey CONCRETE floor slab. 6 mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.15 m centres at 0.08 m depth. Polythene damp proof membrane at base.		0.17 9.26	                         
0.40	B2					MADE GROUND: Pale brown yellow-brown slightly silty fine to medium SAND. Rare occasional fine to medium gravel of irregularly formed aerated slag.		(0.38)	
0.50	ES3							0.55 8.88	
0.90	B4					Pale brown locally slightly silty fine to medium SAND. Rare fine to medium subangular elongate mudstone (BLOWN SAND).		(2.05)	                         
1.00	ES5								
2.00	B6								
2.50	B7				End of Exploratory Hole		2.60 6.83		

PLAN DETAILS



Long Axis Orientation:
45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 0.8m
Groundwater (description): Not Encountered

Remarks

Remarks	Concrete surface broken out using hydraulic hammer on 16/02/2015
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Termination Depth:
2.60m

Project

Afan Lido

Client

Neath Port Talbot County Borough Council

Project No.

UA007442-04

Fasting (QS)

274654.6

Ground Level (m AOD)

10.70

Northing (QS)

189594.4

Start Date

18-02-15

Finish Date

18-02-15

Sheet

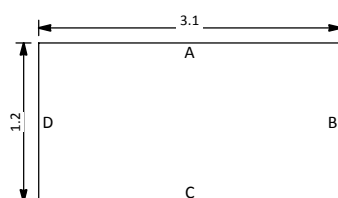
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Scale

1:25

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)	Install/ Backfill
0.20	ES1	0.30	B2			Dense bituminous surface dressing.		0.08 10.62 10.56	
						MADE GROUND: Red purple-brown very sandy GRAVEL. Sand comprises ash and slag. Gravel is fine to medium irregular aerated low density slag and occasional brick fragments		0.14 (0.26)	
0.50	B3 ES4					MADE GROUND: Dark grey to black slightly silty very sandy GRAVEL with low cobble content. Silt and sand comprise ash and slag. Gravel and cobbles are irregular aerated low density slag and clinker, often oxidised and occasional fragments of foundry brick.		0.40 10.30	
						MADE GROUND: Pale brown and grey-brown mottled slightly silty fine to medium SAND with occasional irregular dark grey veining. Rare fine to medium subangular flat to elongate mudstone gravel.		0.52 10.18	
1.00	ES5 B6					Pale yellow-brown and occasionally pale grey-brown mottled locally slightly silty fine to medium SAND. Rare fine subangular elongate mudstone gravel. (BLOWN SAND)		(2.18)	
									
									
									
									
									
									
									
									
									
2.20	B7								
									
									
									
									
									
						End of Exploratory Hole		2.70 8.00	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 0.6m
Groundwater (description): Not Encountered

Remarks

Remarks Bituminous surface broken out using hydraulic hammer on 16/02/2015

Termination Depth:

2.70m

Project

Afan Lido

Client

Neath Port Talbot County Borough Council

Project No.

UA007442-04

Fasting (QS)

274675.0

Ground Level (m AOD)

10.62

Northing (QS)

189570.9

Start Date

18-02-15

Finish Date

18-02-15

Sheet

1 of 1

Scale

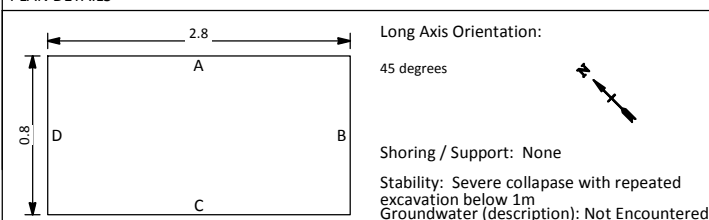
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SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)	
0.10	ES1					MADE GROUND: Grey-brown slightly silty sandy GRAVEL with low cobble content. Gravel and cobbles comprise fragments of irregular crushed concrete, occasional brick, ceramic tile and bituminous bound material. Occasional steel reinforcement.		0.17 10.45 10.39	
0.20	B2					MADE GROUND: Red purple-brown very sandy GRAVEL. Sand comprises ash and slag. Gravel is fine to medium irregularly formed aerated low density slag and occasional fine brick fragments.		0.23 (0.20)	
0.20	ES3					MADE GROUND: Dark grey to black slightly silty very sandy GRAVEL with low cobble content. Sand is ash and slag derived. Gravel and cobbles are irregularly formed aerated low-density slag/clinker, often oxidised. Becoming silty towards base.		0.43 10.19	
0.30	B4					MADE GROUND: Dark grey to black slightly silty very sandy GRAVEL with low cobble content. Sand is ash and slag derived. Gravel and cobbles are irregularly formed aerated low-density slag/clinker, often oxidised. Becoming silty towards base.		(0.19)	
0.40	ES5					Pale brown and grey-brown mottled slightly silty fine to medium SAND. Occasional fine to medium subangular flat-elongate sandstone and mudstone gravel. (BLOWN SAND).		0.62 10.00	
0.60	ES6					Pale brown yellow-brown locally slightly silty fine to medium SAND. (BLOWN SAND)			
1.00	ES7								
1.00	B8							(0.78)	
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
PLAN DETAILS						Remarks			
3 0.9 A B C D Long Axis Orientation: 135 degrees  Shoring / Support: None Stability: Severe collapse with repeated excavation below 1.4m Groundwater (description): Not Encountered						Termination Depth: 3.40m			

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.68	18-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274679.4	189533.6	18-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA				Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)		
0.20	ES1					BITUMINOUS wearing course.		10.64		
0.25	B2					BITUMINOUS base course, partially decomposed.		10.53		
0.40	ES3					MADE GROUND: Red-brown slightly silty SAND AND GRAVEL. Silt and sand comprise ash. Gravel is fine to medium irregularly formed aerated slag, clinker and occasional foundry brick fragments.		10.41		
0.50	B4					MADE GROUND: Dark grey-black slightly silty sandy GRAVEL with low cobble content. Sand comprises slag. Gravel and cobbles are irregularly formed aerated and often oxidised low-density slag and whole or broken foundry brick fragments. Large flat concrete fragment encountered 0.47 m to 0.55 m in northern corner of pit at least 0.50 m visible length.		10.13		
0.70	ES5					MADE GROUND: Pale brown and grey-brown mottled locally slightly silty slightly gravelly fine to medium SAND. Gravel is fine to medium subrounded irregular aerated slag.		0.95		
0.80	B6							9.73		
1.00	ES7					Pale brown and yellow-brown locally slightly silty fine to medium SAND, locally with very closely spaced grey-brown silty sand laminae up to 10 mm thick. Rare fine subangular flat mudstone gravel. (BLOWN SAND)		0.65		
1.20	B8							1.60		
2.20	B9					Pale brown locally slightly silty fine to medium SAND with very closely spaced impersistent grey-brown silty sand laminae upto 10 mm thick. (BLOWN SAND)		1.20		
						End of Exploratory Hole		2.80		

PLAN DETAILS



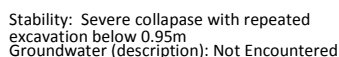
Remarks

Termination Depth:
2.80m

Sheet
1 of 1
Scale
1:25

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Remarks



Termination Depth:
3.10m

Project

Afan Lido

Client
Neath Port Talbot County Borough Council

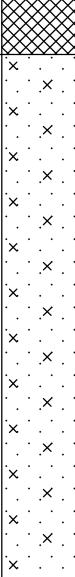
Project No.
UA007442-04
Easting (OS)
274628.9

Ground Level (m AOD)
10.28
Northing (OS)
189579.1

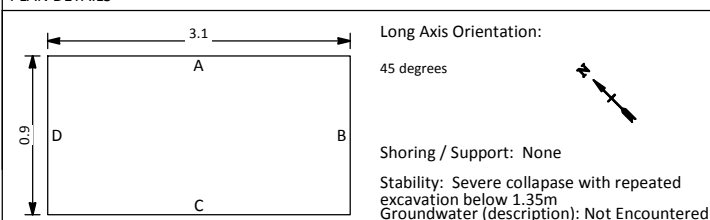
Start Date
19-02-15

Finish Date
19-02-15

Sheet
1 of 1
Scale
1:25

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, <i>Level</i> (thickness)	
0.20	ES1					Strong grey CONCRETE floor slab with 6mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.20m centres at 0.04m depth. No underlying damp proof membrane.		0.11 10.17	
0.30	B2					MADE GROUND: Grey-brown slightly silty fine to medium SAND with rare fine to medium subangular sandstone, mudstone and slag gravel with impersistent dark grey slightly organic horizons below 0.29 m, containing coarse sand-fine gravel size mudstone fragments.		(0.34)	
0.50	ES3					MADE GROUND: Pale brown locally slightly silty fine to medium SAND with occasional grey-brown mottling. Laterally impersistant horizons up to 50 mm thick of dark grey slightly gravelly clay in SE face of pit at 0.8 - 0.95 m depth. Concrete foundation exposed in NW face of pit at 0.90-1.35m depth.		(0.50)	
0.50	B4								
1.00	ES5					Pale brown locally slightly silty fine to medium SAND. (BLOWN SAND)		0.95 9.33	
1.00	B6								
2.00	B7						(1.85)		
End of Exploratory Hole							2.80 7.48		

PLAN DETAILS



Remarks

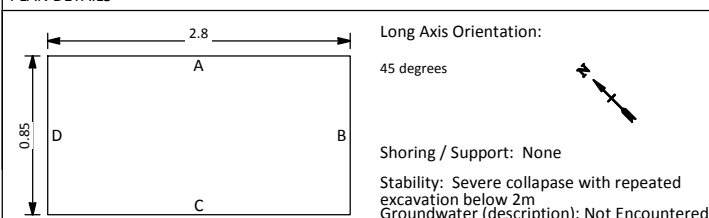
Remarks	Concrete surface broken out using hydraulic hammer on 16/02/2015
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Termination Depth:
2.80m

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.64	19-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274595.0	189582.1	19-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA				Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)		
0.25	ES1					Ceramic tiles over cement-grout.		0.09 10.55	                                              	
						Strong grey CONCRETE floor slab with 6 mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.15 m centres at 0.14 m depth.		0.24 10.40		
						MADE GROUND: Grey cementitious sandy GRAVEL with rare cobbles. Gravel and cobbles are mainly weak concrete and mortar with occasional brick and clay tile fragments.		0.37 10.27		
						MADE GROUND: Grey-brown slightly silty fine to medium SAND with occasional yellow-brown mottling. Rare fine subangular flat mudstone gravel.		(0.26)		
0.50 0.50	B2 ES3							0.63 10.01	                                          	
								(0.72)		
0.70 0.75	B4 ES5							1.35 9.29	                                         	
1.40	ES6							1.35 9.29		
1.50	B7							(1.85)		
2.00	B8									
3.00	B9							3.20 7.44		
						End of Exploratory Hole		3.20 7.44		

PLAN DETAILS

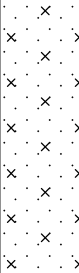


Remarks

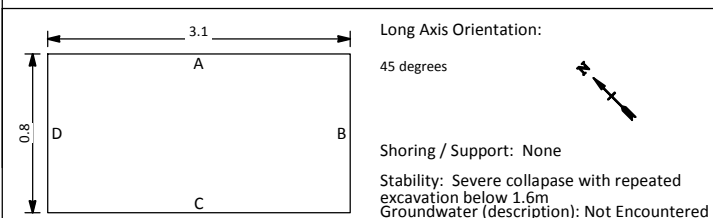
Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth:
3.20m

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	UA007442-04	10.49	17-02-15	1 of 1
Client	Easting (OS)	Northing (OS)	Finish Date	Scale
Neath Port Talbot County Borough Council	274619.2	189542.0	17-02-15	1:25

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	Depth, Level (thickness)	Install/ Backfill
0.20	ES1					MADE GROUND: Grey and grey-brown slightly silty sandy GRAVEL with low cobble content. Gravel and cobbles comprise crushed concrete, whole and half bricks fragments and occaional mortar and ceramic tile fragments with occasional pale brown and dark grey-brown sandy slightly gravelly (fine) clay inclusions below 0.13m depth.		(0.29)	
0.35	ES2					MADE GROUND: Pale grey cementitious sandy GRAVEL with medium cobble content. Gravel and cobbles are irregular crushed concrete and limestone aggregate.		0.29 10.20	
0.50	ES3					MADE GROUND: Stiff green-grey, green brown and orange-brown mottled silty slightly gravelly CLAY with occasional dark grey veining. Gravel is fine to medium subangular mudstone.		0.45 10.04	
0.50	B4							0.53 9.96	
0.70	B5					MADE GROUND: Grey-brown, orange brown and dark grey mottled slightly silty gravelly fine to medium SAND. Sand comprises grey ash, gravel is crushed slag/clinker and occasional brick. Rare glass and ceramic tile fragments towards base of layer..		(0.30)	
0.90	B6							0.83 9.66	
1.00	ES7					Pale brown yellow-brown occasionally slightly silty fine to medium SAND with closely spaced weakly cemented lenses up to 50mm thick. Rare fine to medium subangular elongate sandstone and mudstone gravel. (BLOWN SAND)		(1.17)	
1.80	B8							2.00 8.49	
						Pale yellow-brown fine to medium SAND. (BLOWN SAND)		(1.40)	
2.50	B9							3.40 7.09	
						End of Exploratory Hole			
									
									
									
									

PLAN DETAILS



Remarks

Termination Depth:
3.40m

1:50

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1 of 1
Scale
1:50

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Scale
1:50

YNDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOW LESS SAMPLE LOG Z:\GEO\TECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3 - GDT <<DrawingFileSpec>> 29/06/2015 14:44:58

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1 of 1

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Appendix C

Ground and Gas Monitoring

Water Levels

	25/02/2015 12:00-13:00	27/02/2015 13:15-13:45	25/03/2015 9.30 - 11.00	25/03/2015 12.00-13.00	25/03/2015 12.00-13.00	09/04/2015	09/04/2015	25/05/2015	25/05/2015
BH ID	Water depth below cover level	Water depth below cover level	Water depth below cover level	Water depth below cover level	Well depth below cover level	Water depth below cover level	Well depth below cover level	Water depth below cover level	Well depth below cover level
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
BH101p	Installation covered over		NA	NA	NA	6.78	NA	-	-
BH101s	Installation covered over		Dry	Dry	6.08	dry	6.00	-	-
BH102p	Drilling in progress		-	-	-	-	-	-	-
BH102s	Drilling in progress		6.30	6.28	7.14	NA	NA	6.50	NA
BH103p			-	-	-	-	-		
BH103s	3.96	6.71	4.07	4.10	6.68	NA	NA	4.32	NA
WS143A	Dry	2.16	Dry	Dry	2.15	dry	2.10		
WS144	Dry	3.89	NA	NA	NA	NA	NA		
WS146	Dry	5.07	Dry	Dry	5.12	dry	5.00		
WS147	Dry	5.06	Dry	Dry	5.09	NA	NA		
WS148	Dry	5.14	Dry	Dry	5.15	NA	NA	Dry	5.15

Remarks

Date	BH ID	Remarks
27/02/2015 13:15-13:45	WS143A	Cover installed by MLW on 27/02/15 flush with ground level as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 26/02/15, 0.035m above reference peg as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 02/03/15 flush with reference peg as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 02/03/15 flush with ground level as surveyed.
25/03/2015 9.30 - 11.00	WS144	Unable to open. Ridges in lock eroded away, key doesn't fit.
25/03/2015 9.30 - 11.00	BH103s	Sample taken and sent to i2
25/03/2015 9.30 - 11.00	BH102	Sample taken and sent to i2
09/04/2015	WS147	No access to well
09/04/2015	WS144	could not open
09/04/2015	WS148	No access to well
09/04/2015	BH103	No access to well
09/04/2015	BH102	No access to well

Gas Monitoring

	Date		25/03/2015						09/04/2015						22/05/2015					
BH ID	Determinand	Units	Initial	Time (secs)					Initial	Time (secs)					Initial	Time (secs)				
			0	30	60	90	120	180	0	30	60	90	120	180	0	30	60	90	120	180
BH101s	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.5	19.4	-	19.4	19.3		19.2	19.1	19.1	19.1	19.1						
	CO2	%vol		0.8	0.9	-	0.9	0.9		1.1	1.1	1.1	1.1	1.1						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1009						1023											
BH102s	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		20.5	20.5	-	20.5	20.5								20.3	20.3	20.1	20.5	20.3
	CO2	%vol		0.1	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1011												1009					
BH103s	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		18.5	18.4	-	18.3	18.2								18.7	18.7	18.6	18.7	18.7
	CO2	%vol		1.2	1.3	-	1.3	1.4								1.0	1.0	1.1	1.2	1.1
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1010												1009					
WS143A	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.8	19.7	-	19.7	19.7		19.7	19.7	19.6	19.6	19.6						
	CO2	%vol		0.7	0.7	-	0.7	0.7		0.8	0.8	0.7	0.7	0.7						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1010						1023											
WS146	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.4	19.3	-	19.3	19.3		19.6	19.4	19.3	19.3	19.3						
	CO2	%vol		0.9	1.0	-	1.0	1.0		0.8	0.8	0.9	0.9	0.9						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1013						1023											
WS147	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.9	19.8	-	19.8	19.7		19.6	19.4	19.3	19.3	19.3						
	CO2	%vol		0.3	0.3	-	0.3	0.4		0.8	0.8	0.9	0.9	0.9						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1010						1023											
WS148	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.5	19.3	-	19.3	19.3								19.8	19.8	19.6	19.6	19.6
	CO2	%vol		0.0	0.0	-	0.0	0.0								0.7	0.7	0.8	0.8	0.8
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1013												1009					

