

**Geotechnical & Geo-environmental
Report:**

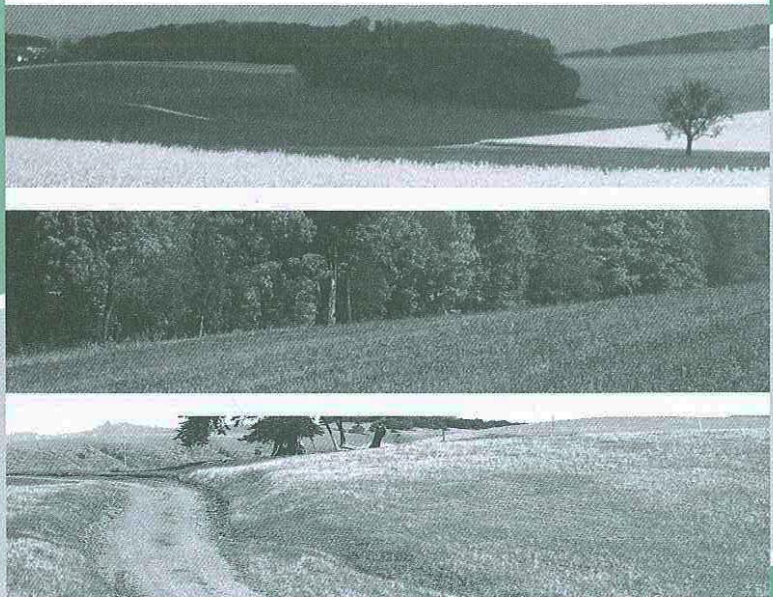
Proposed Commercial Development
Swansea Bay Technology Centre
Central Avenue
Port Talbot

PREPARED FOR:

Morgan Sindall Construction &
Infrastructure Ltd

February 2020

Job No: 15773




terrafirma

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Bay Technology Centre, Central Avenue, Port
Talbot

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Executive Summary

Site Location and Proposed Development	Morgan Sindall Construction & Infrastructure Ltd (the Client) is proposing the commercial development of a mixed use three storey structure at Central Avenue, Port Talbot SA12 7AX.
Site History	The development area is largely designated as marsh (saltings) until c.1977. From 1899 the Rhondda and Swansea Bay railway is shown crossing the site adjacent and parallel with the eastern boundary. Post 1977 the site situates towards the periphery of BP petrochemicals plant on undeveloped ground and a railway branch line is shown to the northeast corner of the site. The adjacent Baglan Bay Innovation Centre and associated car park was constructed between 2006 and 2019 with the above mentioned railways dismantled prior to this.
Geology	The 1:50,000 scale geological map of the area (Sheet 247) was consulted for geology underlying the site. The site is shown to be underlain by the South Wales Middle Coal Measures which is Carboniferous in age. The rocks are grey coal bearing mudstone and sandstone with seatearth and minor sandstone. Superficial deposits of Tidal Flat Deposits are recorded at the site. Made ground is anticipated at the site.
Radon	No radon protective measures are required for new developments on the investigation site.
Ground Conditions	Variable Made Ground to 1.00-3.30m Superficial deposits (Clay, Sand) to 9.40-10.70m Suspected bedrock (sandstone recovered as gravel) to >15.0m
Contaminants of Concern	Methane Gas Groundwater (arsenic, copper, TPH & Naphthalene)
Recommended Foundation & Floor Slab Solution	Due to the variable nature and depth of the made ground and superficial deposits, mass concrete strip and pad foundations are not considered feasible for the development, where unfavourable differential settlement between foundations is anticipated. It is therefore recommended that a piled foundation is adopted for the development. For a 275mm square precast concrete driven pile founded within the dense to very dense granular materials at depths of between 12.50m to 15.00m a safe working load of 400kN should be achievable. It should be noted that pile type, size, length and working loads are for guidance only and should be confirmed by the specialist piling contractor. The floor slabs should be designed as suspended, and if within influence of tree root systems in general accordance with the NHBC guidelines.

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SECTION 1 Introduction and Proposed Development

1.1 Introduction

Morgan Sindall Construction & Infrastructure Ltd (the Client) is proposing the commercial development of a mixed use three storey structure at Central Avenue, Port Talbot SA12 7AX.

Terra Firma (Wales) Limited have been commissioned by the Client to undertake a geotechnical and geo-environmental investigation at the site.

The main objectives of the geo-environmental assessment programme were to:

- Investigate the potential environmental liabilities at the site associated with any soil, groundwater or ground gas contamination
- Provide a summary of the environmental conditions at the site, together with any necessary further intrusive works and / or remediation works to render the site fit for its intended use
- Provide a waste classification assessment of each principle soil type encountered in accordance with WM3.

The main objectives of the geotechnical site investigation were to:

- Determine the type, strength and bearing characteristics of the shallow superficial and underlying solid geology
- Provide engineering foundation and floor slab recommendations for the development
- Provide an assessment of the risks of concrete in aggressive ground in accordance with BRE-SD1
- Provided a radon risk assessment
- Provide CBR recommendations for the proposed car parking area.
- Provided infiltration rates for storm water drainage and permeable paving options.
- Provide recommendations with regard to any other geotechnical aspects pertaining to the development

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a site walkover, a review of existing data, followed by a field investigation to collect geotechnical and environmental data from selected locations.

1.2 Limitations and Exceptions of Investigation

The Client has requested that a Geo-environmental Site Assessment (GSA) and Geotechnical Investigation (GI) be performed in order to determine if contamination is present beneath the site and to determine an appropriate foundation and floor slab solution for the proposed development.

The GSA and GI were conducted, and this report has been prepared for the sole internal reliance of the Client and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

It was beyond the scope of this investigation to provide a preliminary human health and environmental risk assessment.

The site investigation was not detrimentally limited by surface or subterranean features.

SECTION 2 Review of Existing Data

2.1 Physical Setting and Current Site Use

The development site locates on a landscaped grassed area within the grounds of Baglan Bay Innovation centre building, positioned immediately to the east. The proposed structures centres on an approximate National Grid Reference of 274038 192972, occupying a total plan area of approximately 1.8 Hectares.

The site is currently accessed from Central Avenue to the southwest.

The site elevation is approximately 8m AOD and generally level.

The current site layout with proposed structures overlain can be seen on **Figure 2.1** along with the site layout in **Drawing 01**.