Appendix D

Geotechnical Laboratory Results



Contract Number: 25981

Client's Reference: **UA007442-4**

Report Date: **16-03-2015**

Client **Hyder Consulting Limited**
HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

Contract Title: **Afon Lido**
For the attention of: **Oliver Neal Wells**

Date Received: **19-02-2015**
Date Commenced: **19-02-2015**
Date Completed: **16-03-2015**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	33
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	6
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	18
PSD: Sedimentation by pipette carried out with Wet Sieve 1377 : 1990 Part 2 : 9.4 - * UKAS	1
PSD: Sedimentation by pipette carried out separately 1377 : 1990 Part 2 : 9.4 - * UKAS	2
(GI) BRE Suite Total Sulphate, Aqueous Sulphate, Total Sulphur, Aqueous Nitrate, Aqueous Mag, Chloride, 1377 : 1990 Part 3 & BRE CP2/79 - @ Non Accredited Test	3

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)



Contract Number: 25981

Test Description	Qty
pH Value of Soil 1377 : 1990 Part 3 : 9 - @ Non Accredited Test	12
Water Soluble Sulphate 2:1 extract 1377 : 1990 Part 3 : 5 - @ Non Accredited Test	12
Loss on Ignition 1377 : 1990 Part 3 : 4 - @ Non Accredited Test	5
Determination of the Total Sulphur content of Soil 1377 : 1990 BRE Dependant Options - @ Non Accredited Test	9
Chloride Content 1377 : 1990 Part 3 : 7 - @ Non Accredited Test	9
One-dimensional Consolidation 75mm or 50mm diameter specimens (5 days) 1377 : 1990 Part 5 : 3 - * UKAS	4
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) 1377 : 1990 Part 7 : 8 - * UKAS	4
Disposal of Samples on Project	1

Notes: Observations and Interpretations are outside the UKAS Accreditation
* - denotes test included in laboratory scope of accreditation
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

Client ref:	UA007442-04
Location:	Afon Lido
Contract Number:	25981-020315

[illegible]

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)

Date: 16.3.15

Katam



2788

Client ref:	UA007442-04
Location:	Afon Lido
Contract Number:	25981-020315

[illegible]

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)

Date: 16.3.15

Katam



2788

**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: UA007442-04

Location: Afon Lido

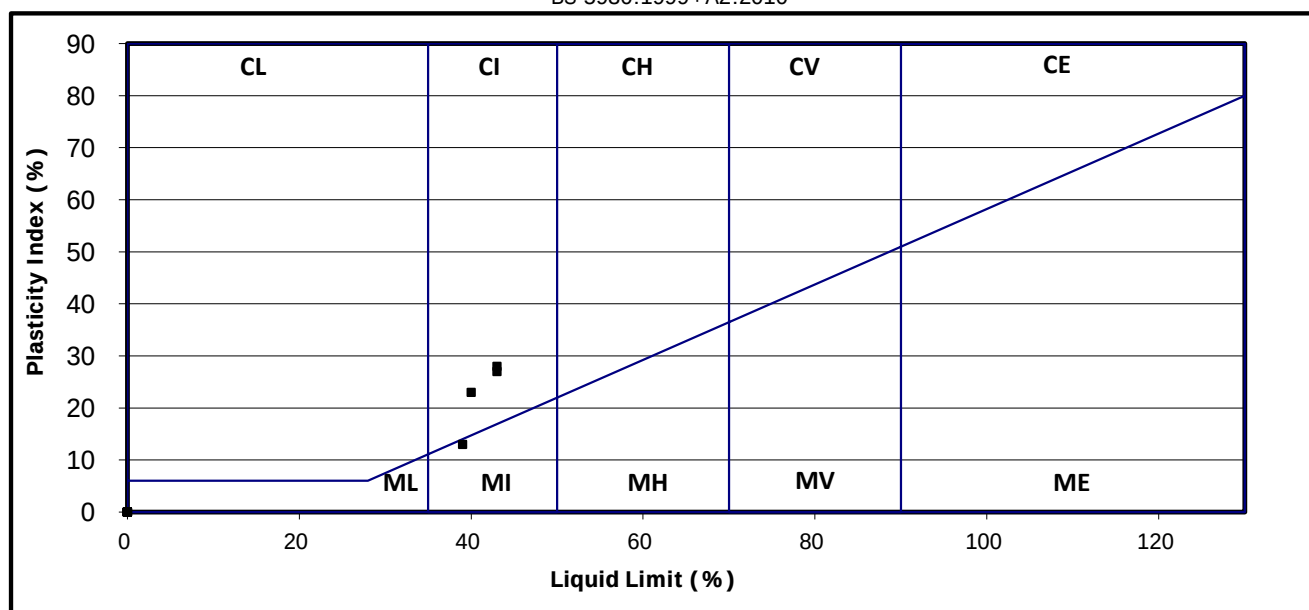
Contract Number: 25981-020315

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
BH101/1	B	1.00 - 1.20	19					
BH101/5	B	2.90 - 3.20	23					
BH101/9	B	4.90 - 5.20	25					
BH101/26	UT	17.00 - 17.45	27	40	17	23	100	CI Intermediate Plasticity
BH101/30	B	18.00 - 18.70	33		NP		100	
BH101/31	UT	19.50 - 19.95	27	43	16	27	100	CI Intermediate Plasticity
BH102/24	UT	15.50	23	39	26	13	98	MI Intermediate Plasticity
BH103/36	UT	18.50 - 18.95	29	43	15	28	100	CI Intermediate Plasticity
BH103/51	B	28.70 - 29.00	44		NP		100	
TP121/2	B	0.35	49					
TP122/6	B	1.30	5.1					
TP123/3	B	0.30	25					
TP125/3	B	0.20	10					
TP126/1	B	0.05	15					
TP127/4	B	0.50	23					
TP133/2	B	0.25	14					
TP134/3	B	0.40	6.2					
TP135/6	B	1.00	14					

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010



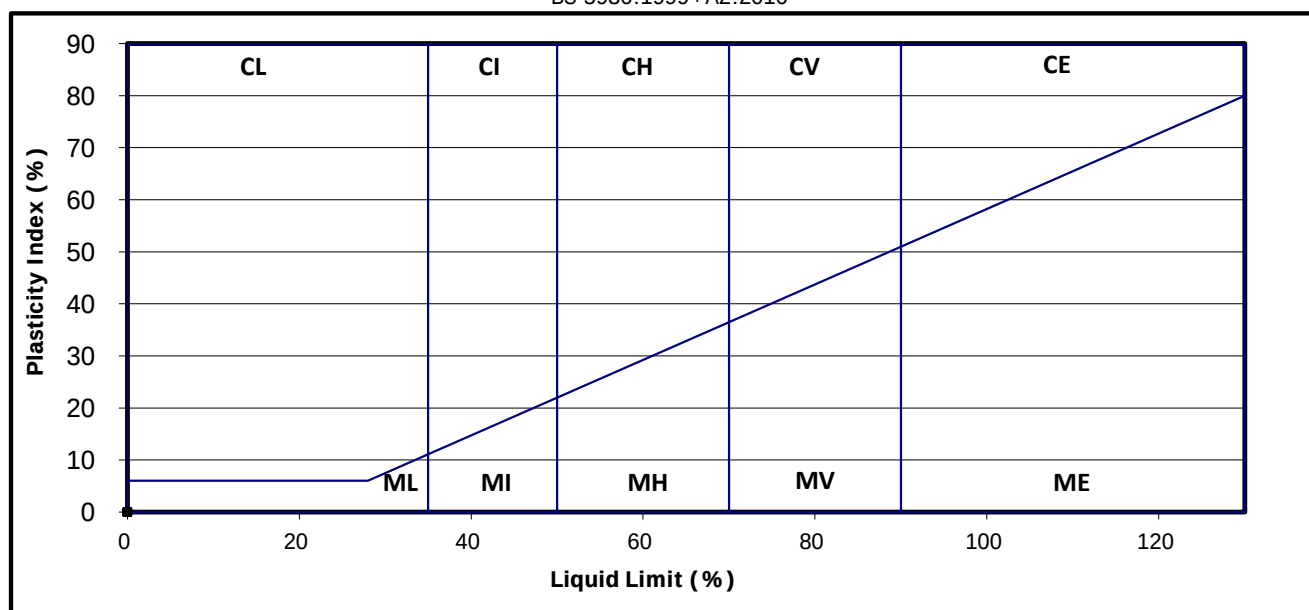
**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315

Hole/ Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3 / 4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS141/1	B	0.10 - 1.00	10					
WS141/6	B	2.50 - 3.00	4.1					
WS141/7	B	3.50 - 4.00	9.3					
WS142/4	B	1.10 - 1.50	6.9					
WS143/2	B	0.40 - 0.75	11					
WS143/6	B	1.40 - 2.00	8.4					
WS144/6	B	1.00 - 1.50	11					
WS144/8	B	3.50 - 4.00	8.9					
WS145/3	B	0.75 - 1.20	4.6					
WS145/6	B	3.50 - 4.00	5.9					
WS146/5	B	1.20 - 1.30	13					
WS146/7	B	4.00 - 5.00	10					
WS147/3	B	0.70 - 1.00	22					
WS148/4	B	0.70 - 1.00	11					
WS148/7	B	3.00 - 3.50	13					

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

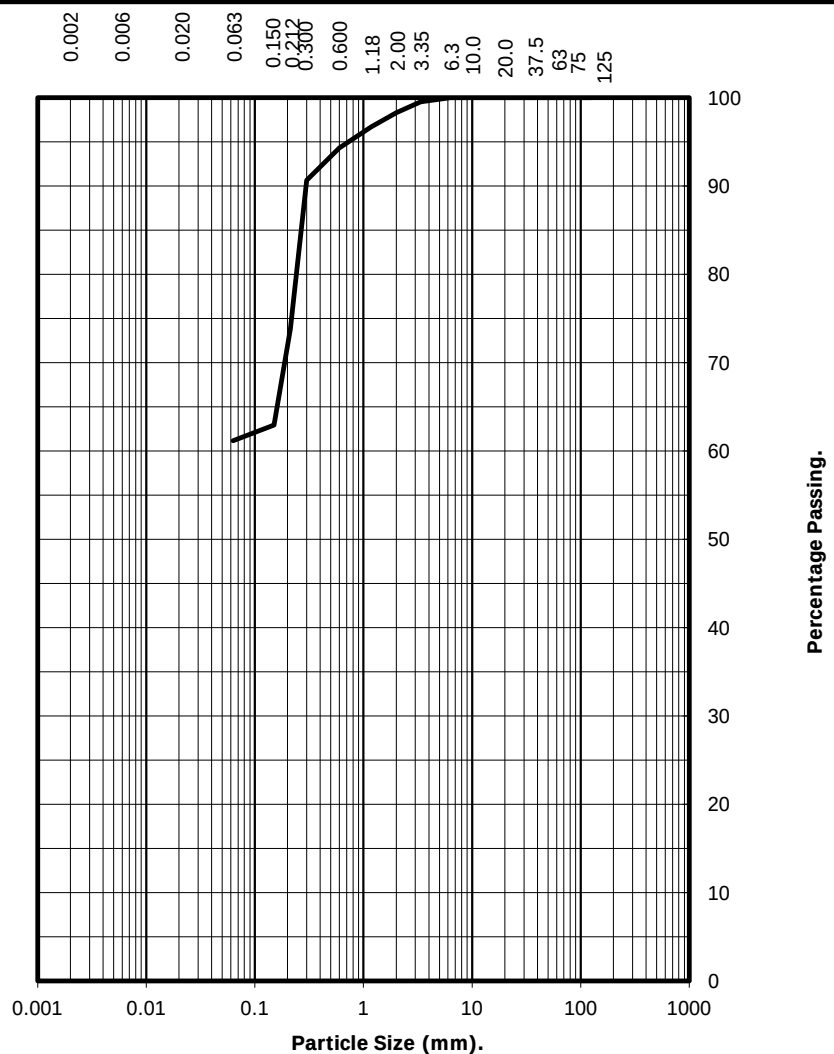
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH101****Sample Number:****15****Depth from (m):****8.30****Depth to (m):****8.60****Sample Type:****B****Description:****Brown gravelly (fine) sandy silty CLAY**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	98
1.18	97
0.60	94
0.300	91
0.212	74
0.150	63
0.063	61

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	61	37	2	0	Total Percentage

Remarks:

#- not determined

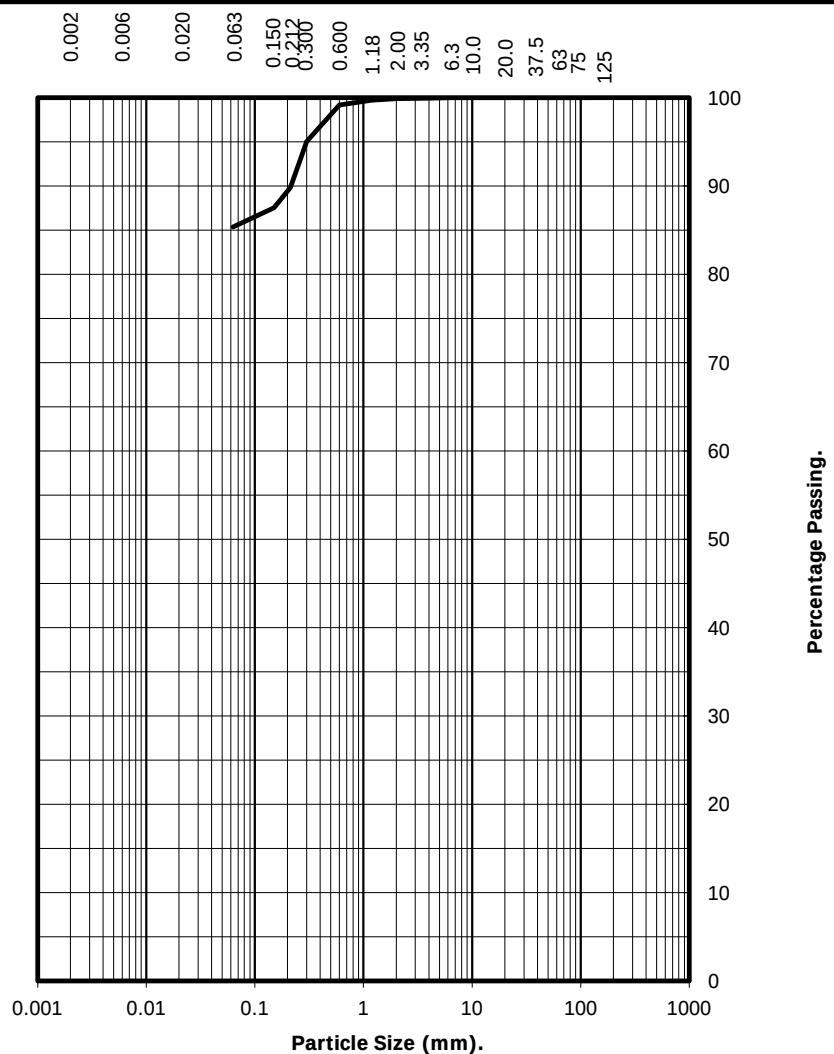
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **10.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH101
Sample Number: 30
Depth from (m): 18.00
Depth to (m): 18.70
Sample Type: B
Description: Brown/grey sandy clayey SILT

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	99
0.300	95
0.212	90
0.150	88
0.063	85

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	85	15	0	0	Total Percentage

Remarks:

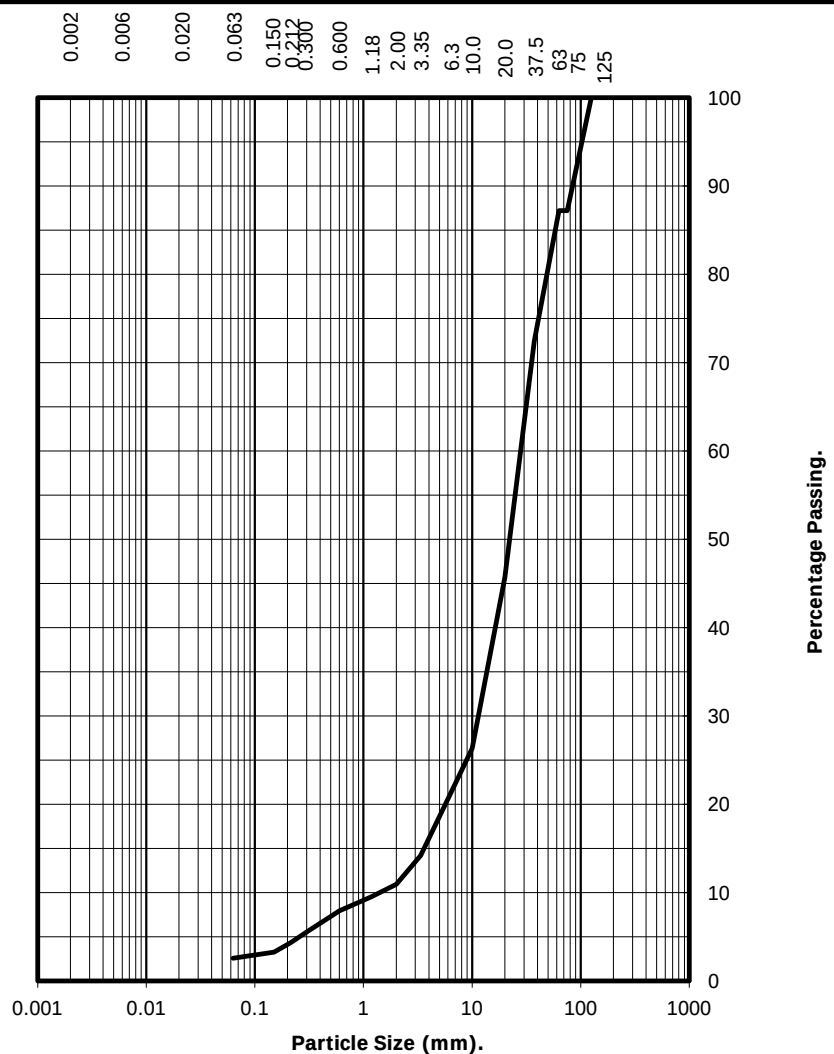
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For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **16.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH101****Sample Number:****38****Depth from (m):****23.80****Depth to (m):****24.10****Sample Type:****B****Description:****Brown/grey silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	87
63	87
37.5	72
20	46
10	26
6.3	21
3.35	14
2.00	11
1.18	10
0.60	8
0.300	6
0.212	4
0.150	3
0.063	3

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	3	8	76	13	Total Percentage

Remarks:

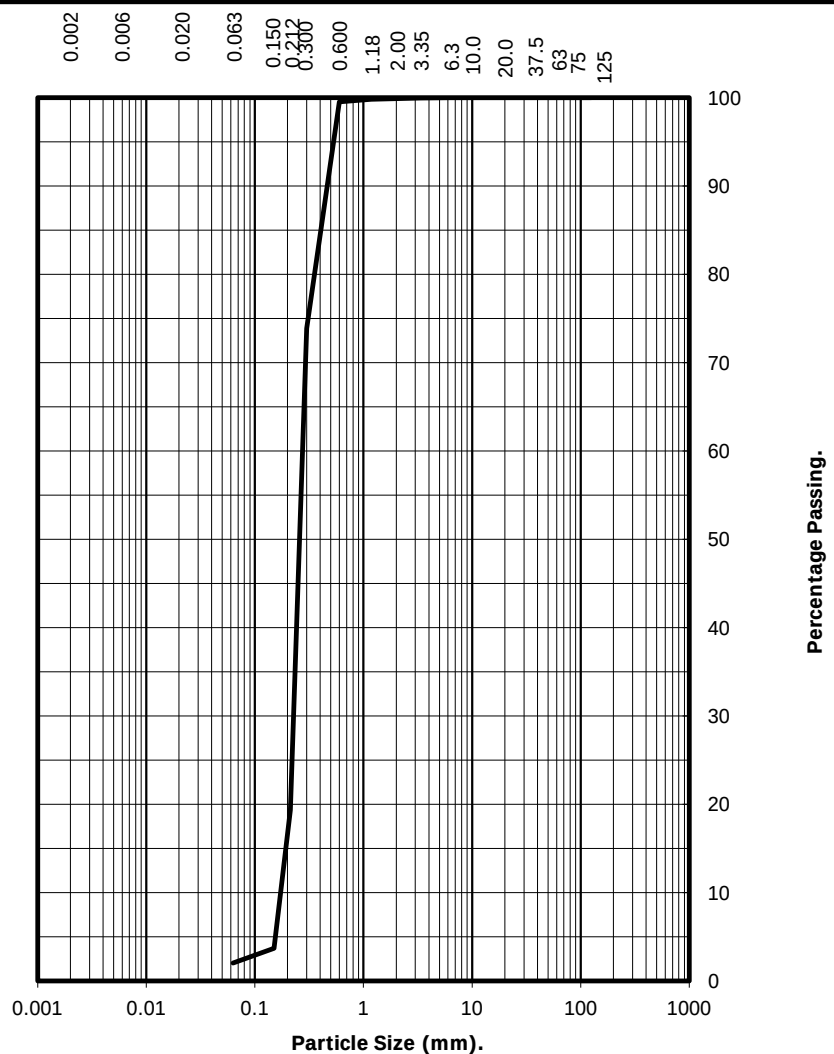
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **10.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH102****Sample Number:****16****Depth from (m):****9.40****Depth to (m):****Sample Type:****B****Description:****Brown silty clayey SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	74
0.212	19
0.150	4
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	98	0	0	Total Percentage

Remarks:

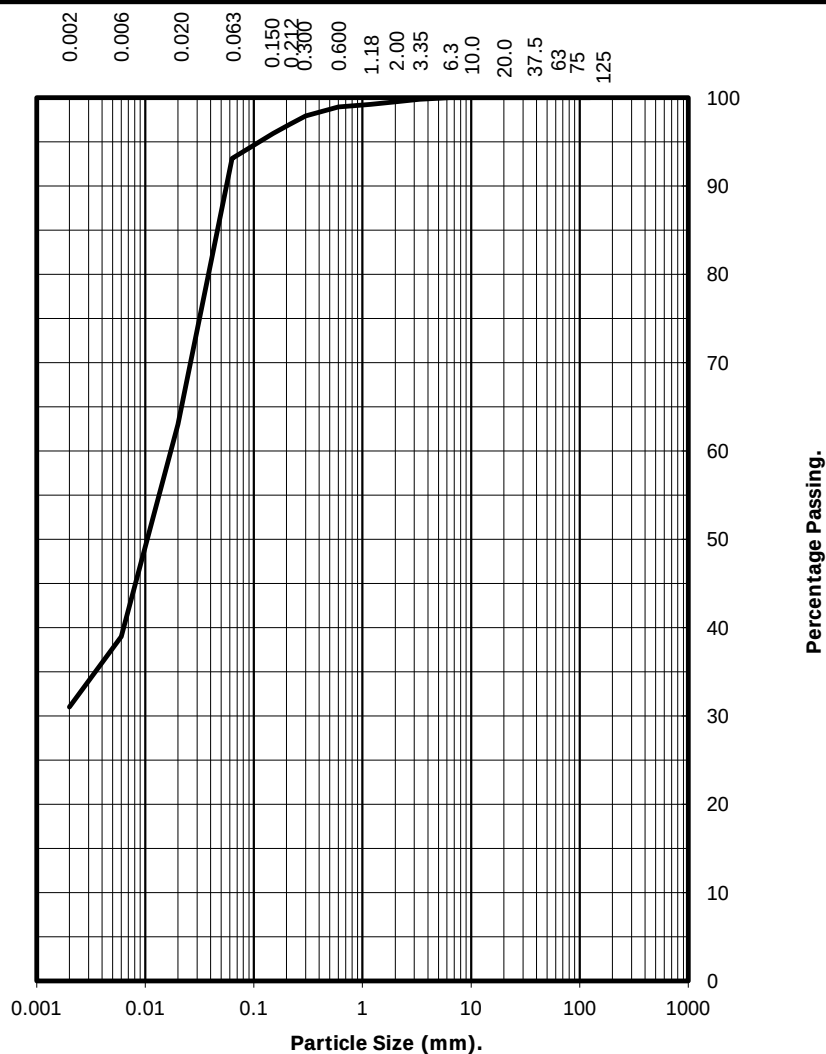
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **10.3.15**

Test Report:**Particle Size Distribution Test****BS 1377 Part 2:1990.****Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH102****Sample Number:****24****Depth from (m):****15.50****Depth to (m):****Sample Type:****UT****Description:****Brown sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	99
0.60	99
0.300	98
0.212	97
0.150	96
0.063	93

Particle Diameter	Percentage Passing
0.02	63
0.006	39
0.002	31



Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
31	62	7	0	0	Total Percentage

Remarks:

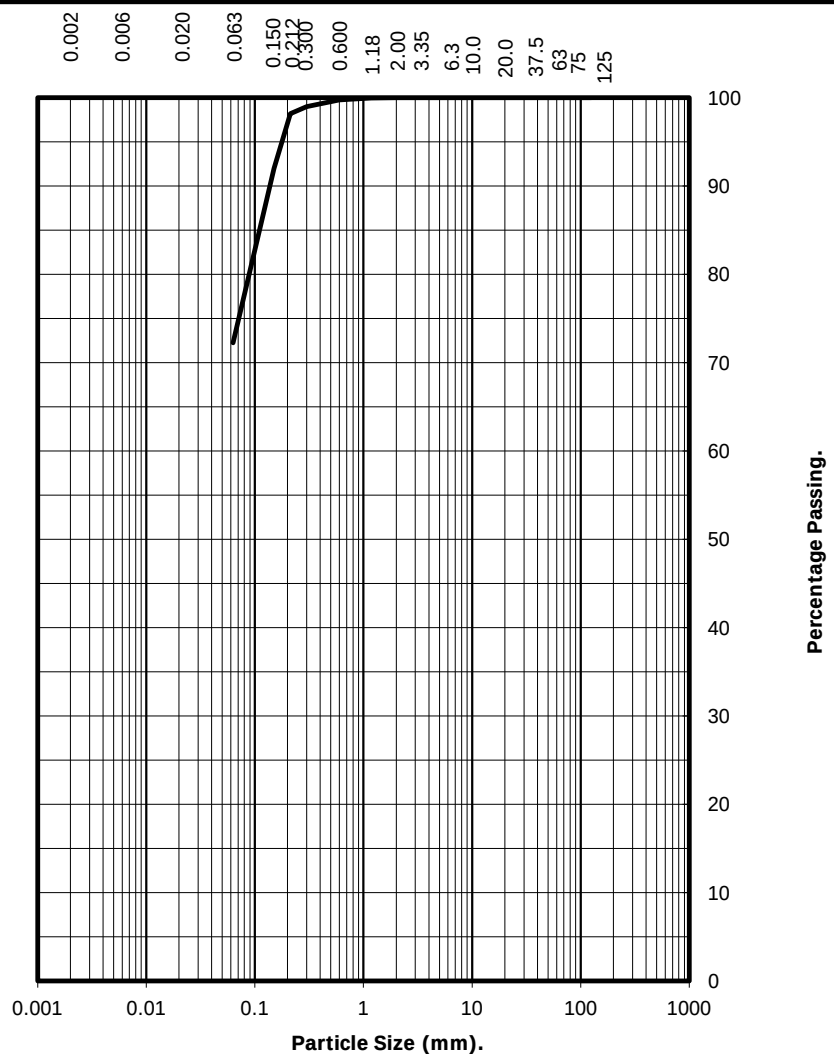
CI 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH102****Sample Number:****29****Depth from (m):****19.90****Depth to (m):****Sample Type:****B****Description:****Brown sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	99
0.212	98
0.150	92
0.063	72

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	72	28	0	0	Total Percentage

Remarks:

#- not determined

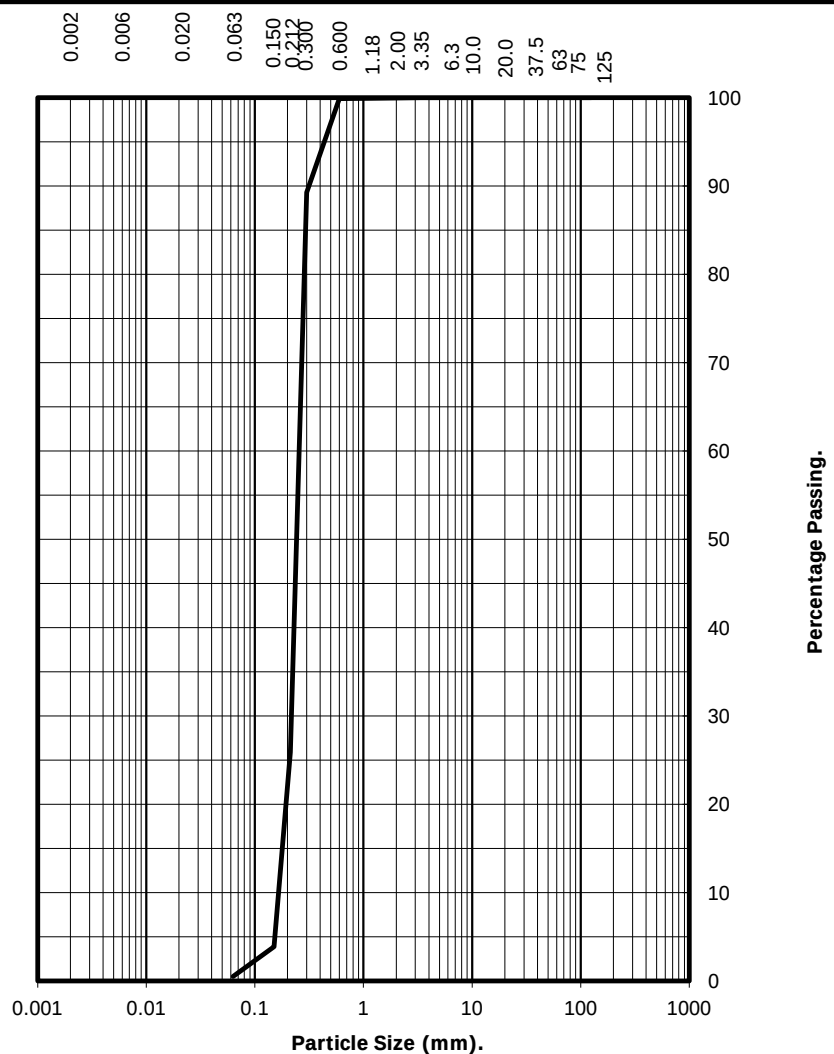
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test
BS 1377 Part 2:1990.
Wet Sieve, Clause 9.2

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH103
Sample Number: 9
Depth from (m): 2.75
Depth to (m): 3.00
Sample Type: B
Description: Brown SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	89
0.212	26
0.150	4
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	100	0	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Tatam

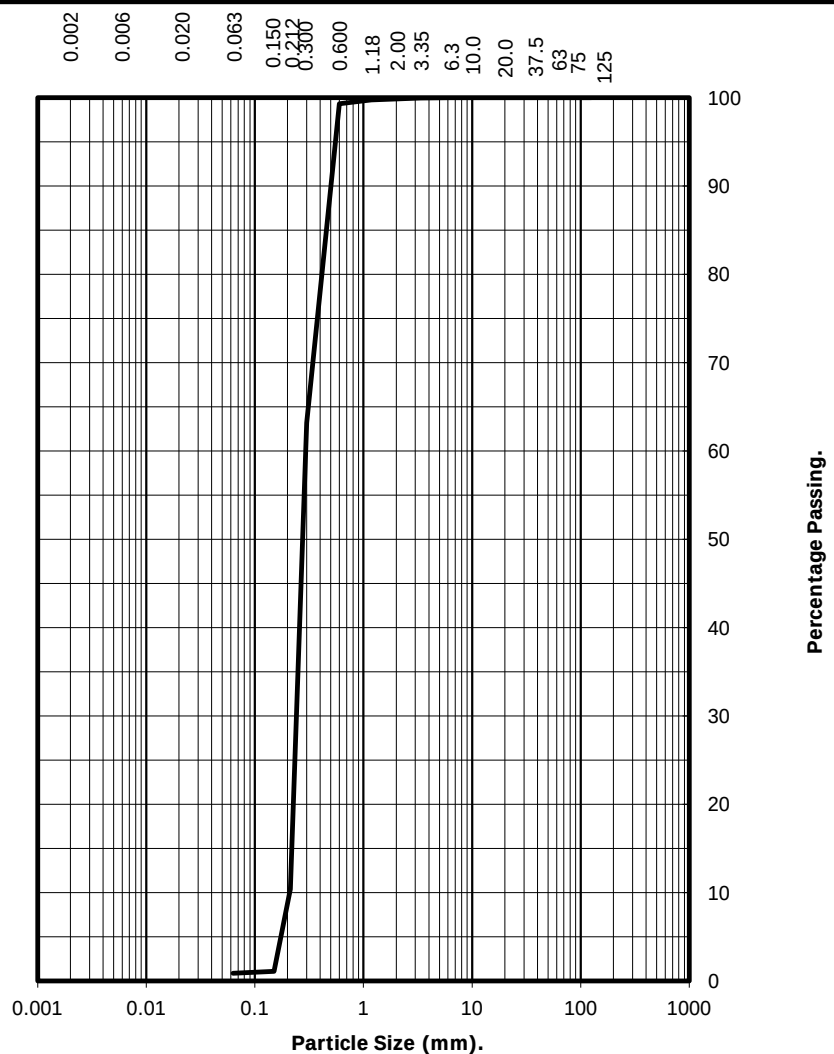
Date: 12.3.15

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH103
Sample Number: 23
Depth from (m): 9.50
Depth to (m): 10.00
Sample Type: B
Description: Brown silty SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	99
0.300	63
0.212	10
0.150	1
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	99	0	0	Total Percentage

Remarks:

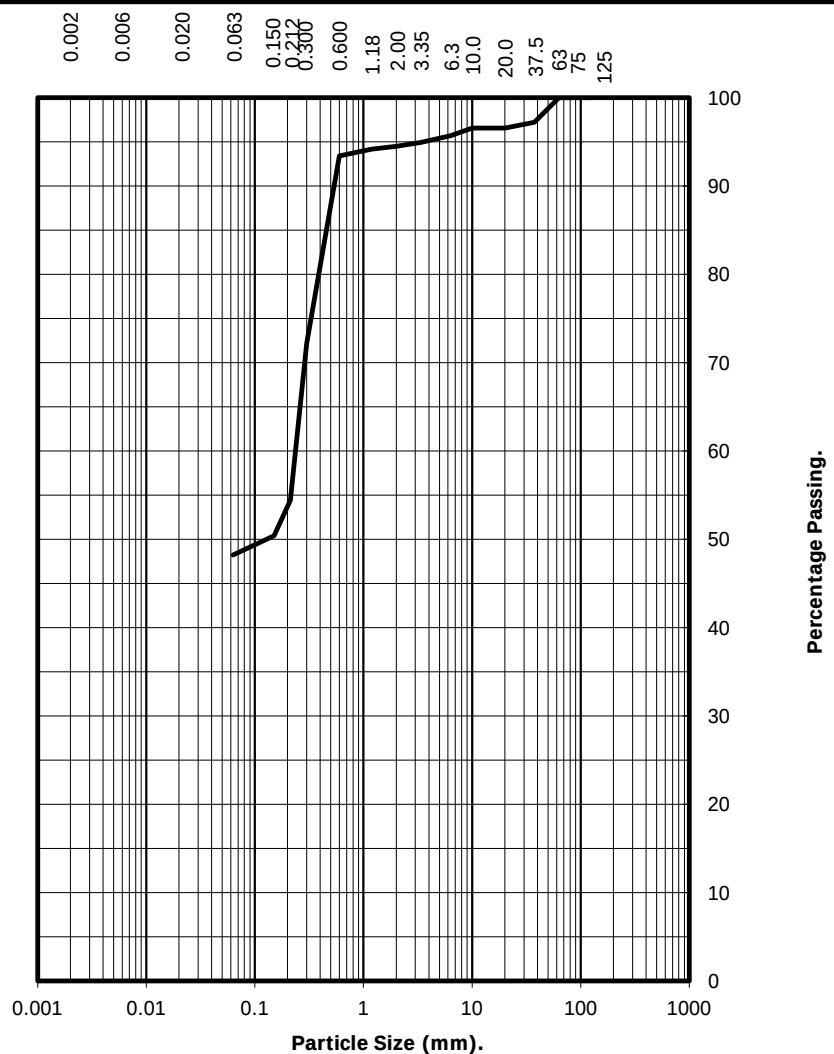
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH103****Sample Number:****27****Depth from (m):****11.60****Depth to (m):****12.50****Sample Type:****B****Description:****Brown gravelly (fine-coarse) sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	97
20	97
10	97
6.3	96
3.35	95
2.00	95
1.18	94
0.60	93
0.300	72
0.212	54
0.150	50
0.063	48

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	48	47	5	0	Total Percentage

Remarks:

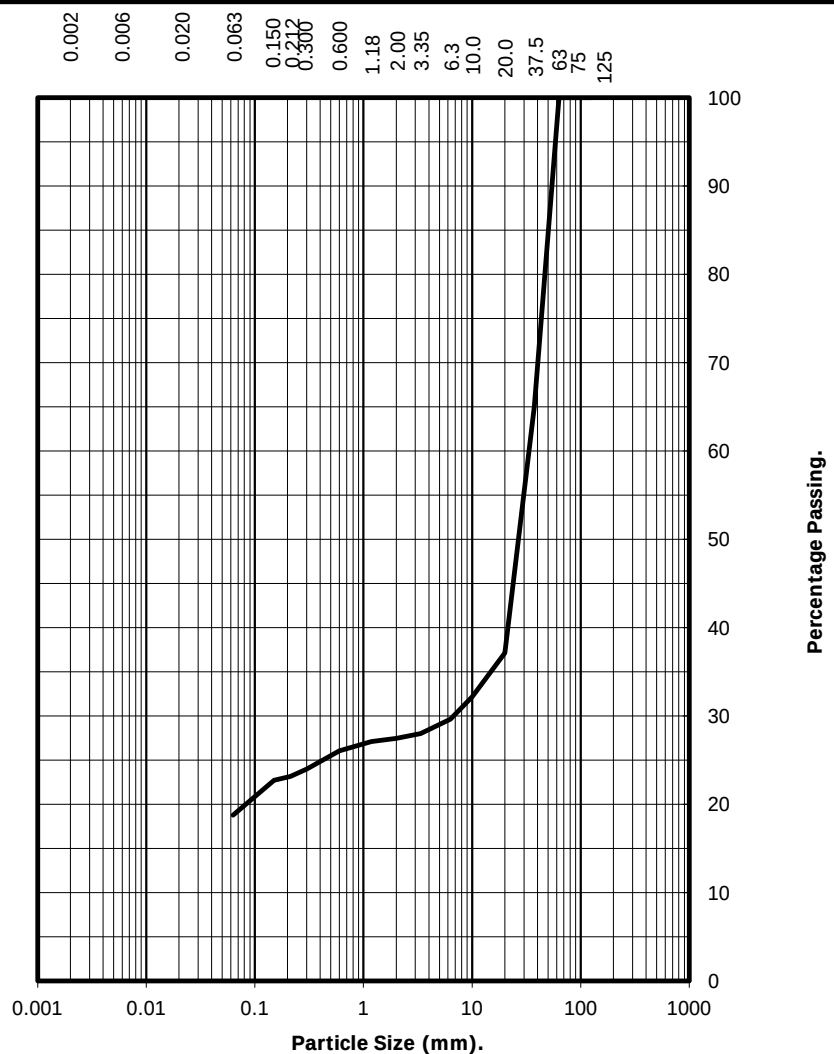
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For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH103****Sample Number:****39****Depth from (m):****20.45****Depth to (m):****21.50****Sample Type:****B****Description:****Brown sandy silty clayey GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	65
20	37
10	32
6.3	30
3.35	28
2.00	27
1.18	27
0.60	26
0.300	24
0.212	23
0.150	23
0.063	19

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	19	8	73	0	Total Percentage

Remarks:

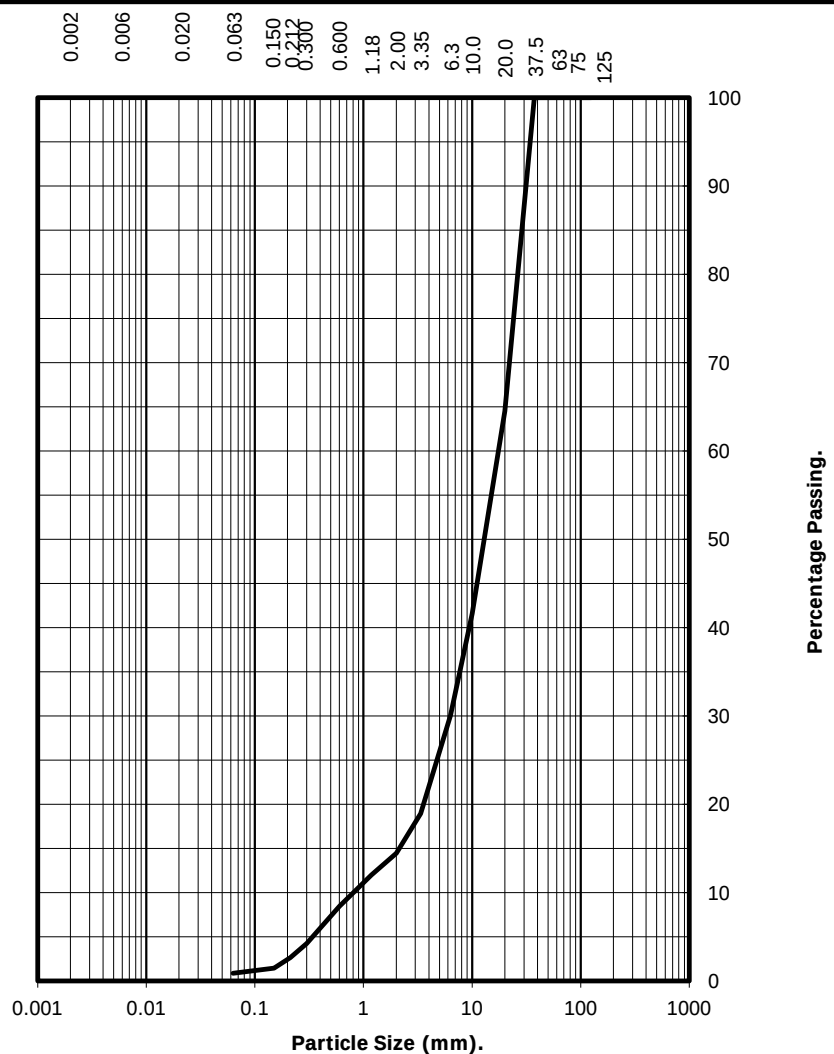
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****BH103****Sample Number:****46****Depth from (m):****25.70****Depth to (m):****26.00****Sample Type:****B****Description:****Brown silty sandy GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	65
10	42
6.3	30
3.35	19
2.00	14
1.18	12
0.60	8
0.300	4
0.212	3
0.150	1
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	13	86	0	Total Percentage

Remarks:

#- not determined

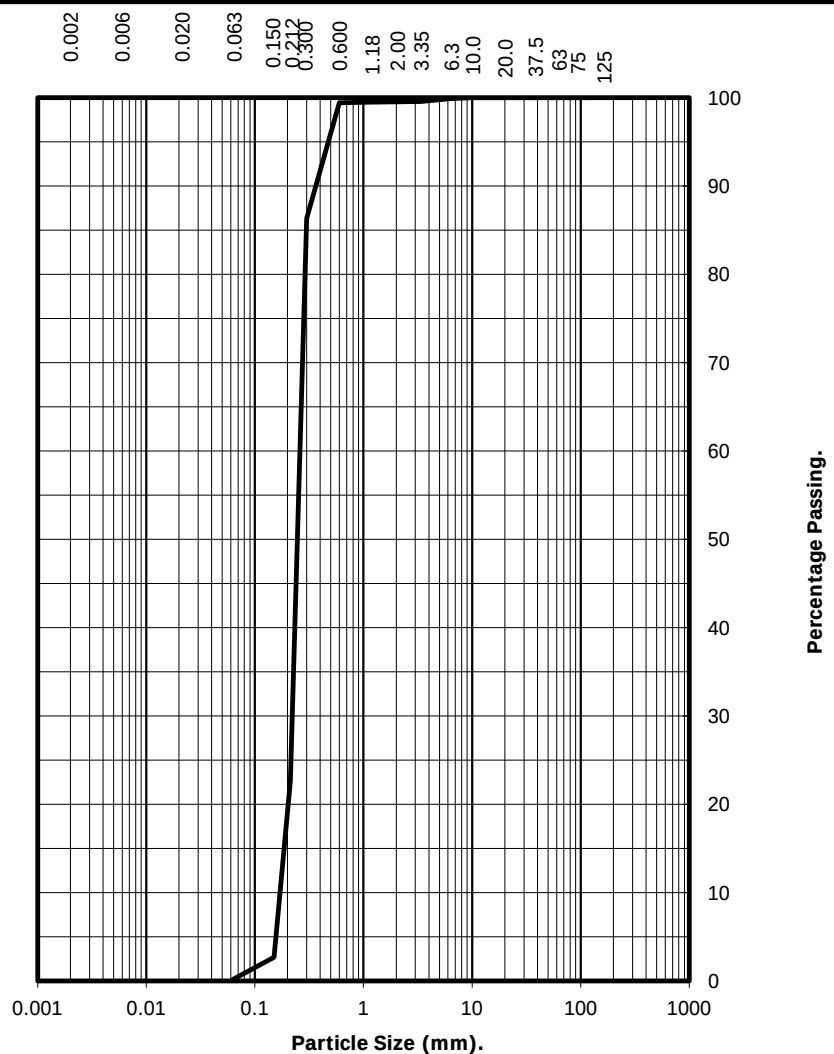
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **12.3.15**

Test Report: Particle Size Distribution Test
BS 1377 Part 2:1990.
Wet Sieve, Clause 9.2

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: TP122
Sample Number: 7
Depth from (m): 2.00
Depth to (m):
Sample Type: B
Description: Brown SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	99
0.60	99
0.300	86
0.212	23
0.150	3
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	100	0	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Tatam

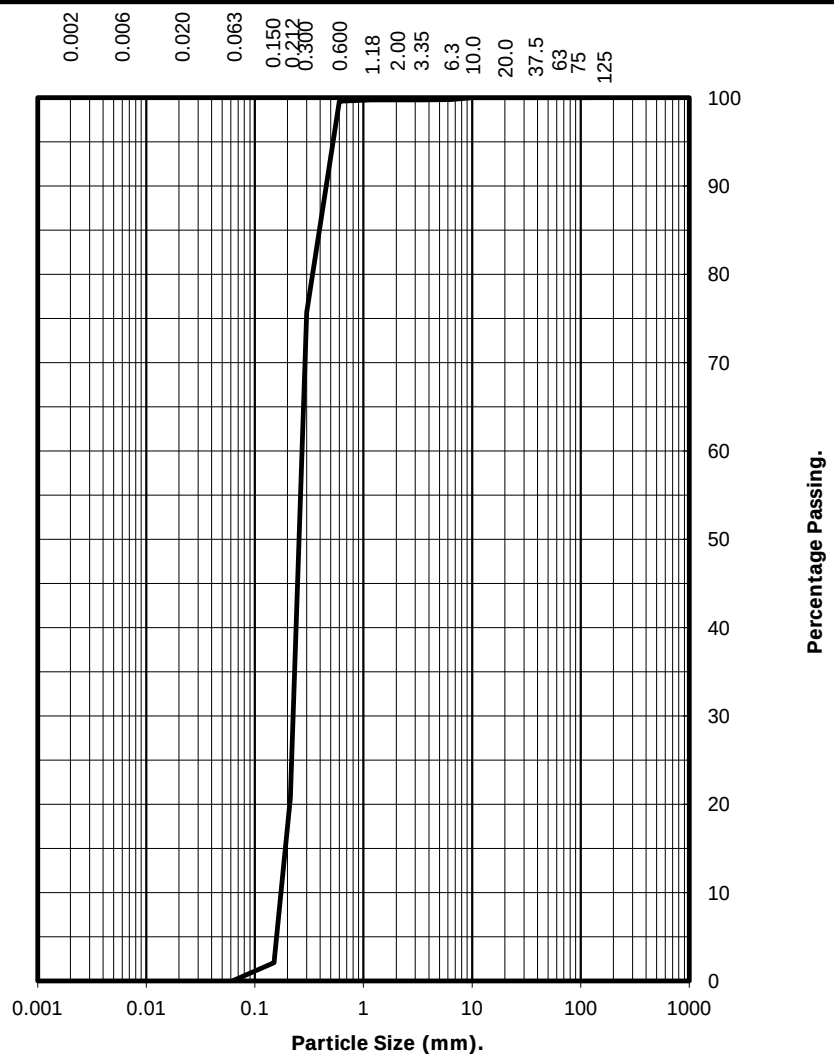
Date: 12.3.15

Test Report: Particle Size Distribution Test
BS 1377 Part 2:1990.
Wet Sieve, Clause 9.2

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: TP124
Sample Number: 7
Depth from (m): 2.60
Depth to (m):
Sample Type: B
Description: Brown SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	76
0.212	21
0.150	2
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	100	0	0	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

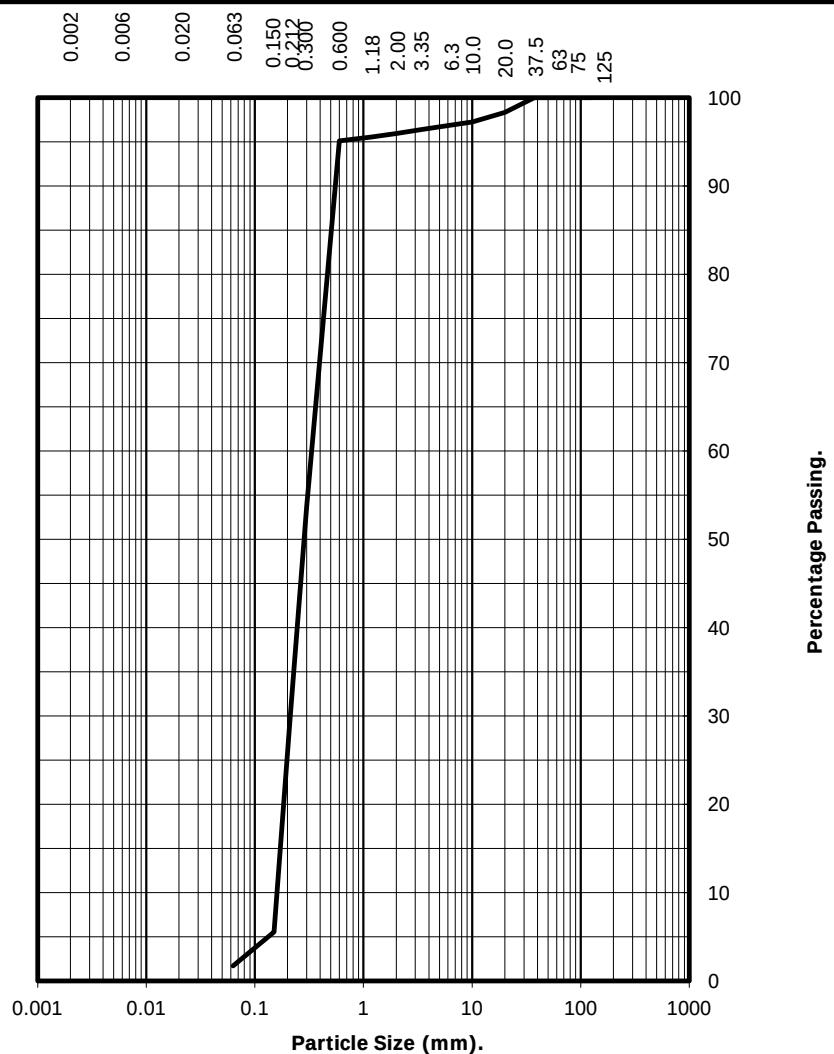
Tatam

Date: 12.3.15

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****TP127****Sample Number:****9****Depth from (m):****2.80****Depth to (m):****Sample Type:****B****Description:****Brown silty clayey gravelly (fine-coarse) SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	97
6.3	97
3.35	96
2.00	96
1.18	96
0.60	95
0.300	54
0.212	30
0.150	6
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	94	4	0	Total Percentage