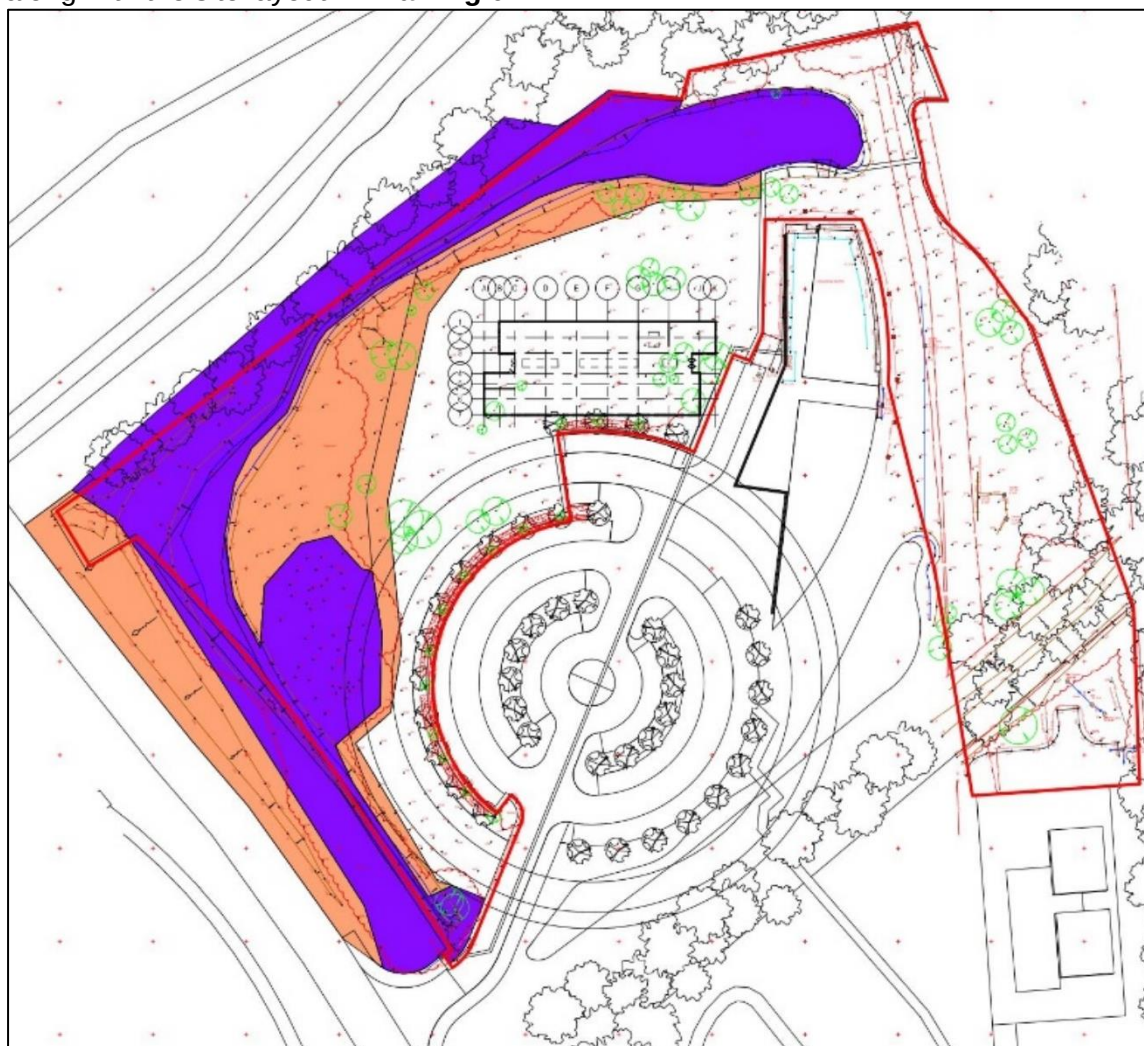


Figure 2.1 – Site Location (Site outlined in red)

2.2 Previous Investigation and Assessments

This report should be read in conjunction with the following documents.

Hydrock Consultants Limited (2019) – Phase 1 Ground Conditions Desk Study. (Ref. 11852-HYD-XX-XX-RP-G-1001)

The following sub-sections are summarised from the above report.

2.3 Site History Summary

The development area is largely designated as marsh (saltings) until c.1977. From 1899 the Rhondda and Swansea Bay railway is shown crossing the site adjacent and parallel with the eastern boundary. Post 1977 the site situates towards the periphery of BP petrochemicals plant on undeveloped ground and a railway branch line is shown to the northeast corner of the site. The adjacent Baglan Bay Innovation Centre and associated car park was constructed between 2006 and 2019 with the above mentioned railways dismantled prior to this.

2.4 Geological Setting

2.4.1 Geology

The 1:50,000 scale geological map of the area (Sheet 247) was consulted for geology underlying the site. The site is shown to be underlain by the South Wales Middle Coal Measures which is Carboniferous in age. The rocks are grey coal bearing mudstone and sandstone with seatearth and minor sandstone.

Superficial deposits of Tidal Flat Deposits are recorded at the site.

Made ground is anticipated at the site.

2.4.2 Radon

The site is located in a lower probability radon affected area, as between 1% and 3% of properties are above the action level.

No radon protective measures are required for new developments on the investigation site.

2.4.3 Mining

The site locates with the South Wales Middle Coal Measures. Hydrock Consultants Limited (2019) report has considered the risk from mining related instability issues. Their report concluded that any coal working would be too deep to present a risk to the proposed development.

2.4.4 Natural Hazards

The underlying geology is not prone to dissolution and the risk of natural cavities in the bedrock is considered negligible.

Superficial soils likely present beneath the site have the potential for running sand conditions and shrinkage/swelling of clay ground stability hazards.

Potential aggressive ground conditions may attack buried concrete.

No other significant natural hazards present a risk to the proposed development.

2.5 Summary of Contaminant Linkages

Significant potential pollutant linkages as defined in Hydrock Consultants Limited (2019) report are summarised in **Table 2.1**.

Table 2.1 Summary of Contaminant Linkages	
Source	Receptor
Made Ground – possible metals, metalloids, petroleum hydrocarbons, polycyclic aromatic hydrocarbons	Site users. Surface waters
Ground gasses (Carbon Dioxide & Methane) from made ground and peat	Site end users & structures

2.6 Groundwater

Hydrock Consultants Limited (2019) report identifies the superficial Tidal Flat deposits to have a secondary undifferentiated aquifer. Secondary undifferentiated is assigned in case where it has not been possible to attribute either category A or B to the stratum. Bedrock is recorded to have a secondary A aquifer. Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

SECTION 3 Field Investigation

3.1 Site Works

A geotechnical and geo-environmental site investigation comprising three cable percussion boreholes, ten trial pits, two soakaway tests and 5 CBR tests were undertaken between the 18th December 2019 and 10th January 2020.

The fieldwork was supervised by Terra Firma (Wales) Limited, who logged the exploratory holes to the requirements of BS5930:2015. The proposed locations of the exploratory holes were determined by Terra Firma (Wales) Limited.

Boreholes reference BH01 to BH03 were formed using a light cable tool (shell and auger) drilling rig. Initially an inspection pit was dug to a maximum of 1.20m. Boreholes were advanced from the base of the inspection pit using 150mm tools and casing with the occasional use of a heavy chisel to assist boring.

The borehole logs are presented in **Annex A**.

A geological cross section of the site is presented in **Annex G**.

Representative disturbed samples were taken and retained in plastic bags and airtight containers for environmental and geotechnical testing.

Standard penetration tests (SPT) were carried out in general accordance with BS1377. A split barrel or solid cone was used depending upon the materials encountered and the split barrel samples retained in airtight tubs. The SPT N value was taken as the number of blows to penetrate the 300mm test drive following a 150mm seating drive. Where low penetration was recorded the seating drive was terminated at 25 blows and the test drive completed after a further 50 blows. SPT results are summarised as N values on the relevant borehole logs.

Boreholes were monitored for groundwater ingress as boring proceeded. Upon encountering water, boring was temporarily stopped to allow the level to stabilise. Water levels are presented on the relevant borehole logs.

On completion all exploratory holes were installed with ground gas/groundwater monitoring wells. Installation details are located on the relevant borehole logs.

Trial pits referenced TP01 to TP10 were formed by a JCB 3CX excavator with a 0.60m wide bucket. The trial pit logs are presented in **Annex B**.

Soakaway tests were carried out in trial pits TP09 and TP10 in general accordance with BRE356. The excavation sides were squared using the excavator bucket and the dimensions recorded within the test section. The trial pit was partially filled with potable water using a dedicated bowser and the fall in level recorded against time. The test was repeated three times. The results are presented in **Annex C**.

CBR tests, referenced CBR01 to CBR05, were carried out using a CNS Farnell A2465 dynamic cone penetrometer. Probe depths were measured with respect to ground level and the number of blows for the penetration of the probe was recorded. Equivalent CBR values have been calculated and presented with the results in **Annex D**. The results of the tests are discussed in **Section 8.5**.

Exploratory hole locations are shown on **Drawing 01**.

3.2 Ground Conditions

The ground conditions encountered by the exploratory holes can in general be summarised as shown in **Table 3.1**.

Table 3.1 Summary of Typical Ground Conditions		
Depth (m)	Thickness (m)	Stratum
0.0 - 1.00/3.30	1.00/3.30	Variable MADE GROUND .
1.00/3.30 - 12.40/14.00	9.40/10.70	Very soft to soft dark grey locally peaty CLAY interbedded with loose to medium dense dark greyish brown SAND .
12.40/14.00 - 13.90/15.00	-	Dense to very dense dark grey sand sandstone GRAVEL . (PROBABLY WEATHERED BEDROCK)

3.3 Water Strikes

The groundwater conditions are summarised in **Table 3.2**.

Table 3.2 Summary of Groundwater Conditions		
Location	Water Strike Depth (m)	Comment
BH01	1.90	Rising to 1.50m after 20mins
BH02	1.90	Rising to 1.30m after 20mins
BH03	1.80	Rising to 1.30m after 20mins
TP01	1.70	Fast
TP02	2.00	Fast
TP03	1.30	Fast
TP04	1.80	Fast
TP05	0.60	Seepage
TP06	1.60	Fast
TP07	1.90	Fast
TP08	1.00	Fast

3.4 Stability and Obstructions

Boreholes refused on suspected bedrock between 13.90-15.00m.

Trial pits TP02 and TP06 encountered running sand below 1.00m and 1.30m respectively and subsequently terminated due to unstable conditions.

Trial pit TP05 refused in very dense materials at 1.10m.

3.5 Borehole Groundwater Monitoring Levels

Table 3.3 Summary of Groundwater Levels		
Location	Groundwater Depth (m)	Date Monitored
BH01	1.45	24/01/20
BH02	2.40	
BH03	1.60	
BH01	1.63	04/02/20
BH02	2.33	
BH03	1.50	

3.6 Laboratory Chemical Testing

3.6.1 Quality Assurance

During the intrusive investigation, several small disturbed soil samples were collected. Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- Soil samples were collected by hand with nitrile gloves.
- Clean gloves were used for each sample.
- Soil samples were stored at a temperature below 4 degrees.
- No head space was left in sample containers.
- Appropriate sample containers were used.
- Samples were submitted for laboratory testing within holding times.

3.6.2 Sampling Regime

The sampling regime was conducted in general accordance with BS10175 (2011) in order to satisfy the following criteria:

- Investigate suspected sources of contamination
- Investigate type and concentration of contamination
- Ensure good representation of the site
- Provide data to advise on remedial measures if necessary

Samples are recorded on the relevant borehole logs.

3.6.3 Soil Laboratory Analysis

During the site works a number of soil samples were taken and despatched to the laboratories of Chemtest for laboratory chemical testing;

Metals and Metalloids

Arsenic
Cadmium
Chromium III
Chromium VI
Copper
Lead
Mercury
Nickel
Selenium
Zinc
Boron

In-Organics

Cyanide
Sulphate
BRE SD1

Organic Chemicals

Phenols
Polycyclic Aromatic Hydrocarbons (PAH)
Petroleum Hydrocarbons (TPHCWG)
Volatile Organic Compounds (VOC)

Others

pH (acidity)
Asbestos
Organic Matter
WAC

The results are discussed in detail in **Section 4**.

Waste Acceptance Criteria testing was also undertaken, and the results are analysed in **Section 6**.

The full laboratory test results certificates may be found in **Annex E**.

3.7 Soil Property Testing

3.7.1 Laboratory Geotechnical Testing

A schedule of laboratory tests was prepared and despatched to the laboratories of GSTL. A summary of the testing carried out is presented in **Table 3.4**.

Table 3.4 Summary of Geotechnical Testing		
Test	Standard (BS1377:1990)	No
Moisture Content	Part 2, Clause 3.2	13
4 Point Liquid and Plastic Limit	Part 2, Clause 4.3 & 5.3	6
PSD Wet Sieve Method	Part 2, Clause 9.2	6
PSD: Sedimentation by Pipette	Part 2, Clause 9.4	1

The test results are presented in **Annex F** and relevant results discussed in **Section 8** of this report.

SECTION 4 Evaluation of Soil Analytical Results

4.1 Soil Assessment Methodology

Comparison of the analytical results has been made with the 2015 Suitable 4 Use Levels (S4UL) provided by Land Quality Management (LQM) Limited and the Chartered Institute of Environmental Health (CIEH) or provisional Category 4 Screening Levels (pC4SL). Where S4UL or C4SL values are not available, reference has been made to Soil Guideline Values (SGV) sourced from the now withdrawn Environment Agency Contaminated Land Exposure Assessment (CLEA).

Sulphate results have been compared to British Research Establishment (BRE) guidelines as sulphate levels need only be considered for buried concrete risk assessment only, not human health related. The leachate analytical results have been compared with available guidelines published in the Water Framework Directive or Drinking Water Directive. Where guidelines are not available reference has been made to the relevant laboratory limit of detection.

4.2 Soil Test Results

A summary of the chemical test results which include the regulatory soil guideline values used in a commercial setting are given in **Tables 4.1 to 4.4**. The complete results can be found in **Annex E**.

Thirteen samples were tested for a standard suite of metals, inorganics and phenols. The summarised results are shown in **Table 4.1**.

Table 4.1 Summary of Soil Chemical Test Results - Standard Suite					
Substance	GAC/SGV (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Arsenic	640	LQM/CIEH	12	30	0
Cadmium	190	LQM/CIEH	0.25	0.93	0
Chromium III	8600	LQM/CIEH	12	1100	0
Chromium VI	33	LQM/CIEH	<0.5	<0.5	0
Copper	68000	LQM/CIEH	22	60	0
Lead	2300	pC4SL	31	290	0
Mercury (inorganic)	1100	LQM/CIEH	<0.05	0.49	0
Nickel	980	LQM/CIEH	9	24	0
Selenium	12000	LQM/CIEH	<0.2	0.54	0
Zinc	730000	LQM/CIEH	110	400	0
Cyanide (total)	480	CLEA	<0.50	<0.50	0
Phenols	440	LQM/CIEH	<0.3	<0.3	0
Boron	240000	LQM/CIEH	0.48	1.5	0
Sulphate (2:1 Water Soluble) mg/l	500	BRE	93	360	0
Sulphate (Acid soluble)	2400	BRE	330	5900	6
pH	-	-	9.0	10.8	-
Organic Matter %	-	-	0.3	2.5	-

Table 4.1 Notes:

- GAC - Generic assessment criteria
- - No available guidelines

Twelve samples were tested for speciated polycyclic aromatic hydrocarbons. The summarised results are shown below in **Table 4.2**.

Table 4.2 Summary of Soil Chemical Test Results - Speciated Polycyclic Aromatic Hydrocarbons					
Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	190	LQM/CIEH	<0.10	<0.10	0
Acenaphthylene	83000	LQM/CIEH	<0.10	<0.10	0
Acenaphthene	84000	LQM/CIEH	<0.10	<0.10	0
Fluorene	63000	LQM/CIEH	<0.10	<0.10	0
Phenanthrene	22000	LQM/CIEH	<0.10	1.0	0
Anthracene	520000	LQM/CIEH	<0.10	0.18	0
Fluoranthene	23000	LQM/CIEH	<0.10	3.7	0
Pyrene	54000	LQM/CIEH	<0.10	2.7	0
Benzo(a)anthracene	170	LQM/CIEH	<0.10	0.76	0
Chrysene	350	LQM/CIEH	<0.10	0.85	0
Benzo(b)fluoranthene	44	LQM/CIEH	<0.10	1.2	0
Benzo(k)fluoranthene	1200	LQM/CIEH	<0.10	0.35	0
Benzo(a)pyrene	35	LQM/CIEH	<0.10	0.88	0
Indeno(123cd)pyrene	500	LQM/CIEH	<0.10	0.62	0
Dibenzo(ah)anthracene	3.5	LQM/CIEH	<0.10	0.16	0
Benzo(ghi)perylene	3900	LQM/CIEH	<0.10	1.2	0
Total PAH	-	-	<2	9.3	-

Notes:

- GAC - Generic assessment criteria
- Thresholds based on 1.0% soil organic matter
- - No available guidelines

Twelve samples were scheduled for petroleum hydrocarbon testing. The summarised results are shown below in **Table 4.3**.