Remarks:

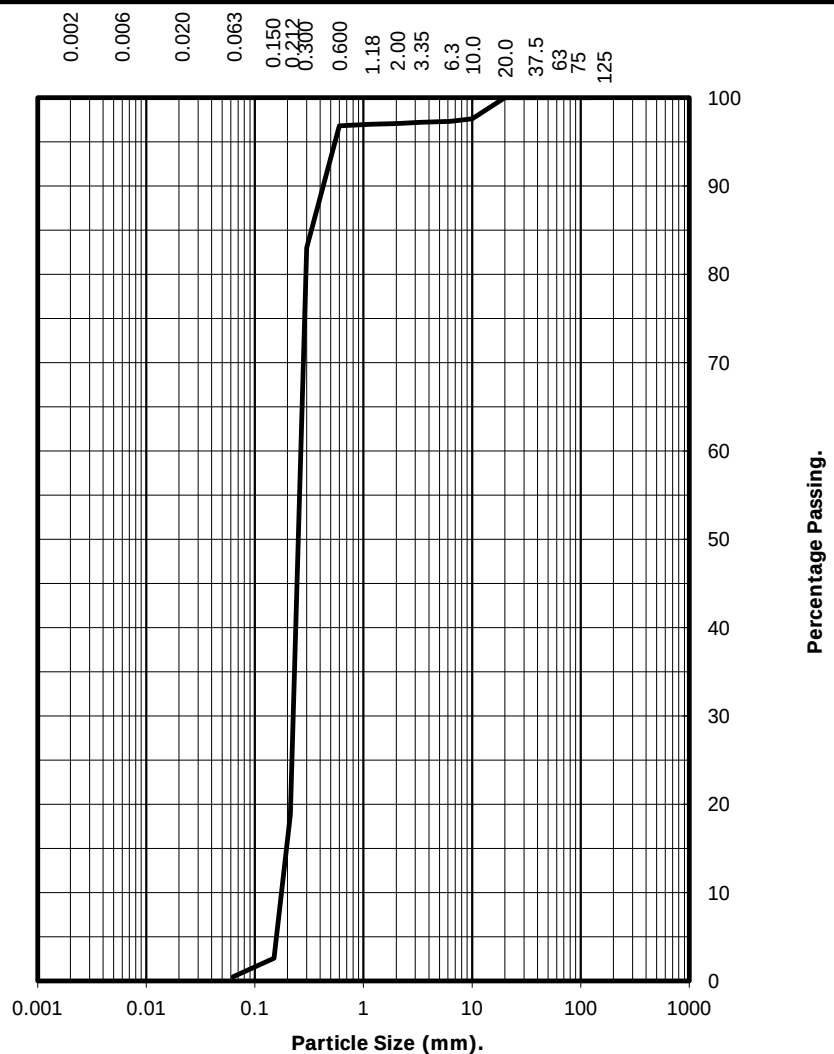
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **13.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****TP130****Sample Number:****7****Depth from (m):****2.50****Depth to (m):****Sample Type:****B****Description:****Brown gravelly (fine-medium) SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	97
3.35	97
2.00	97
1.18	97
0.60	97
0.300	83
0.212	19
0.150	3
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	97	3	0	Total Percentage

Remarks:

#- not determined

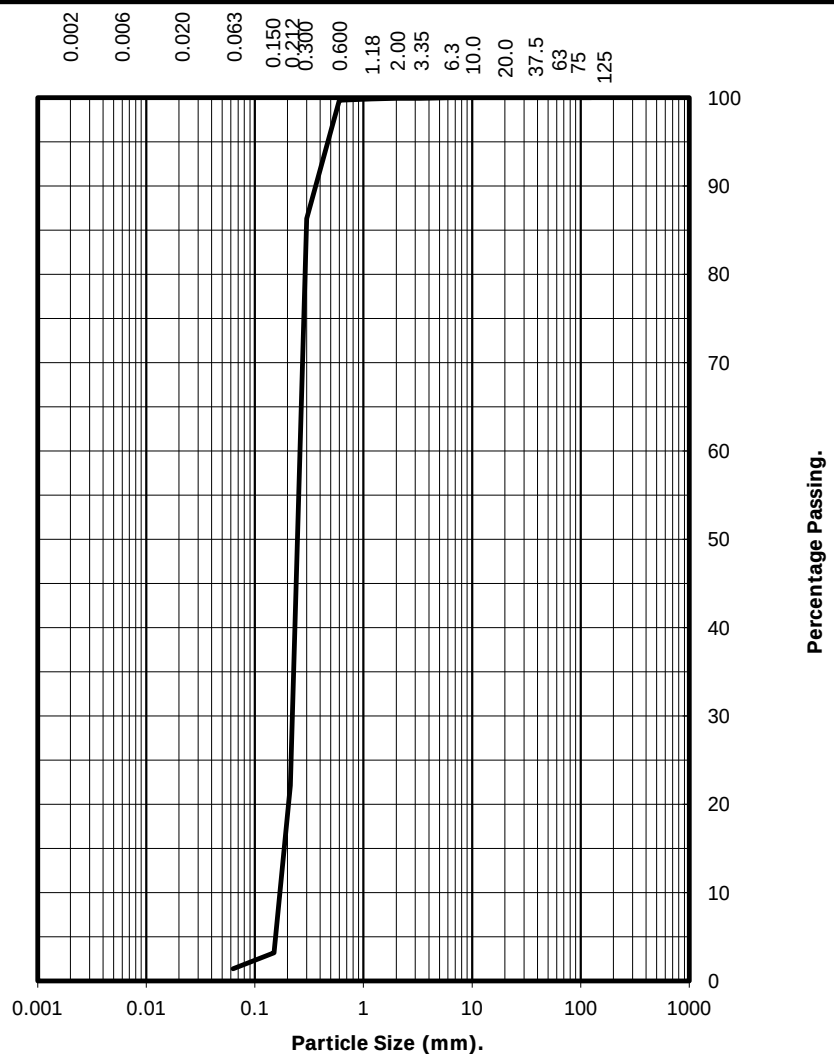
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **13.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: WS141
Sample Number: 7
Depth from (m): 3.50
Depth to (m): 4.00
Sample Type: B
Description: Brown silty SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	86
0.212	22
0.150	3
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	99	0	0	Total Percentage

Remarks:

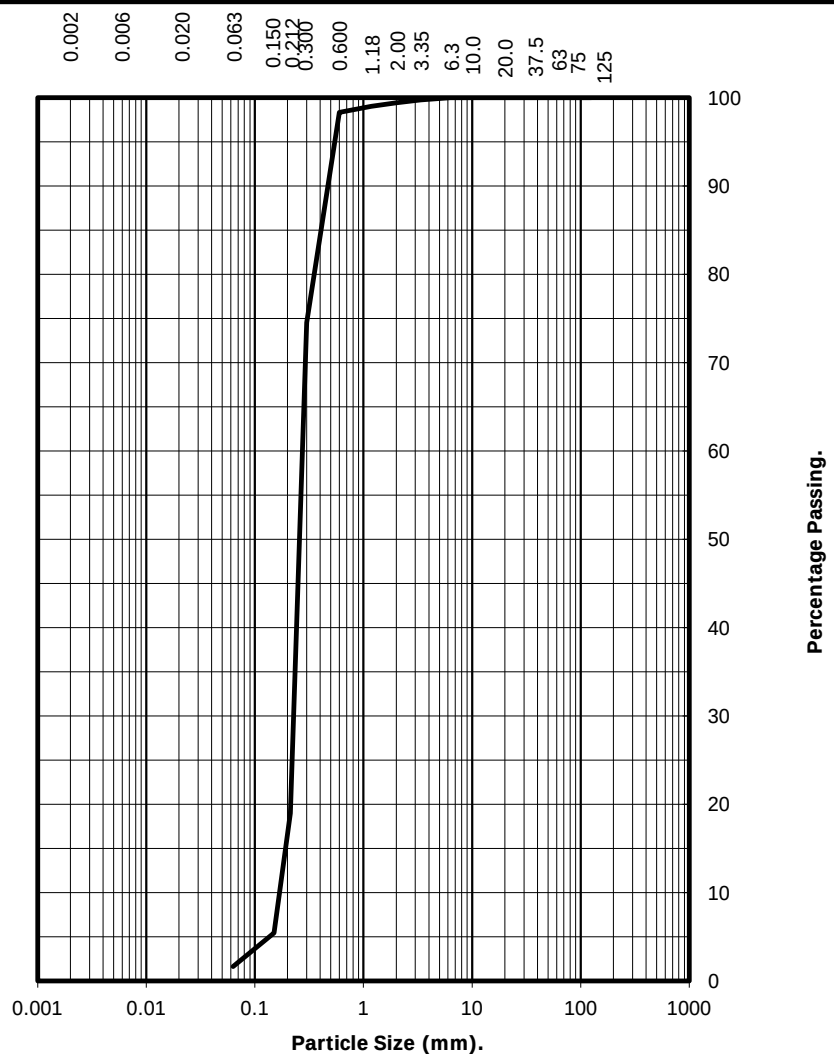
#- not determined

For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **13.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2****Client ref:****UA007442-04****Location:****Afon Lido****Contract Number:****25981-020315****Hole Number:****WS144****Sample Number:****8****Depth from (m):****3.50****Depth to (m):****4.00****Sample Type:****B****Description:****Brown gravelly (fine) silty clayey SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	99
1.18	99
0.60	98
0.300	75
0.212	19
0.150	5
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	97	1	0	Total Percentage

Remarks:

#- not determined

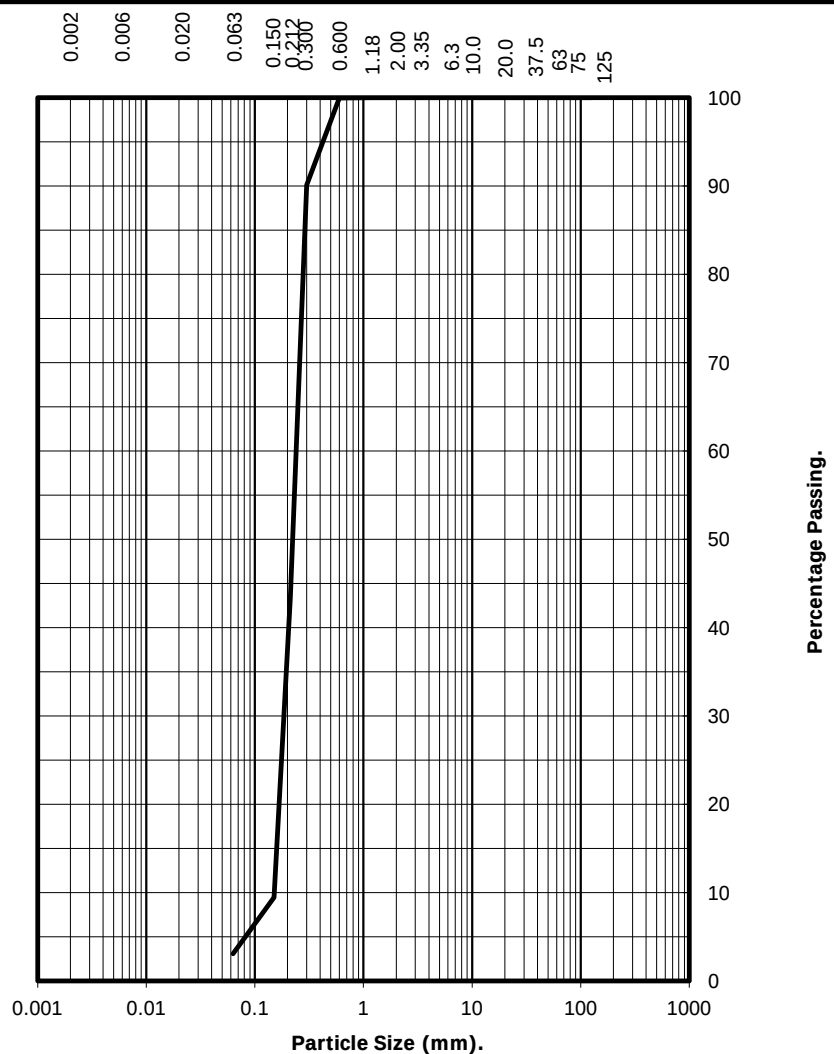
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **13.3.15**

Test Report: Particle Size Distribution Test**BS 1377 Part 2:1990.****Wet Sieve, Clause 9.2**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: WS146
Sample Number: 7
Depth from (m): 4.00
Depth to (m): 5.00
Sample Type: B
Description: Brown silty clayey SAND

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	90
0.212	43
0.150	9
0.063	3

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	3	97	0	0	Total Percentage

Remarks:

#- not determined

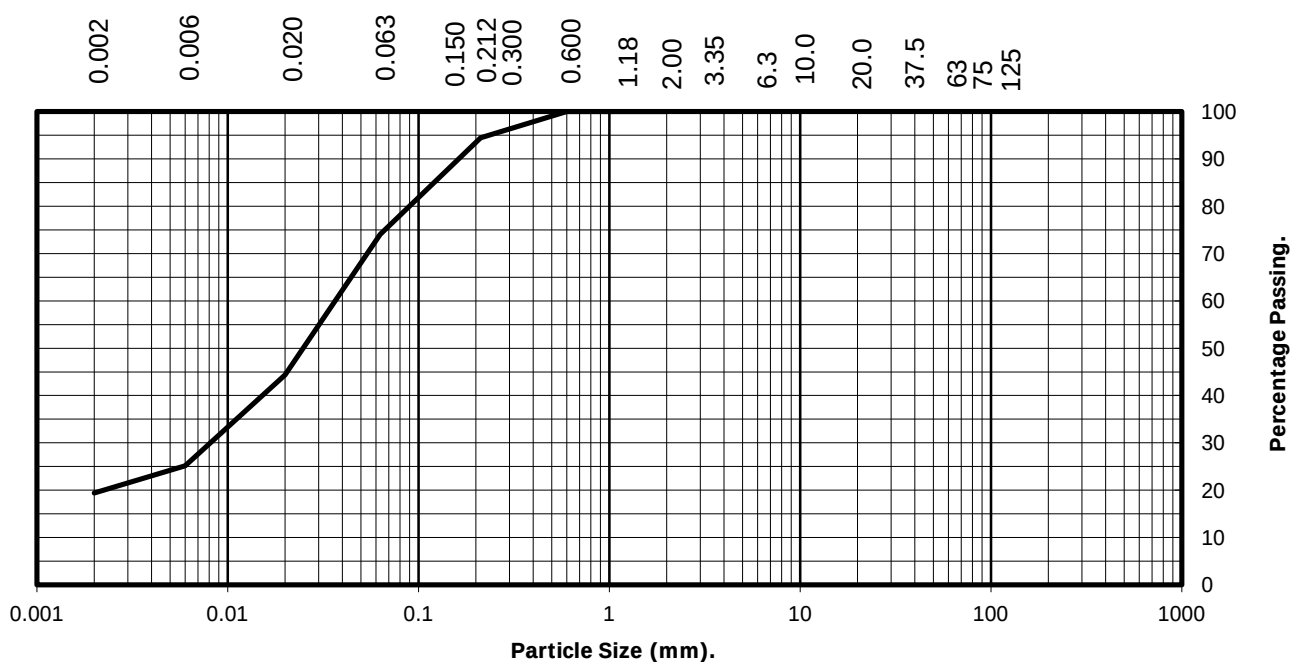
For and behalf of GEO Site & Testing Services LtdAuthorised By: **Jonathan Tatam (Admin/Quality Assistant)**Date: **13.3.15**

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH101
Sample Number: 26
Depth from (m) : 17.00
Depth to (m) : 17.45
Description : Grey clayey sandy SILT
Sample Type: UT