Table 4.3 Summary of Soil Chemical Test Results Petroleum Hydrocarbons					
Substance	GAC (mg/kg)	Source	Measured Concentrations of Tested Substances (mg/kg)		Number of Exceedences
			Minimum	Maximum	
<u>Aliphatic</u>					
PH C5 – C6 Ali	3200	LQM/CIEH	<1.0	<1.0	0
PH C6 – C8 Ali	7800	LQM/CIEH	<1.0	<1.0	0
PH C8 – C10 Ali	2000	LQM/CIEH	<1.0	<1.0	0
PH C10 – C12 Ali	9700	LQM/CIEH	<1.0	<1.0	0
PH C12 – C16 Ali	59000	LQM/CIEH	<1.0	<1.0	0
PH C16 – C21 Ali	1600000*	LQM/CIEH	<1.0	<1.0	0
PH C21 – C35 Ali	1600000*	LQM/CIEH	<1.0	8.2	0
PH C35 – C44 Ali	1600000	LQM/CIEH	<1.0	<1.0	0
<u>Aromatic</u>					
PH C5 – C7 Arom	26000	LQM/CIEH	<1.0	<1.0	0
PH C7 – C8 Arom	26000	LQM/CIEH	<1.0	<1.0	0
PH C8 – C10 Arom	2500	LQM/CIEH	<1.0	<1.0	0
PH C10 – C12 Arom	16000	LQM/CIEH	<1.0	<1.0	0
PH C12 – C16 Arom	36000	LQM/CIEH	<1.0	<1.0	0
PH C16 – C21 Arom	28000	LQM/CIEH	<1.0	38	0
PH C21 – C35 Arom	28000	LQM/CIEH	<1.0	410	0
PH C35 – C44 Arom	28000	LQM/CIEH	<1.0	<1.0	0

Notes:

- GAC - Generic assessment criteria
- PH – Petroleum Hydrocarbon
- Ali - Aliphatic
- Arom - Aromatic
- Thresholds based on 1.0% soil organic matter
- * - Ali C16-21 and C21-C35 based on criteria for Ali EC >16-35

4.2.1 Soil Asbestos Screening

All samples were scheduled for asbestos screening. Asbestos was not detected.

4.2.2 Soil VOC Testing

Four samples of representative soils were scheduled for volatile organic compounds testing. All tests results returned values below the laboratory limit of detection for the determinants tested for.

4.3 Groundwater Test Results

Three groundwater samples were collected from boreholes BH01 to BH03. The samples were tested for suite of determinants including metals, metalloids, organic and inorganics. The results are summarised below in **Tables 4.4 to 4.5**.

Table 4.4 Summary of Water Chemical Test Results Standard Suite					
Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Arsenic	50	WFD2	9	98	2
Cadmium	0.08	WFD1	<0.08	<0.08	0
Chromium III	4.7	WFD2	<20	<20	BLDL
Chromium VI	3.4	WFD2	<20	<20	BLDL
Chromium	3.4 ¹	WFD2	1.7	2.4	0
Copper	1.0	WFD1	<1.0	1.5	1
Lead	1.2	WFD1	<1.0	<1.0	0
Mercury	0.07	WFD3	<0.01	<0.01	0
Nickel	4	WFD1	<1.0	<1.0	0
Selenium	10	DWS	3.6	5.2	0
Zinc	10.9	WFD2	2.5	3.4	0
Cyanide, Total	1.0	WFD2	<50	<50	BLDL
Phenol	7.7	WFD2	<5	<5	0
Sulphide	-	-	<50	380	ALDL
TPH (C6-C40)	10 ²	WFD1	53	130	3
Sulphate (mg/l)	400	BRE	68	140	0
pH	-	-	8.3	8.8	-
BOD (mg/l)	-	-	<4.0	<4.0	-
COD (mg/l)	-	-	18	28	-
Electrical Conductivity (uS/cm)	-	-	520	900	-
Hardness (mg/l)	-	-	310	350	-

Table Notes:

- WFD1 - Water Framework Directive – Inland Surface Waters (AA)
- WFD2 - Water Framework Directive – Freshwater (Long Term Mean)
- WFD3 - Water Framework Directive – Inland Surface Waters (MAC)
- DWS – Drinking Water Directive
- BRE - British Research Establishment
- - No available guideline
- 1 – Conservative threshold for Chromium VI used
- 2 – Conservative threshold for Benzene used
- BLDL - Below laboratory detection limit
- ALDL - Above laboratory detection limit

Table 4.5 Summary of Water Chemical Test Results Speciated Polyaromatic Hydrocarbons

Substance	Threshold (ug/l)	Source	Measured Concentrations of Tested Substances (ug/l)		Number of Exceedences
			Minimum	Maximum	
Naphthalene	2	WFD1	<0.01	3.3	1
Acenaphthylene	-	-	<0.01	<0.01	BLDL
Acenaphthene	-	-	<0.01	<0.01	BLDL
Fluorene	-	-	<0.01	<0.01	BLDL
Phenanthrene	-	-	<0.01	<0.01	BLDL
Anthracene	0.1	WFD1	<0.01	<0.01	0
Fluoranthene	0.0063	WFD1	<0.01	<0.01	BLDL
Pyrene	-	-	<0.01	<0.01	BLDL
Benzo(a)anthracene	-	-	<0.01	<0.01	BLDL
Chrysene	-	-	<0.01	<0.01	BLDL
Benzo(b)fluoranthene	0.017	WFD3	<0.01	<0.01	0
Benzo(k)fluoranthene	0.017	WFD3	<0.01	<0.01	0
Benzo(a)pyrene	0.00017	WFD1	<0.01	<0.01	BLDL
Indeno(123cd)pyrene	-	-	<0.01	<0.01	BLDL
Dibenzo(ah)anthracene	-	-	<0.01	<0.01	BLDL
Benzo(ghi)perylene	0.0082	WFD3	<0.01	<0.01	BLDL

Table Notes:

- WFD1 - Water Framework Directive – Inland Surface Waters (AA)
- WFD3 - Water Framework Directive – Inland Surface Waters (MAC)
- - No available guideline
- ALDL - Above laboratory detection limit
- BLDL - Below laboratory detection limit

SECTION 5 Ground Gas Risk Assessment

5.1 Gas Risk Characterisation

Three monitoring wells were installed as part of the investigation in BH01, BH02 and BH03. Installation details are shown on the relevant log.

Two rounds of gas monitoring have been carried out to date. The installations were tested for carbon dioxide, methane, oxygen, carbon monoxide and hydrogen sulphide using a Gas Analyser GA2000.

The results to date are presented in **Annex H**.

5.1.1 Monitoring Visit 1

Borehole BH01 and BH02 did not record methane or carbon dioxide. Oxygen concentrations varied between 2.7% and 10.6% V/V. Depletion of oxygen was recorded to decrease over time during the monitoring process.

It is considered the high groundwater level within boreholes is the controlling factor of the recorded oxygen depletion, and not a reflection of the low oxygen levels within the soil. For instance, monitoring in borehole BH01 recorded a slight rebound of levels after four minutes.

Borehole BH03 recorded peak methane levels at 29.7% V/V, quickly depleting to 12.2% after 5 minutes of monitoring. Carbon dioxide was not recorded. Initial oxygen concentrations were recorded at 3.8%, quickly increasing over time to 14.8% after 5 minutes of monitoring. It should be noted that the well screen in this borehole was completely submerged and may better represent the ground gas potential at depth, without the potential effect of leakage into shallow unsaturated soils or equilibration with adjacent granular soils. Groundwater at shallow depth may have an influence on the actual gas concentrations.

The gas flow rate from the boreholes was also assessed, flow was not recorded.