BS Test Sieve	Percentage Passing
2.00	100
0.60	100
0.212	94
0.063	74

Particle Diameter	Percentage Passing
0.02	44
0.006	25
0.002	19

Soil Fraction	Total Percentage
Gravel	0
Sand	26
Silt	55
Clay	19

Remarks:

Cl 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

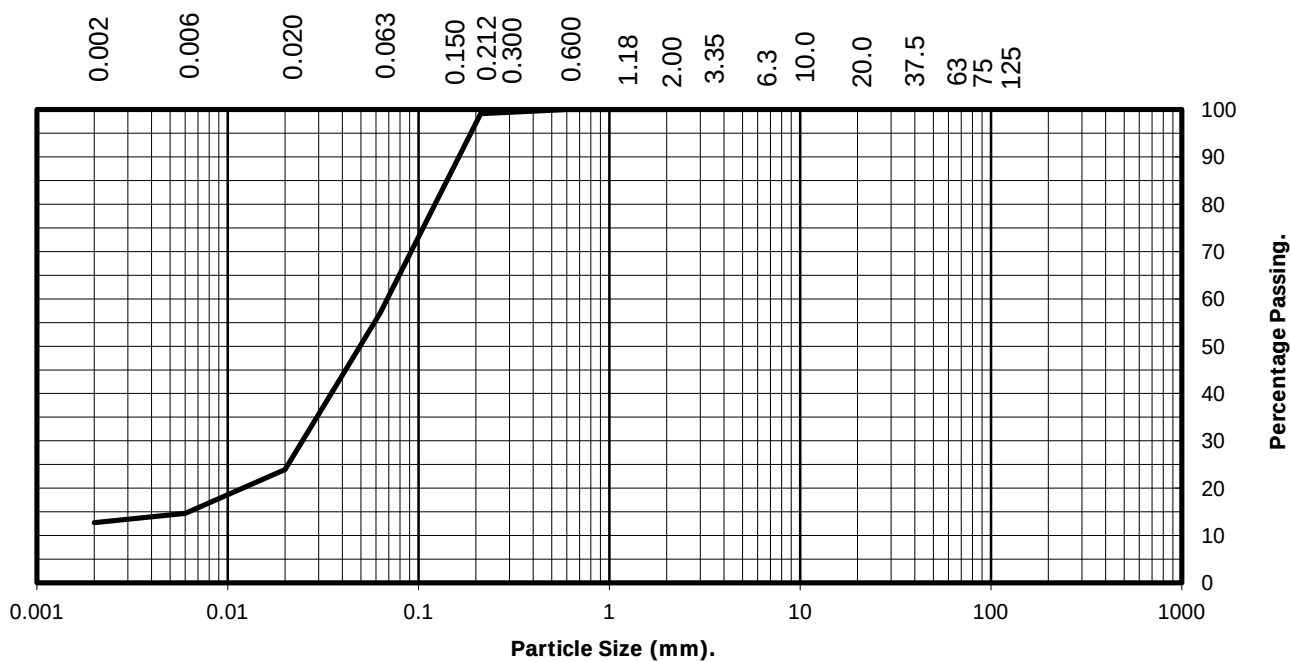
Tatam

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH103
Sample Number: 36
Depth from (m) : 18.50
Depth to (m) : 18.95
Description : Grey clayey sandy SILT
Sample Type: UT



BS Test Sieve	Percentage Passing
2.00	100
0.60	100
0.212	99
0.063	57

Particle Diameter	Percentage Passing
0.02	24
0.006	15
0.002	13

Soil Fraction	Total Percentage
Gravel	0
Sand	43
Silt	44
Clay	13

Remarks:

Cl 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By:

Jonathan Tatam (Admin/Quality Assistant)

Katam



Unit 4
Heol Aur
Dafen Ind EstateDafen
Carmarthenshire
SA14 8QN
Tel: 01554 784040
01554 750752
Fax: 01554 770529
01554 784041
Web: www.geo.uk.com

Certificate of Analysis

Date: 06/03/2015

Client: Hyder Consulting (UK) Ltd

Our Reference: 25981-020315

Client Reference: UA007442-04

Contract Title: Afon Lido

Description: (Total Samples) 19

Date Received: 02/03/2015

Date Started: 04/03/2015

Date Completed: 06/03/2015

Test Procedures: (B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)

Notes:

Solid samples will be disposed 1 month and liquids 2 weeks
after the date of issue of this test certificate

Approved By:

Authorised Signatories:

Emma Williams
Laboratory Office Manager

Dafydd Simon
Laboratory Team Leader

Paul Evans
Quality Manager

Date: 06/03/2015

(B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)

[illegible]

NCP - No Chloride present

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**
 Location: **Afon Lido**
 Contract Number: **25981-020315**
 Hole/Sample Number: **BH101**
 Depth (m) : **17.00 - 17.45**
 Sample Type: **UT**

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	27	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.94	0 - 340	0.21	6.6	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.53	340 - 425	0.13	2.4	20°C
Voids Ratio:	0.7291	425 - 510	0.12	2.4	Location of specimen with sample
Degree of saturation:	97.8	510 - 680	0.067	3.8	top
Height (mm):	20.13				Remarks:
Diameter (mm)	50.01				
Particle Density (Mg/m3)	2.65				
Assumed					

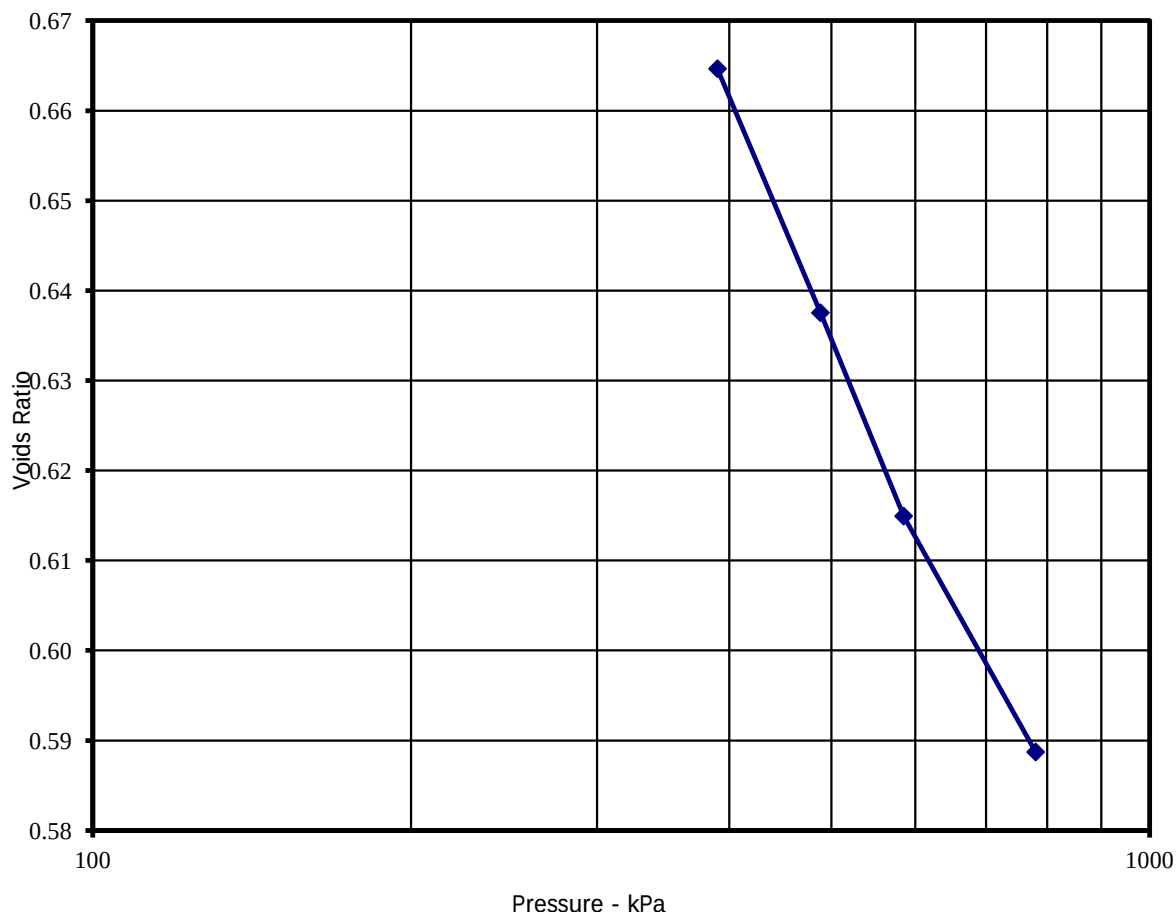


Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**
 Location: **Afon Lido**
 Contract Number: **25981-020315**
 Hole/Sample Number: **BH101**
 Depth (m) : **19.50 - 19.95**
 Sample Type: **UT**

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	31	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.91	0 - 390	0.21	4.6	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.46	390 - 488	0.17	0.58	20°C
Voids Ratio:	0.8118	488 - 585	0.14	1.5	Location of specimen with sample
Degree of saturation:	100.9	585 - 780	0.083	2.8	top
Height (mm):	20.04				Remarks:
Diameter (mm)	50.02				
Particle Density (Mg/m3)	2.65				
Assumed					

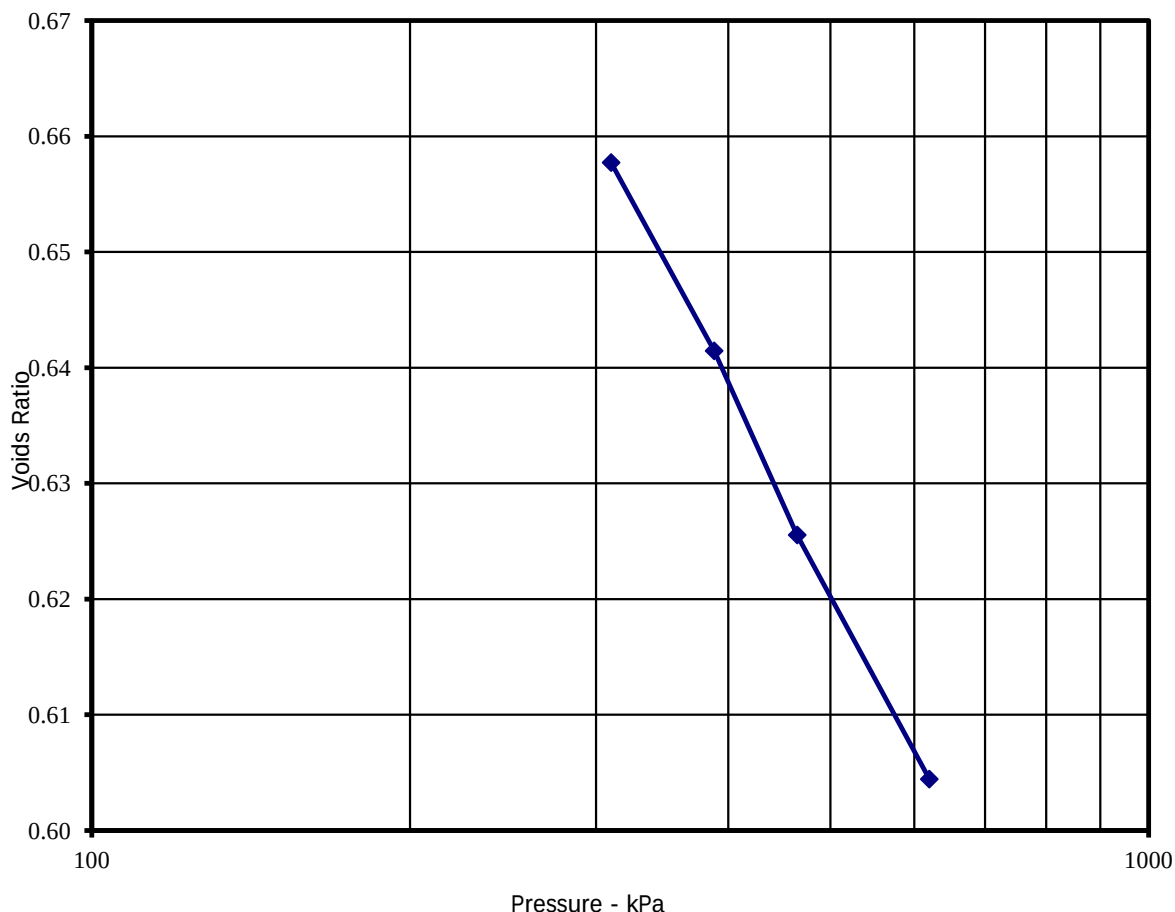


Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**
 Location: **Afon Lido**
 Contract Number: **25981-020315**
 Hole/Sample Number: **BH102**
 Depth (m) : **15.50 - N/A**
 Sample Type: **UT**

Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	29	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.90	0 - 310	0.24	9.1	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.48	310 - 388	0.13	1.5	20°C
Voids Ratio:	0.7904	388 - 465	0.13	1.6	Location of specimen with sample
Degree of saturation:	96.0	465 - 620	0.084	5.1	top
Height (mm):	20.02				Remarks:
Diameter (mm)	50.05				
Particle Density (Mg/m3)	2.65				
Assumed					



Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**
 Location: **Afon Lido**
 Contract Number: **25981-020315**
 Hole/Sample Number: **BH103**
 Depth (m) : **18.50 - 18.95**
 Sample Type: **UT**

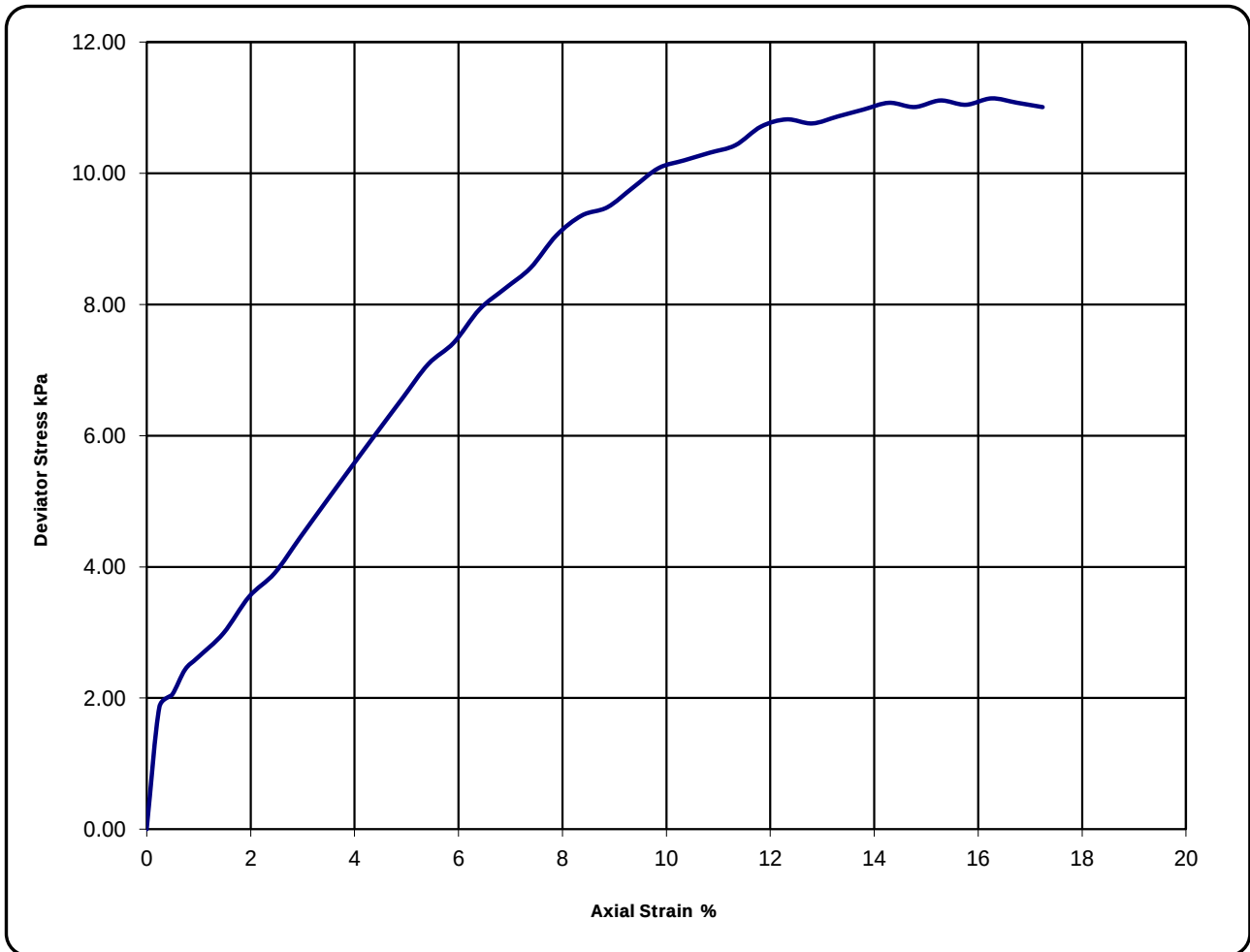
Initial Conditions		Pressure Range	Mv	Cv	Method of time fitting used
Moisture Content (%):	30	kPa	m2/MN	m2/yr	Cv Calculated using t90
Bulk Density (Mg/m3):	1.96	0 - 370	0.28	17	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.50	370 - 463	0.13	0.81	20°C
Voids Ratio:	0.7635	463 - 555	0.051	1.1	Location of specimen with sample
Degree of saturation:	104.5	555 - 740	0.068	1.8	top
Height (mm):	20.03				Remarks:
Diameter (mm)	50				
Particle Density (Mg/m3)	2.65				
Assumed					



Test Report:

Undrained Shear Strength in Triaxial Compression
BS 1377 : Part 7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH101
Sample Number: 26
Depth (m) : 17.00 to 17.45
Sample Type : UT
Sample Description : Soft to firm greyish brown sandy fine to medium silty CLAY.