5.1.2 Monitoring Visit 2

Borehole BH01 and BH02 recorded peak methane at 0.1% and 0.6% diminishing to nil within 45 seconds. Carbon dioxide remained steady at 0.1% during testing. Oxygen concentrations varied between 0.8-2.3%, but typically remained steady during monitoring.

Borehole BH03 recorded peak methane levels at 35.9% remaining constant for the duration of the monitoring. Contrary to the first monitoring visit, maximum flow was recorded at 7.6l/hr which may be attributed to tidal changes. Carbon dioxide was not recorded, and oxygen levels were recorded as low as 7.3%.

As per the first monitoring visit groundwater was recorded at shallow depth in each borehole and may have an influence on the actual gas concentrations.

5.1.3 Gas Screening Value

Based on a gas flow rate of 7.6l/hr and the peak recorded methane concentration of 35.9%, a gas screening value of 2.73l/hr is calculated, as follows:

$$(29.7/100) \times 0.1 = 2.73\text{l/hr}$$

When this result is compared with Table 8.5 of CIRIA report C665, the site is classified as 'Gas Characteristic Situation 3' (CS3).

It is considered the principle gas source in this scenario are organic rich clay stratum at depth. Given the variable geological profile and potential vertical pathway to surface for gas generation from organic rich stratum, and considering the proposed development is to use a piled foundation solution creating a potential migration pathway, GS3 gas protection measures are appropriate for the development.

5.2 Volatile Gas Risk

All boreholes were monitored for volatile organic compounds using a PID, no significant volatiles were recorded. The risk from volatile gasses is considered negligible.

5.3 Recommended Protection Measures

Upon completion of the full six rounds of monitoring the recommendation will be reviewed in a letter report and if necessary amended.

The ground gas protection system should be designed, verified, installed and validated in accordance with the British Standard 8485:2015+A1:2019 and CIRIA guidance C735:2014.

It is recommended that a specialist consultant is retained to prepare a risk assessed ground gas protection system Verification Plan for the proposed development. The Verification Plan will detail the required protection measures based on the perceived risk associated with the complexity of design, experience of the installer, scale of the development and gas characteristic situation. The Verification Plan also details the step by step process and requirements to allow for the completion of a Validation Report. Terra Firma (Wales) Ltd offer Verification and Validation services.

Validation of installed ground gas protection systems by an independent third party will be required upon completion of the development. Validation may only be achieved if processes prescribed in the Verification Plan are undertaken.

SECTION 6 Classification of Waste Soil

Soil samples were collected and submitted to the UKAS and MCERT Accredited laboratories of Chemtest and subject to the Terra Firma Wales Ltd Waste Suite and asbestos screening. Selected samples were also subject to Waste Acceptance Criteria (WAC) testing.

Soil test results are presented in **Annex E**.

10 No. samples of soil were subject to analysis for a general suite. In addition, four samples were subject VOC analysis, and four samples were subject to Waste Acceptance Criteria (WAC) Analysis

On the basis of the soil chemical test results, the soil was classified based on the identified hazards as defined in accordance with waste classification algorithms detailed in Environment Agency publication WM3 (V.1.1., 2018).

Representative compounds were selected for the detected elements for waste classification. Where necessary, appropriate factors were employed to account for differences between elemental and molecular weight.

Total Petroleum Hydrocarbons (TPH) was detected in one sample during TPHCWG analysis, at a concentration of 460 mg/kg. The potential for HP 3(i) was triggered on account of this although Terra Firma Wales Ltd does not expect this hazard to be realised as hydrocarbon free product was not noted during the investigation.

Asbestos was detected in one sample. The result of the quantification is presented in **Table 6.1**.

Table 6.1 Summary of Asbestos Testing	
	TP05 0.2m
Asbestos Identification	Chrysotile Fibres/Clumps
Total Asbestos (wt/wt)	0.27%

A summary of the soil classification is presented in **Table 6.2**.

Table 6.2 Summary of Classification			
Sample Location	Waste Classification	EWC Code	Additional Comments
TP01, 0.5m	Non-Hazardous	17 05 04	
TP01, 1.0m (VOC/SVOC Only)	Non-Hazardous	17 05 04	
TP02, 0.6m	Non-Hazardous	17 05 04	
TP03, 0.3m	Hazardous	17 05 03*	HP14
TP04, 0.5m	Non-Hazardous	17 05 04	
TP04, 1.6m	Non-Hazardous	17 05 04	
TP05, 0.2m	Hazardous	17 05 03*	HP7 (Contains 0.27% Asbestos)
TP05, 1.0m	Non-Hazardous	17 05 04	
TP06, 0.9m	Non-Hazardous	17 05 04	
TP07, 0.5m	Non-Hazardous	17 05 04	
TP07, 2.1m	Non-Hazardous	17 05 04	

4No. samples were submitted for WAC analysis. The Total Analysis Sample that was taken from the same material as the WAC sample is also detailed in the table. An appraisal of the WAC results is presented in **Table 6.3**.

Table 6.3 Summary of WAC Testing

WAC Sample	Corresponding Total Analysis Sample (i.e. Same Soil Type)	Comments
TP01, 1.0m	TP01, 0.5m	Fails Inert Criteria on account of elevated leachable mercury and lead
TP03, 0.3m	TP03, 0.3m	Satisfies Criteria for Stable Non-Reactive Hazardous Waste
TP04, 0.5m	TP04, 0.5m	Satisfies Inert Criteria
TP02, 0.1m	TP05, 0.2m	Satisfies Criteria for Stable Non-Reactive Hazardous Waste

If soils cannot be satisfactorily segregated, the worst-case classification should be applied to the soil.

The classifications do not include an assessment of invasive plant species. If anomalous materials are encountered during excavation the classification should be revisited.

It should be noted that the receiving landfill sites and Natural Resources Wales have ultimate authority in deciding whether a waste may be accepted, regardless of its classification.

SECTION 7 Quantitative Risk Assessment

7.1 Contaminants of Concern

7.1.1 Contaminants of Concern in Soil

All substances tested for were found to be present at concentrations below their respective human health threshold levels for a commercial setting.

7.1.2 Ground Gasses of Concern

To date two in-situ ground gas monitoring visits have been undertaken, with another four rounds scheduled over the next seven weeks. A gas characteristic situation of CS3 has been assessed. This will be readdressed following the completion of the gas monitoring regime.

7.1.3 Groundwater Contaminants of Concern

Elevated levels of Arsenic, Copper, TPH and Naphthalene were recorded in groundwater.

Given the benign contaminant nature of the overlying made ground and no obvious historical on-site source of contamination, it is considered the identified contaminants of concern are relicts of the industrial heritage of the area and derive from historical offsite sources.

7.2 Potential Receptors and Pathways

7.2.1 Human Receptors

Table 7.1 Source Pathway Receptor (Human)		
Source	Pathway	Receptor
Methane – decomposition of organic rich soils	Migration through soil, vertically migration along pile annulus and accumulation indoors. Explosion and asphyxiation from depletion of oxygen	Future Site Users – Staff and Visitors Structure
Groundwater – Arsenic, Copper, TPH, Naphthalene,	Dermal contact, Ingestion of contaminated waters	Site staff and maintenance workers

7.2.2 Aquatic Environment

Identified contaminants have the potential to migrate through groundwater bodies negatively impacting nearby aquatic environments.

7.3 Mitigation and Remedial Measures

7.3.1 Human Health

Remedial measures will be required with regards to the presence of methane gas in high quantities and high flows on occasion. Due to the elevated recorded methane gas levels, ground gas protection measures will need to be incorporated into the proposed development. It is recommended that a ground gas protection system Verification Plan is

prepared by a suitably qualified person prior to the construction phase to assess the required mitigation measures.

Mitigating measures will need to be adopted by ground workers and site maintenance staff during the construction of the structure to protect workers from dermal contact or ingestion of contaminated groundwater.