Diameter (mm):		104	Height (mm):		203	Test:		UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks	
	A	25.1	2.05	1.64	340	11	6	16.3	Compound	Sample taken from Top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness



[Signature]

Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

[Signature]

Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number BH101
Sample Number: N/A
Depth (m) : 17.00
Sample Type : UT



Post Test Specimen



Specimen Split

Diameter (mm):		104	Height (mm):		203	Test:	UT 104 mm Single Stage.		
Specimen	Moisture	Bulk	Dry	Cell	Deviator	Cohesion	Failure	Mode	Remarks
	Content	Density	Density	Pressure	Stress	(kPa)	Strain	of	Sample taken from Top of tube
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	(kPa)	(kPa)	(%)	Failure	Rate of strain = 2 %/min
A	25.1	2.05	1.64	340	11	6	16.3	Compound	Latex Membrane used 0.2 mm thickness



Ben Sharp

Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

Paul Evans

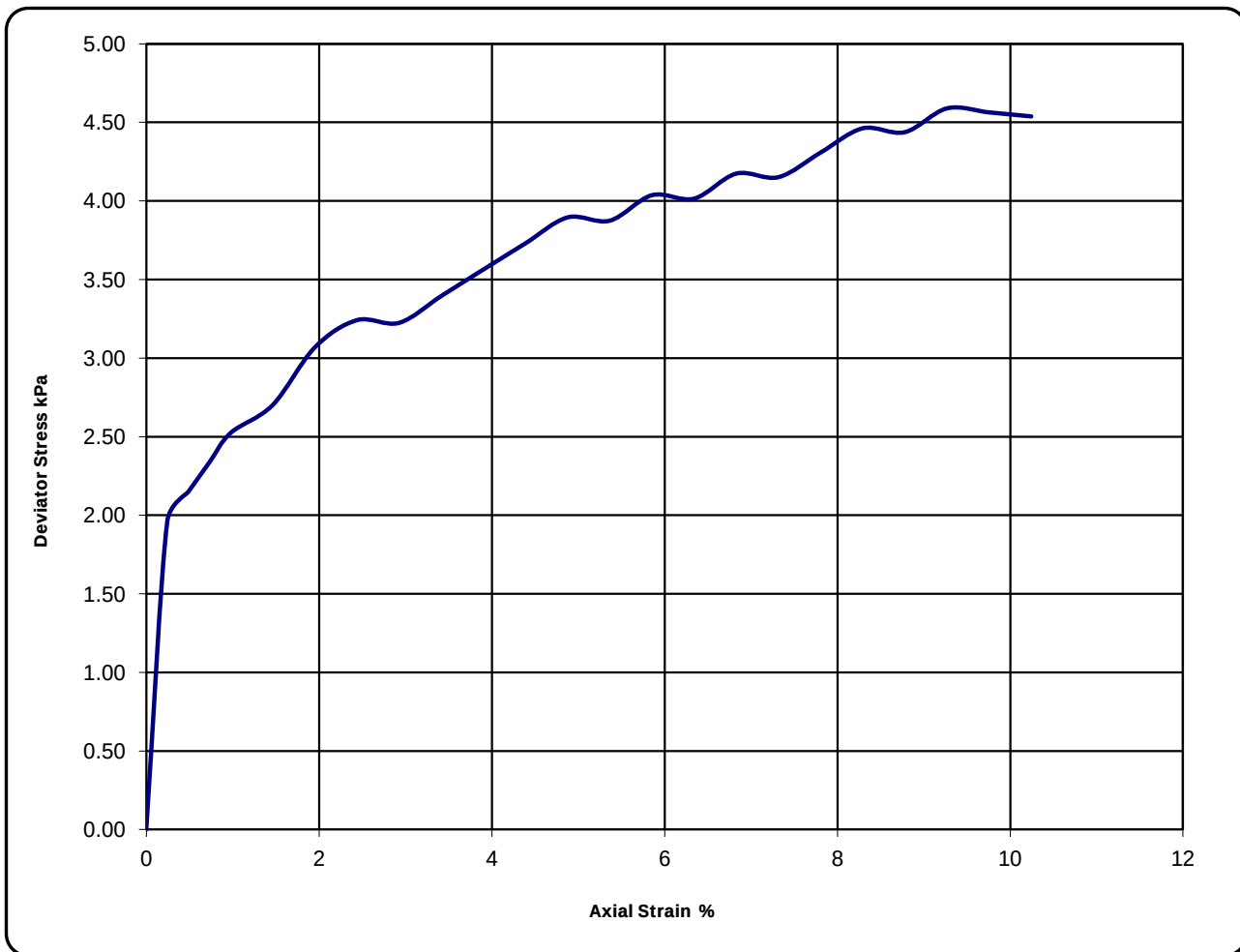
Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Test Report:

Undrained Shear Strength in Triaxial Compression
BS 1377 : Part 7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH101
Sample Number: 31
Depth (m) : 19.50 to 19.95
Sample Type : UT
Sample Description : Soft to firm greyish brown silty CLAY.



Diameter (mm):		104	Height (mm):		205	Test:		UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks	
	A	31.6	1.95	1.48	390	5	2	9.3	Plastic	Sample taken from Top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness



(Signature)

Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

(Signature)

Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Test Report:**Undrained Shear Strength in Triaxial Compression
BS 1377 : Part 7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure**

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH101
Sample Number: N/A
Depth (m) : 19.50
Sample Type : UT

**Post Test Specimen****Specimen Split**

Diameter (mm):		104	Height (mm):		205	Test:		UT 104 mm Single Stage.	
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks
A	31.6	1.95	1.48	390	5	2	9.3	Plastic	Sample taken from Top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thickness

Checked By
Ben Sharp (Contracts Manager)
Date Approved:

Approved By:
Paul Evans (Quality Manager)
13.3.15

Test Report:

Undrained Shear Strength in Triaxial Compression

BS 1377 : Part 7 : Clause 8 : 1990 Single Stage Test

without measurement of Pore Pressure

Client ref:

UA007442-04

Location:

Afon Lido

Contract Number:

25981-020315

Hole Number

BH102

Sample Number:

24

Depth (m) :

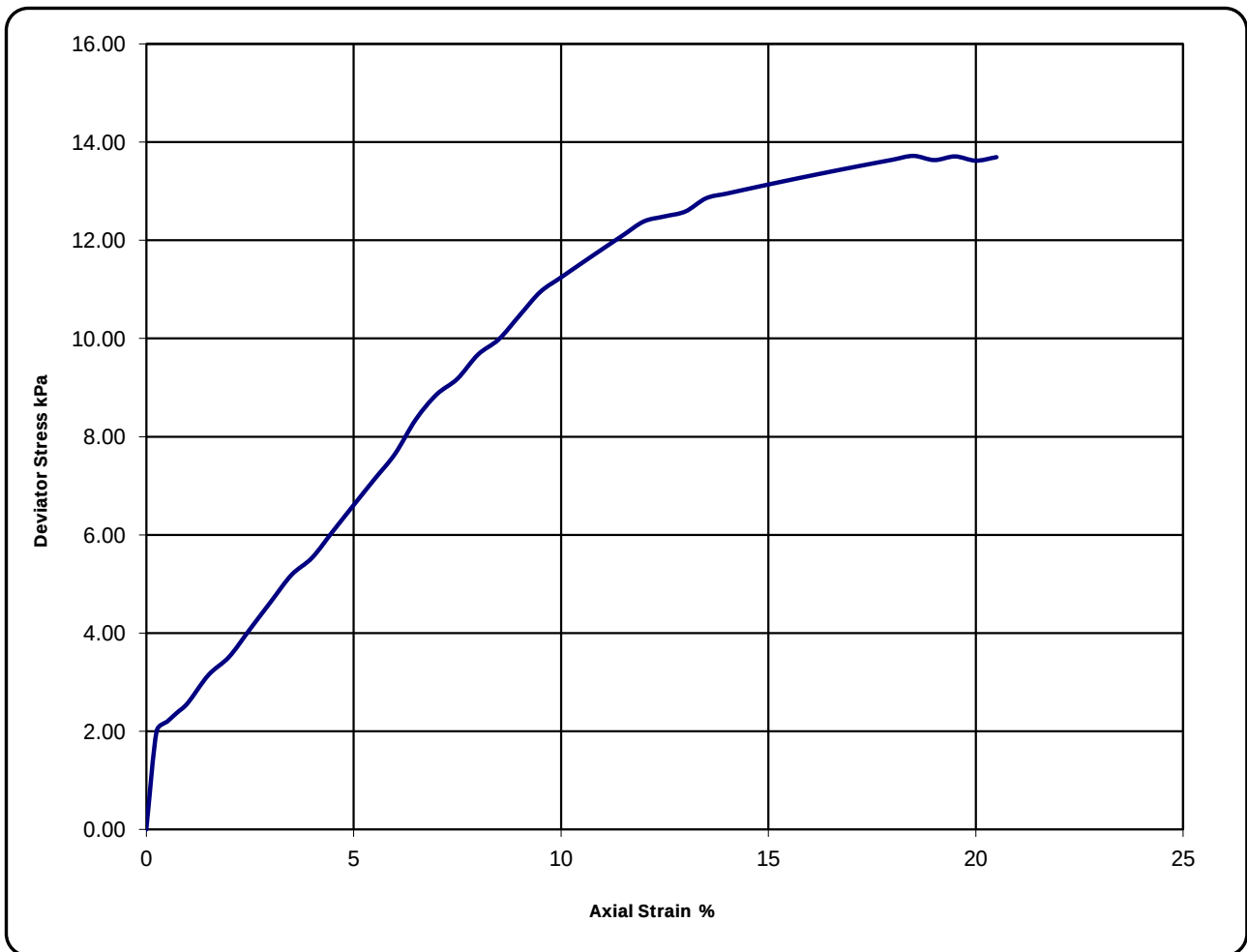
15.50 to 15.95

Sample Type :

UT

Sample Description :

Soft to firm greyish brown sandy (fine to medium) silty CLAY.



Diameter (mm):		103	Height (mm):		200	Test:	UT 103 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks
	A	25.2	2.10	1.68	310	14	7	18.5	Compound

Test Report:

Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
 Location: Afon Lido
 Contract Number: 25981-020315
 Hole Number: BH102
 Sample Number: N/A
 Depth (m) : 15.50
 Sample Type : UT

**Post Test Specimen****Specimen Split**

Diameter (mm):		103	Height (mm):		200	Test:	UT 103 mm Single Stage.		
Specimen	Moisture	Bulk	Dry	Cell	Deviator	Cohesion	Failure	Mode	Remarks
	Content	Density	Density	Pressure	Stress	(kPa)	Strain	of	
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	(kPa)		(%)	Failure	Rate of strain = 2 %/min
A	25.2	2.10	1.68	310	14	7	18.5	Compound	Latex Membrane used 0.2 mm thickness



Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

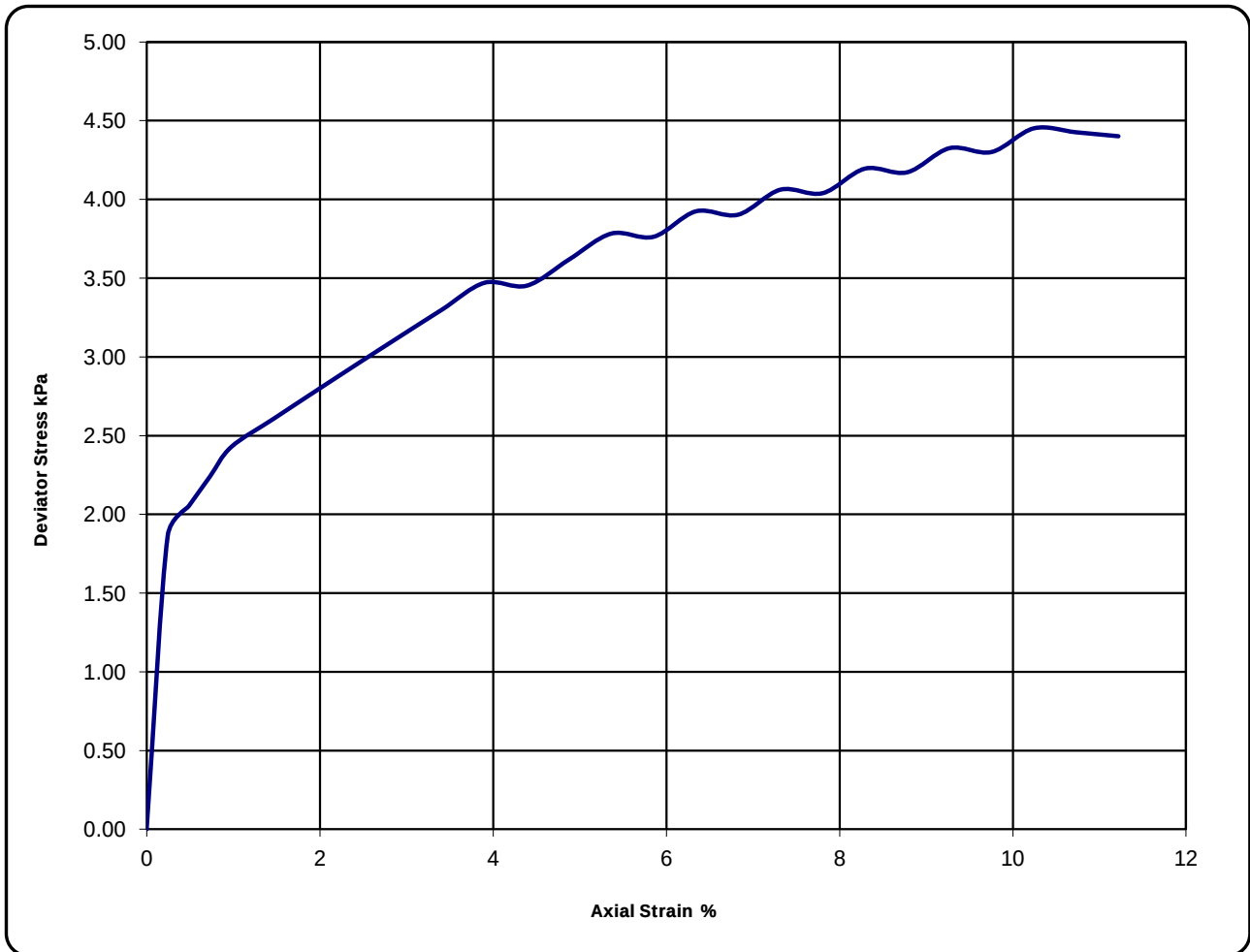
Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Test Report:

Undrained Shear Strength in Triaxial Compression
BS 1377 : Part 7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number: BH103
Sample Number: 36
Depth (m) : 18.50 to 18.95
Sample Type : UT
Sample Description : Soft to firm greyish brown silty CLAY.



Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks
	A	27.5	2.04	1.60	370	4	2	10.2	Plastic



[Signature]

Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

[Signature]

Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Test Report: Undrained Shear Strength in Triaxial Compression
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref: UA007442-04
Location: Afon Lido
Contract Number: 25981-020315
Hole Number BH103
Sample Number: N/A
Depth (m) : 18.50
Sample Type : UT



Post Test Specimen



Specimen Split

Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture	Bulk	Dry	Cell	Deviator	Cohesion	Failure	Mode	Remarks
	Content	Density	Density	Pressure	Stress	(kPa)	Strain	of	Sample taken from Top of tube
	(%)	(Mg/m3)	(Mg/m3)	(kPa)	(kPa)		(%)	Failure	Rate of strain = 2 %/min
A	27.5	2.04	1.60	370	4	2	10.2	Plastic	Latex Membrane used 0.2 mm thickness



Ben Sharp

Checked By
 Ben Sharp (Contracts Manager)
 Date Approved:

Paul Evans

Approved By:
 Paul Evans (Quality Manager)
 13.3.15



Appendix E

Chemical Laboratory Analysis Results



Environmental Science

Laura Cohu

Hyder Consulting (UK) Ltd
5th Floor
The Pithay
Bristol
BS1 2NL

t: 01173721360

e: laura.cohu@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 15-72366

Project / Site name: Afan Lido

Samples received on: 26/05/2015

Your job number:

Samples instructed on: 27/05/2015

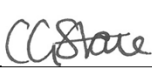
Your order number:

Analysis completed by: 03/06/2015

Report Issue Number: 1

Report issued on: 03/06/2015

Samples Analysed: 2 water samples

Signed: 

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed: 

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Analytical Report Number: 15-72366

Project / Site name: Afan Lido

Lab Sample Number				447775	447776			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/05/2015	22/05/2015			
Time Taken				1030	1100			
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status		

General Inorganics

pH	pH Units	N/A	ISO 17025	7.4	7.3			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO ₄	µg/l	45	ISO 17025	189000	32700			
Chloride	mg/l	0.15	ISO 17025	41	44			

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

Total PAH

Total EPA-16 PAHs	µg/l	0.2	ISO 17025	< 0.20	< 0.20			
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Analytical Report Number: 15-72366

Project / Site name: Afan Lido

Lab Sample Number				447775	447776			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/05/2015	22/05/2015			
Time Taken				1030	1100			
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.47	0.87			
Boron (dissolved)	µg/l	10	ISO 17025	63	41			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.06	< 0.02			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	2.8	2.8			
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3	0.4			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	4.0	3.7			
Selenium (dissolved)	µg/l	0.6	ISO 17025	11	4.0			
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.3	1.8			

Monoaromatics

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C7 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 15-72366

Project / Site name: Afan Lido

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073W-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082 B	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH in water	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L070-UK	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-UK	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



Laura Cohu

Hyder Consulting (UK) Ltd
5th Floor
The Pithay
Bristol
BS1 2NL

t: 01173721360

e: laura.cohu@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 15-69059

Project / Site name: Afon Lido

Samples received on: 26/03/2015

Your job number:

Samples instructed on: 26/03/2015

Your order number:

Analysis completed by: 08/04/2015

Report Issue Number: 1

Report issued on: 08/04/2015

Samples Analysed: 2 water samples

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Analytical Report Number: 15-69059

Project / Site name: Afon Lido

Lab Sample Number				429599	429600			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				25/03/2015	25/03/2015			
Time Taken				1204	1215			
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status		

General Inorganics

pH	pH Units	N/A	ISO 17025	7.5	7.6			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO ₄	µg/l	45	ISO 17025	67000	70100			
Chloride	mg/l	0.15	ISO 17025	50	50			

Total Phenols

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

Total PAH

Total EPA-16 PAHs	µg/l	0.2	ISO 17025	< 0.20	< 0.20			
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.24	1.94			
Boron (dissolved)	µg/l	10	ISO 17025	270	140			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.4			
Copper (dissolved)	µg/l	0.5	ISO 17025	6.4	9.1			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.9	3.3			
Zinc (dissolved)	µg/l	0.5	ISO 17025	7.6	2.0			



Analytical Report Number: 15-69059

Project / Site name: Afon Lido

Lab Sample Number				429599	429600			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				25/03/2015	25/03/2015			
Time Taken				1204	1215			
Analytical Parameter (Water Analysis)				Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C7 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 15-69059

Project / Site name: Afon Lido

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron by acidification followed by ICP-MS. Accredited matrices: SW, GW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Chloride in water	Determination of Chloride in water by Gallery Discrete Analyser based on reaction with mercury (II) thiocyanate and acid solution with iron (III) nitrate to form a red/brown iron (III) thiocyanate complex; followed by spectrophotometric measurement at a wavelength of 480 nm.	Methods for the Examination of Water and Associated Materials Chloride in Waters, Sewage and Effluents 1981.ISBN 0117516260 Accredited matrices: SW, PW, GW.	L082-B	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH in water	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L070-UK	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-UK	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

**Ian Parsons**

Hyder Consulting (UK) Ltd
HCL House
St Mellon's Business Park
Cardiff
CF3 OEY

t: 029 2092 6873

e: ian.parsons@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

Samples received on: 25/02/2015

Your job number: UA007442

Samples instructed on: 02/03/2015

Your order number:

Analysis completed by: 11/03/2015

Report Issue Number: 0

Report issued on: 11/03/2015

Samples Analysed: 33 soil samples

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Preliminary reports provided at the request of the client should be considered as incomplete and have not been through the complete quality control procedure.

Results contained in preliminary reports may be subject to change and therefore should not be used as a basis for decision making, except at the risk of the client.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422328	422329	422330	422331	422332
Sample Reference				BH101	BH101	TP123	TP123	TP124
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	0.50	1.00	0.50
Date Sampled				16/02/2015	16/02/2015	17/02/2015	17/02/2015	17/02/2015
Time Taken				0830	1130	0830	0830	0915
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.2	13	3.8	3.4	4.2
Total mass of sample received	kg	0.001	NONE	1.5	1.3	1.3	1.4	1.4

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.0	8.0	8.1	8.1	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	2	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.11	0.096	0.0069	0.0035	0.0078
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	110	96	6.9	3.5	7.8
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.057	0.048	0.0035	0.0018	0.0039
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	-	0.92
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	-	To follow

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.20	0.74	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	0.23	1.7	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	0.76	0.87	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	0.45	2.7	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	14	8.2	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	3.4	3.4	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	25	11	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	18	8.2	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	12	3.8	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	11	3.4	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	9.7	3.3	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	5.9	1.8	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	8.1	2.9	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	4.5	1.8	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	1.3	0.33	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.6	2.2	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	120	56.2	< 1.60	< 1.60	< 1.60
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Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number	422328	422329	422330	422331	422332
Sample Reference	BH101	BH101	TP123	TP123	TP124
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50	1.00	0.50	1.00	0.50
Date Sampled	16/02/2015	16/02/2015	17/02/2015	17/02/2015	17/02/2015
Time Taken	0830	1130	0830	0830	0915
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	20	53	14	19
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	1.6	0.3	0.3	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	11	3.2	5.8	2.9
Copper (aqua regia extractable)	mg/kg	1	MCERTS	280	87	40	11	33
Lead (aqua regia extractable)	mg/kg	1	MCERTS	350	310	12	10	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	18	6.1	6.0	7.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	390	280	53	35	78

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	22	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	84	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	290	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	400	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	2.9	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	32	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	120	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	190	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	340	-	-	-

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number	422333	422334	422335	422336	422337
Sample Reference	WS142	WS148	WS147	TP133	TP133
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50-0.60	0.50-0.60	0.20-0.30	0.20	0.40
Date Sampled	17/02/2015	17/02/2015	17/02/2015	18/02/2015	18/02/2015
Time Taken	None Supplied	None Supplied	None Supplied	0930	0930
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	13	20
Total mass of sample received	kg	0.001	NONE	1.3	1.0
				1.4	1.3
				1.3	1.1

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Crocidolite- Loose fibres
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.2	8.0	8.1	8.2	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1	5	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.12	0.18	1.1	0.33	0.28
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	120	180	1100	330	280
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.062	0.091	0.56	0.16	0.14
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.28	0.31	< 0.05	< 0.05	0.41
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.90	1.0	0.24	< 0.10	0.93
Anthracene	mg/kg	0.1	MCERTS	< 0.10	0.12	< 0.10	< 0.10	0.14
Fluoranthene	mg/kg	0.1	MCERTS	1.3	1.1	0.22	< 0.10	2.0
Pyrene	mg/kg	0.1	MCERTS	1.1	0.87	0.24	< 0.10	1.8
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.82	0.93	< 0.10	< 0.10	1.5
Chrysene	mg/kg	0.05	MCERTS	1.1	1.1	< 0.05	< 0.05	1.5
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.96	1.0	< 0.10	< 0.10	1.8
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.60	0.58	< 0.10	< 0.10	0.94
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.73	0.64	< 0.10	< 0.10	1.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.52	0.51	< 0.10	< 0.10	1.0
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	0.27
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.54	0.65	< 0.05	< 0.05	1.2

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	8.79	8.91	< 1.60	< 1.60	15.0
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Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422333	422334	422335	422336	422337
Sample Reference				WS142	WS148	WS147	TP133	TP133
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.60	0.50-0.60	0.20-0.30	0.20	0.40
Date Sampled				17/02/2015	17/02/2015	17/02/2015	18/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	0930	0930
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	380	210	600	1100	40
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.7	1.3	0.4	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	3.4	4.1	27	64	5.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	39	41	19	27	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	3900	360	1300	1300	640
Lead (aqua regia extractable)	mg/kg	1	MCERTS	560	2500	23000	24000	280
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	95	85	78	100	81
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	2400	5200	40000	40000	1500

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-



Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422338	422339	422340	422341	422342
Sample Reference				TP127	TP128	WS144	TP125	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.25	0.35-0.50	0.20	1.00
Date Sampled				18/02/2015	18/02/2015	20/02/2015	17/02/2015	17/02/2015
Time Taken				1030	1130	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.3	5.5	4.0	9.1	12
Total mass of sample received	kg	0.001	NONE	1.5	1.4	1.4	1.3	1.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.2	8.0	8.8	8.6	8.8
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.017	2.4	0.014	0.87	0.020
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	17	2400	14	870	20
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.0085	1.2	0.0071	0.44	0.010
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	3.3	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	To follow	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.75	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.18	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.77	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.60	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.51	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.42	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.45	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.24	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.34	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.22	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.25	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	4.73	< 1.60
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Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422338	422339	422340	422341	422342
Sample Reference				TP127	TP128	WS144	TP125	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.25	0.35-0.50	0.20	1.00
Date Sampled				18/02/2015	18/02/2015	20/02/2015	17/02/2015	17/02/2015
Time Taken				1030	1130	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	110	16	19	16
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.4	0.3	0.9	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	1.9	5.5	1.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5.9	8.2	2.6	35	2.7
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.0	230	21	89	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	1500	70	170	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.2	12	5.7	26	4.5
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	2300	910	280	38

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-



Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422343	422344	422345	422346	422347
Sample Reference				TP126	TP134	TP137	TP137	TP129
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.20	0.50	0.50
Date Sampled				17/02/2015	17/02/2015	17/02/2015	17/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	1245
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.5	6.1	10	17	4.7
Total mass of sample received	kg	0.001	NONE	1.5	1.2	1.3	1.3	1.5

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile- Loose fibres	Amosite- Loose fibres	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Detected	Not-detected	Not-detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.9	8.7	8.6	8.2	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.026	0.12	2.5	1.1	0.027
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	26	120	2500	1100	27
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.013	0.058	1.3	0.55	0.014
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	4.6	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	To follow	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60
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Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422343	422344	422345	422346	422347
Sample Reference				TP126	TP134	TP137	TP137	TP129
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.20	0.50	0.50
Date Sampled				17/02/2015	17/02/2015	17/02/2015	17/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	1245
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	8.3	22	45	13
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.8	2.6	2.5	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2.0	0.6	0.6	2.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.5	34	16	36	6.2
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	47	31	58	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	300	68	200	340	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.9	19	12	35	7.9
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	760	180	460	670	81

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422348	422349	422350	422351	422352
Sample Reference				TP132	TP132	WS141	WS141	WS145
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.30-0.50	1.20-1.40	0.15-0.25
Date Sampled				18/02/2015	18/02/2015	20/02/2015	20/02/2015	20/02/2015
Time Taken				1500	1500	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	16	2.7	3.9	8.6
Total mass of sample received	kg	0.001	NONE	1.3	1.1	1.3	1.4	1.2

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.5	8.5	8.5	8.6	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.45	0.27	0.16	0.023	0.11
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	450	270	160	23	110
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.23	0.13	0.079	0.011	0.054
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	0.85	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	To follow	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	0.35	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	0.17	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.23	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60
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Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422348	422349	422350	422351	422352
Sample Reference				TP132	TP132	WS141	WS141	WS145
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.30-0.50	1.20-1.40	0.15-0.25
Date Sampled				18/02/2015	18/02/2015	20/02/2015	20/02/2015	20/02/2015
Time Taken				1500	1500	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1200	130	21	13	52
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	1.0	0.3	0.3	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	63	12	0.8	< 0.2	0.9
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	25	5.1	4.5	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	1600	300	67	12	240
Lead (aqua regia extractable)	mg/kg	1	MCERTS	23000	2000	930	33	960
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	96	65	7.9	5.2	77
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	47000	4500	800	39	1000

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-



Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422353	422354	422355	422356	422357
Sample Reference				WS146	WS143	WS143	TP130	TP130
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.20-0.30	1.10-1.20	0.50	1.00
Date Sampled				20/02/2015	20/02/2015	20/02/2015	19/02/2015	19/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.5	3.6	1.4	2.4	3.2
Total mass of sample received	kg	0.001	NONE	1.3	1.2	1.4	1.3	1.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH	pH Units	N/A	MCERTS	8.6	8.2	8.6	8.4	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.14	1.6	0.019	0.036	0.018
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	140	1600	19	36	18
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.069	0.82	0.0095	0.018	0.0088
Loss on Ignition @ 450°C	%	0.2	MCERTS	6.0	-	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	To follow	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.51	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	0.85	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	0.68	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.46	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	0.63	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.77	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.43	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.48	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	4.81	< 1.60	< 1.60	< 1.60	< 1.60
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Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422353	422354	422355	422356	422357
Sample Reference				WS146	WS143	WS143	TP130	TP130
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.20-0.30	1.10-1.20	0.50	1.00
Date Sampled				20/02/2015	20/02/2015	20/02/2015	19/02/2015	19/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	24	11	11	16	17
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	1.7	0.3	0.3	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41	15	4.5	6.1	6.4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	150	44	7.7	10	9.6
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	33	7.8	22	42
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	60	4.0	5.6	7.2	5.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	3.3	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	240	56	35	56	60

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

Analytical Report Number: 15-67903
Project / Site name: Afan Lido, Port Talbot

Lab Sample Number	422358	422359	422360		
Sample Reference	TP135	TP136	TP136		
Sample Number	None Supplied	None Supplied	None Supplied		
Depth (m)	1.00	0.25	0.75		
Date Sampled	19/02/2015	19/02/2015	19/02/2015		
Time Taken	None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	7.8	4.2
Total mass of sample received	kg	0.001	NONE	1.3	1.4

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		

General Inorganics

pH	pH Units	N/A	MCERTS	8.3	10.7	9.4		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1		
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.11	0.18	0.51		
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	110	180	510		
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.054	0.092	0.26		
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-		
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-		

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	0.21	< 0.10		
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	0.32	< 0.10		
Pyrene	mg/kg	0.1	MCERTS	< 0.10	0.23	< 0.10		
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60		
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Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422358	422359	422360		
Sample Reference				TP135	TP136	TP136		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.00	0.25	0.75		
Date Sampled				19/02/2015	19/02/2015	19/02/2015		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	12	19		
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.9	0.3		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5.3	15	4.5		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.8	20	15		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.5	44	13		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.5	12	7.1		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	35	74	40		

Monoaromatics

Benzene	µg/kg	1	MCERTS	-	-	-		
Toluene	µg/kg	1	MCERTS	-	-	-		
Ethylbenzene	µg/kg	1	MCERTS	-	-	-		
p & m-xylene	µg/kg	1	MCERTS	-	-	-		
o-xylene	µg/kg	1	MCERTS	-	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-		

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		



Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
422328	BH101	None Supplied	0.50	Light brown sand.
422329	BH101	None Supplied	1.00	Brown sandy topsoil.
422330	TP123	None Supplied	0.50	Beige sand.
422331	TP123	None Supplied	1.00	Beige sand.
422332	TP124	None Supplied	0.50	Light brown sand.
422333	WS142	None Supplied	0.50-0.60	Black sandy topsoil with gravel and brick.
422334	WS148	None Supplied	0.50-0.60	Brown sandy topsoil with gravel and vegetation.
422335	WS147	None Supplied	0.20-0.30	Brown sandy topsoil with gravel and rubble.
422336	TP133	None Supplied	0.20	Red sand with brick.
422337	TP133	None Supplied	0.40	Black topsoil and gravel with clinker.
422338	TP127	None Supplied	0.20	Beige sand.
422339	TP128	None Supplied	0.25	Light brown sand.
422340	WS144	None Supplied	0.35-0.50	Light brown sand.
422341	TP125	None Supplied	0.20	Black sandy topsoil with gravel.
422342	TP125	None Supplied	1.00	Light brown sand.
422343	TP126	None Supplied	0.50	Light brown sand.
422344	TP134	None Supplied	0.20	Light brown sand with rubble and brick.
422345	TP137	None Supplied	0.20	Light brown sand with rubble.
422346	TP137	None Supplied	0.50	Brown topsoil and clay with vegetation.
422347	TP129	None Supplied	0.50	Light brown sand.
422348	TP132	None Supplied	0.20	Brown topsoil and gravel with clinker and brick.
422349	TP132	None Supplied	0.40	Black topsoil and gravel with brick.
422350	WS141	None Supplied	0.30-0.50	Light brown sand.
422351	WS141	None Supplied	1.20-1.40	Beige sand.
422352	WS145	None Supplied	0.15-0.25	Brown topsoil and gravel with clinker and brick.
422353	WS146	None Supplied	0.30-0.50	Brown topsoil and gravel with clinker and brick.
422354	WS143	None Supplied	0.20-0.30	Light grey sandy topsoil with rubble.
422355	WS143	None Supplied	1.10-1.20	Beige sand.
422356	TP130	None Supplied	0.50	Beige sand.
422357	TP130	None Supplied	1.00	Beige sand.
422358	TP135	None Supplied	1.00	Beige sand.
422359	TP136	None Supplied	0.25	Light brown sand with rubble.
422360	TP136	None Supplied	0.75	Light brown sand.

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Calorific Value of soil	Subcontracted.	Subcontracted analysis		W	NONE
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 dphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results are not corrected for the stone content of the sample.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by extraction with water followed by ICP-OES. Results reported corrected for extraction ratio (soil equivalent) as g/l and mg/kg; and upon the 2:1 leachate (g/l)	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.