Any imported soils should be validated as clean and suitable for use in accordance with 'Requirements for the Chemical Testing of Imported Soils for Various End Uses and Validation Cover Systems'.

For proposed new supply water pipes, the UK Water Industry Research publication 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (Report 10/WM/03/21)' should be consulted.

In accordance with EC Regulation 1272/2008 and Environment Agency Guidance WM3 soils destined for off-site disposal should be classified on the basis of their hazard phrases prior to disposal. Soils are classified as a mirror entry waste and should be classified on the basis of their specific chemical properties.

Construction workers should also adhere to good site management, COSHH, good standards of hygiene and appropriate health & safety on site, with personal protection equipment (PPE) and dust suppression where appropriate.

Neighbouring site occupants and passers-by can be protected by site screening and dust suppression measures if deemed necessary. Contractors should provide method statements and risk assessment to deal with this particular risk.

If during development works any other unexpected ground conditions or evidence of contamination is found, inspection by a geo-environmental engineer should be made, and any required testing or investigation carried out prior to continuation of works.

7.3.2 Aquatic Environment

Groundwater beneath the site is confined within the superficial deposits secondary undifferentiated aquifer, which is also believed to be tidal.

The nearest surface water body locates on site which comprises a small pond. The nearest significant surface water body Baglan Brook locates 200m northwest and drains towards the River Neath located 900m northwest.

Although contaminants identified in water are slightly elevated above threshold levels it is considered their source lies off-site and most likely attributed to the historical BP petrochemicals plant to the southwest. Therefore, groundwater contamination could not be successfully remediated beneath the site and will with time further dilute.

During the construction period, there is a risk to the environment/adjacent sites from de-watering, digging foundations, moving contaminated soil, drainage misconnections, discharges to local surface waters or the ground, runoff from construction materials and/or exposed ground, wheel washings and oil or chemical spills.

The risk is considered to be negligible as any adverse effects will be easily preventable by due diligence to good construction practise and housekeeping in preventing surface runoff and the spillage of materials.

The basic measures that should be taken are as follows:

- Prepare a drainage plan and mark the manholes to prevent pollutants accidentally reaching the surface water sewers;
- Carry out any activities that could cause pollution in a designated, bunded area, away from rivers or boreholes. Where possible it should drain to the foul sewer;
- Use settlement ponds to remove silty water;
- Store all oils and chemicals in a fully bunded area to prevent leaks or spills;
- Get advice on whether you need an environmental permit and apply in good time

SECTION 8 Engineering Recommendations

8.1 Preparation of Site

All topsoil, vegetation including roots should be stripped and removed from beneath the proposed development area.

Contingencies should be made for the protection/diversion of any underground/overhead services present beneath/above the site brought about as a result of the proposed works.

Any reduced levels should be brought up to the required levels with suitable inert mainly granular materials. Department of Transport (Dtp) type 1/2 sub base or similar should be used and should be compacted in layers to the requirements of the Specification for Highway works.

Allowances should also be made for the excavation of any soft spots/areas and their replacement with well compacted imported granular materials.

The soil types anticipated to be removed from site have been classified in accordance with WM3. Waste classification is discussed in **Section 6**.

8.2 Foundation and Floor Slab Solution

Due to the variable nature and depth of the made ground and superficial deposits, mass concrete strip and pad foundations are not considered feasible for the development, where unfavourable differential settlement between foundations is anticipated.

It is therefore recommended that a piled foundation is adopted for the development.

For a 275mm square precast concrete driven pile founded within the dense to very dense granular materials at depths of between 12.50m to 15.00m a safe working load of 400kN should be achievable.

It should be noted that pile type, size, length and working loads are for guidance only and should be confirmed by the specialist piling contractor.

Allowances should also be made for the removal of obstructions during piling which should be anticipated in the made ground.

For the quoted pile size, founded within the gravel, total settlements should not exceed 10mm with differential movements between adjacent piles being less than half this value.

Measurements should be kept on vibrations during installation. Measures should also be taken to dampen such vibrations. If, however, vibrations exceed permissible values then consideration should be given to an alternative solution.

The floor slabs should be designed as suspended, and if within influence of tree root systems in general accordance with the NHBC guidelines.

If trees are to be incorporated into the proposed design guidance should be sought. The National House Building Council (NHBC) Chapter 4.2 gives guidelines as to the appropriate type of floor slab and void based on the type of tree, distance of the foundation from the tree and the plasticity index of the in-situ materials.

During the investigation six samples of the in-situ clay were taken and submitted for plasticity and moisture content testing. The test results are summarised in **Table 8.1** and presented in **Annex F**.

Table 8.1 Geotechnical Test Results

Sample	Depth (m)	Laboratory Soil Description	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Volume Change Potential	Moisture Content
BH01	13.10	Grey silty CLAY	28	100	28	Medium	49
BH02	4.00-4.45	Brown silty CLAY	33	100	33	Medium	46
BH03	5.0	Brown clayey SILT	19	100	19	Low	50
BH03	11.6-12.0	Brown silty CLAY	46	100	46	High	18
TP01	2.90-3.00	Grey clayey SILT	19	100	19	Low	57
TP07	2.80-3.00	Brown clayey SILT	10	100	10	Low	39

In line with the NHBC (Chapter 4.2), the modified plasticity index for each sample was calculated. For design purposes the soils on site should be assumed to have a high volume change potential.

All foundation formations should be inspected by a suitably qualified Engineer before being concreted.

8.3 Excavations and Formations

Most of the excavations will be possible with normal soil excavating machinery.

Shallow groundwater flows were encountered during the investigation as well as running sand conditions. Special precautions should therefore be taken to deal with groundwater inflows.

The sides of any excavations deeper than 1.20m, or shallower if unstable, should be supported by planking and strutting or other proprietary means.

The sub-formations/formations are likely to be susceptible to loosening, softening and deterioration by exposure to weather (rain, frost and drying conditions), the action of water (flood water or removal of groundwater) and site traffic.

Formations should never be left unprotected and continuously exposed to rain causing degradation, or left exposed/uncovered overnight, unless permitted by a qualified engineer.

Construction plant and other vehicular traffic should not be operated on unprotected formations.

As a minimum the formation/excavation surfaces must be protected by blinding concrete immediately after exposure.

Allowances should be made for the removal of soft spots/areas and their replacement with well compacted granular materials.

Allowances should also be made for special precautions to prevent formation deterioration in addition to the above.

8.4 Protection of Buried Concrete

During the investigation four soil samples were scheduled for BRE SD1 testing to assist in buried concrete classification. Testing results are presented in **Annex E**.

Levels of 2:1 water soluble sulphate within the shallow in-situ materials measured between 93mg/l to 360mg/l and the pH varied between 9 and 10.8.

Levels of Sulphate (acid soluble) were recorded between 330 mg/kg and 5900mg/kg.

When the results are compared with Table C2 of BRE Digest 1:2005, it indicates that buried concrete should generally conform to DS1 Class AC-2.

8.5 Access Roads and Car Parking Areas

CBR testing was undertaken in the location of the proposed car park a DCP probe. The results are presented in **Annex D**. A CBR >5%. Was recorded at a depth of between 0.04-0.24m. It is considered this value is representable of the shallow granular fill material typically encountered below topsoil to a depth of between 0.5-0.8m.

8.6 Stormwater Drainage

During the site investigation two soakaway tests were undertaken in accordance of BRE 365 (2016) in trial pits TP09 and TP10.

Test results are summarised in **Table 8.2**.

Table 8.2 Summary of Soakaway Results		
Trial Pit	Depth Range of Test (m)	Infiltration Rate (ms ⁻¹)
TP09	0.35-0.80	1.02x10 ⁻⁰⁵
TP10	0.43-0.70	9.77x10 ⁻⁰⁶

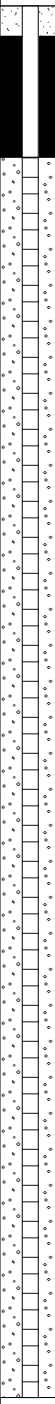
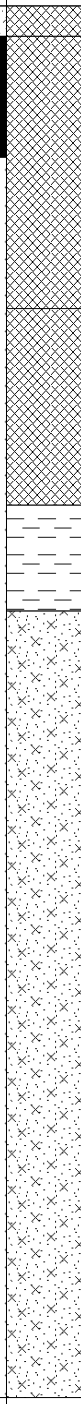
In-situ soils are therefore considered suitable for soakaway drainage. However, proposed soakaways should be positioned at least 5.0m away from any structure.

Consideration should be given to the shallow depth of groundwater at the site.

Soakaway calculation sheets are presented in **Annex C** for reference.

**ANNEX A
Borehole Logs**

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274016E - 192978N	Hole Type	CP
Location:	Baglan	Level:	6.80m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	09/01/2020 - 10/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
	0.20 - 1.65 1.20	B SPT	N=37 (9,8/10,13,7,7)	0.20	6.60			Grass over topsoil. (Driller's description)	
	1.20 - 1.65 1.20	B SPT	N=37 (9,8/10,13,7,7)					Very stiff dark greyish brown slightly gravelly sandy CLAY. Gravel is angular to rounded fine to coarse brick, concrete, slag and sandstone. (MADE GROUND)	
	2.00 - 2.45 2.00	B SPT	N=44 (5,11/12,11,9,12)	2.00	4.80			Dense dark greyish brown slightly silty gravelly fine to coarse SAND. Gravel is angular to subrounded fine to coarse concrete, brick, slag and sandstone. (MADE GROUND)	
	3.00 - 3.25 3.00 3.30 - 3.75	B SPT B	N=15 (6,9/10,2,2,1)	3.30	3.50			Very soft dark grey slightly sandy CLAY.	
	4.00 - 4.45 4.00 - 4.45 4.00	B D SPT	N=0 (0,0/0,0,0,0)	4.00	2.80			Loose locally medium dense dark greyish brown silty fine and medium SAND.	
	5.00 - 5.45 5.00 - 5.45 5.00	B D SPT	N=7 (2,1/2,2,1,2)						
	6.50 - 6.95 6.50 - 6.95 6.50	B D SPT	N=11 (2,3/2,3,3,3)						
	8.00 - 8.45 8.00 - 8.45 8.00	B D SPT	N=8 (1,2/2,2,2,2)						

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks

Remarks: Groundwater encountered at 1.90m rising to 1.50m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-1.00m, bentonite seal 14.80-10.00m and 1.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.90-13.10m.

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274016E - 192978N	Hole Type	CP
Location:	Baglan	Level:	6.80m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	09/01/2020 - 10/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
	9.50 - 9.95 9.50 - 9.95 9.50	B D SPT	N=6 (1,1/1,1,2,2)					Loose locally medium dense dark greyish brown silty fine and medium SAND.	10
	11.00 - 11.45 11.00 - 11.45 11.00	B D SPT	N=8 (2,1/1,2,2,3)						11
	12.50 - 12.95 12.50 - 12.95 12.50	B D SPT	N=10 (2,2/3,3,2,2)						12
	13.10	D		13.10	-6.30			Very soft dark grey CLAY.	13
	14.00 - 14.45 14.00	B SPT	50 (8,11/50 for 115mm)	13.90	-7.10			Very dense dark grey slightly sandy subangular and subrounded fine to coarse sandstone GRAVEL with low cobble content.	14
	14.80	SPT	50 (6,13/50 for 150mm)	14.80	-8.00			End of Borehole at 14.800m	15
									16
									17
									18

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
	13.60	13.80	00:30	

Remarks: Groundwater encountered at 1.90m rising to 1.50m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-1.00m, bentonite seal 14.80-10.00m and 1.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.90-13.10m.

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274033E - 192978N	Hole Type	CP
Location:	Baglan	Level:	6.50m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	07/01/2020 - 08/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
				0.20	6.30			Grass over topsoil. (Driller's description)	
								Dense to medium dense brown slightly clayey slightly gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse brick, slag, concrete and sandstone. (MADE GROUND)	1
	1.20 - 1.65 1.20	B SPT	N=41 (25 for 125mm/13,7,7,14)						
	2.00 - 2.45 2.00	B SPT	N=19 (7,9/5,4,5,5)						2
	3.00 - 3.25 3.00 3.30	B SPT D	N=14 (5,7/6,4,2,2)	3.00 3.30	3.50 3.20			Medium dense dark grey sandy angular fine to coarse brick, concrete, slag and sandstone GRAVEL with low cobble content. (MADE GROUND) Very soft to soft dark grey sandy silty CLAY.	3
	4.00 - 4.45 4.00 - 4.45 4.00	B D SPT	N=3 (1,0/1,0,1,1)						4
	5.00 - 5.45 5.00 - 5.45 5.00	B D SPT	N=7 (1,2/2,1,2,2)						5
	6.50 - 6.95 6.50 - 6.95 6.50	B D SPT	N=13 (2,2/3,3,3,4)	6.70	-0.20			Loose to medium dense dark greyish brown slightly silty fine and medium SAND.	7
	8.00 - 8.45 8.00 - 8.45 8.00	B D SPT	N=11 (2,1/3,2,3,3)						8
									9

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks

Remarks: Groundwater encountered at 1.90m rising to 1.30m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-1.00m, bentonite seal 15.00-10.00m and 1.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.70-12.60m.

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274033E - 192978N	Hole Type	CP
Location:	Baglan	Level:	6.50m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	07/01/2020 - 08/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
	9.50 - 9.95 9.50 - 9.95 9.50	B D SPT	N=9 (1,2/3,2,1,3)					Loose to medium dense dark greyish brown slightly silty fine and medium SAND.	10
	11.00 - 11.45 11.00 - 11.45 11.00	B D SPT	N=7 (2,2/1,2,2,2)						11
	12.50 - 12.95 12.50 - 12.95 12.50	B D SPT	N=5 (2,2/2,1,1,1)	12.60	-6.10			Soft dark grey CLAY.	13
	14.00 - 14.45 14.00 - 14.45 14.00	B D SPT	50 (13,11/50 for 275mm)	14.00	-7.50			Very dense dark grey slightly silty sandy angular to subrounded fine to coarse sandstone GRAVEL with low cobble and boulder content.	14
	15.00	SPT	50 (25 for 115mm/50 for 255mm)	15.00	-8.50			End of Borehole at 15.000m	15
									16
									17
									18

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
	14.80	15.00	00:30	

Remarks: Groundwater encountered at 1.90m rising to 1.30m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-1.00m, bentonite seal 15.00-10.00m and 1.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.70-12.60m.

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274049E - 192977N	Hole Type	CP
Location:	Baglan	Level:	6.40m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	06/01/2020 - 07/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
				0.20	6.20			Grass over topsoil. (Driller's description)	
	1.20 - 1.65 1.20	B SPT	36 (25,14/36 for 200mm)					Very dense dark brown slightly silty slightly gravelly fine to coarse SAND with rare timer fragments. Gravel is angular fine to coarse slag, brick, concrete and sandstone. With low cobble content. (MADE GROUND)	1
	2.00 - 2.45 2.00	B SPT	50 (8,12/50 for 275mm)						2
	3.00 - 3.45 3.00	B SPT	N=11 (2,3/3,2,3,3)	3.00	3.40			Soft to firm dark grey peaty CLAY.	3
	3.50 - 3.95	B		3.50	2.90			Medium dense dark greyish brown silty fine and medium SAND.	4
	4.00 - 4.45 4.00	B SPT	N=10 (2,2/2,2,3,3)						5
	5.00 5.00 - 5.45 5.00 - 5.45 5.00	D B D SPT	N=12 (2,3/3,3,3,3)	5.00	1.40			Soft to firm dark grey slightly sandy CLAY.	6
	6.50 - 6.95 6.50 - 6.95 6.50	B D SPT	N=12 (2,2/2,3,3,4)	6.50	-0.10			Medium dense locally loose dark greyish brown silty fine and medium SAND.	7
	8.00 - 8.45 8.00 - 8.45 8.00	B D SPT	N=13 (1,2/3,3,4,3)						8
									9

Chiseling	Depth Top (m)	Depth Base (m)	Duration (hh:mm)	Remarks
	1.20	1.40	00:30	

Remarks: Groundwater encountered at 1.80m rising to 1.30m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-3.00m, bentonite seal 13.00-10.00m and 3.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.70-10.00m.

Project Name:	Swansea Bay Technology Centre	Project No:	15773	Co-ords:	274049E - 192977N	Hole Type	CP
Location:	Baglan	Level:	6.40m	Scale	1:50	Logged By	JRW
Client:	Morgan Sindall Construction & Infrastructure Ltd	Dates:	06/01/2020 - 07/01/2020				

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Well	Legend	Stratum Description	
	Depth (m)	Type	Results						
	9.50 - 9.95 9.50 - 9.95 9.50	B D SPT	N=9 (1,2/1,2,3,3)					Medium dense locally loose dark greyish brown silty fine and medium SAND.	10
	11.00 - 11.45 11.00 - 11.45 11.00	B D SPT	N=31 (3,4/4,8,8,11)						11
	11.60 - 12.00 11.60 - 12.00	B D		11.60	-5.20			Very soft dark grey slightly sandy CLAY.	12
	12.40 - 12.85 12.50	B SPT	N=41 (5,5/8,9,12,12)	12.40	-6.00			Dense to very dense dark grey sandy subangular and subrounded fine to coarse sandstone GRAVEL with low cobble and boulder content.	13
	13.70 - 13.85 13.70	D SPT	0 (25 for 50mm/0 for 50mm)	13.90	-7.50				14
	13.90	SPT	50 (25 for 40mm/50 for 85mm)					End of Borehole at 13.900m	15
									16
									17
									18

Chiseling	Depth Top (m)		Depth Base (m)		Duration (hh:mm)		Remarks
	13.50	13.70	13.70	13.90	01:00	01:00	
	13.70						

Remarks: Groundwater encountered at 1.80m rising to 1.30m after 20mins monitoring. On completion, a slotted standpipe (50mm) was installed to 10.00m, granular response zone 10.00-3.00m, bentonite seal 13.00-10.00m and 3.00-0.20, concrete and stopcock cover 0.20-0.00m. Water added between 6.70-10.00m.

**ANNEX B
Trial Pit Logs**

Project Name: Swansea Bay Technology Centre	Project No: 15773	Co-ords: - Level:	Date: 18/12/2019
---	-------------------	----------------------	------------------

Location: Baglan	Dimensions: 2.50 Depth 3.00	0.70 	Scale: 1:25 Logged: JRW
Client: Morgan Sindall Construction & Infrastructure Ltd			

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)	
	0.50	ES					(Loose to medium dense) light greyish brown gravelly fine to coarse SAND with low cobble content. Gravel is subangular and subrounded fine to coarse sandstone, rare brick and concrete. (MADE GROUND)	
	1.00	ES		0.90			(Medium dense to dense) dark greyish brown silty gravelly fine to coarse SAND with low boulder content. Gravel is angular to subrounded fine to coarse sandstone, rare brick, concrete and ceramic. With rare timber and plastic fragments. (MADE GROUND)	1
				1.80			(Medium dense) dark brownish grey silty sandy subangular and subrounded sandstone GRAVEL. (MADE GROUND)	2
	2.90 - 3.00	D		2.90 3.00			Soft dark grey peaty CLAY.	3
							End of Pit at 3.000m	4
								5

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater encountered at 1.70m. On completion, trial pit backfilled with materials arising.

Project Name: Swansea Bay Technology Centre Project No: 15773 Co-ords: - Date: 18/12/2019
Level: Scale: 1:25

Location: Baglan Dimensions: 2.60
Depth 2.40 0.70 Client: Morgan Sindall Construction & Infrastructure Ltd Logged: JRW

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.30			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse brick, concrete, sandstone, ash and rare slag. (MADE GROUND)	
	0.60	ES		1.30			(Medium dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. With rare plastic fragments. (MADE GRUOND)	1
				1.80			(Medium dense) greyish brown gravelly fine to coarse SAND with rare slag boulders. Gravel is subangular and subrounded fine to coarse sandstone. (MADE GRUOND)	
				2.40			(Loose) light brown locally dark grey fine to coarse SAND.	2
							End of Pit at 2.400m	3
								4
								5

Stability: Trial pit unstable below 1.00m, running sand.

Remarks: Groundwater encountered at 2.00m. Running sands. On completion, trial pit backfilled with materials arising.



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Trial Pit No:

TP03

Sheet 1 of 1

Project Name: Swansea Bay Technology Centre

Project No:
15773

Co-ords: -
Level:

Date:
18/12/2019

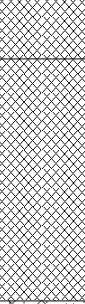
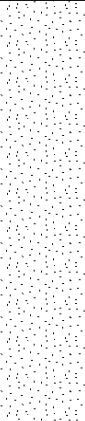
Location: Baglan

Dimensions:
2.50
Depth 1.70
3.00

Scale:
1:25

Logged:
JRW

Client: Morgan Sindall Construction & Infrastructure Ltd

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	ES		0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)	
							(Loose) light brown slightly gravelly fine to coarse SAND. Gravel is subangular and subrounded fine to coarse sandstone, rare brick and ceramic. (MADE GROUND)	
				1.00			(Loose) dark brown silty fine to coarse SAND.	1
				1.20			(Loose) light brown slightly gravelly fine to coarse SAND. Gravel is subrounded and rounded fine to coarse sandstone.	2
				2.60			Soft dark grey peaty CLAY.	
				3.00			End of Pit at 3.000m	3
								4
								5

Stability: Trial pit unstable from surface.

Remarks: Groundwater encountered at 1.30m. On completion, trial pit backfilled with materials arising.



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Trial Pit No:

TP04

Sheet 1 of 1

Project Name: Swansea Bay Technology Centre

Project No:
15773

Co-ords: -
Level:

Date:
18/12/2019

Location: Baglan

Dimensions: 2.80

Depth
2.50

0.80

Scale:
1:25

Logged:
JRW

Client: Morgan Sindall Construction & Infrastructure Ltd

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20			0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)	
	0.50	ES					(Medium dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. With rare plastic fragments. (MADE GROUND)	
				1.00			(Medium dense to dense) brownish grey gravelly fine to coarse SAND with low boulder content. Gravel is angular to rounded fine to coarse sandstone, concrete and brick. With rare steel, plastic and timber fragments. (MADE GROUND)	1
	1.60	ES						2
				2.50			End of Pit at 2.500m	3
								4
								5

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater encountered at 1.80m. On completion, trial pit backfilled with materials arising.



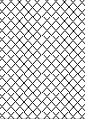
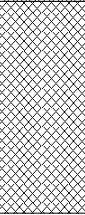
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Trial Pit No:
TP05
Sheet 1 of 1

Project Name: Swansea Bay Technology Centre	Project No: 15773	Co-ords: - Level:	Date: 18/12/2019
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Location: Baglan	Dimensions: 2.60 Depth 1.10	Scale: 1:25 Logged: JRW
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Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	ES		0.40			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, brick, ash and rare slag. (MADE GROUND)
	1.00	ES		1.10			(Very dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. With rare plastic fragments. (MADE GROUND)
							End of Pit at 1.100m

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater seepage at 0.60m. Refusal at 1.10m. On completion, trial pit backfilled with materials arising.

Project Name: Swansea Bay Technology Centre	Project No: 15773	Co-ords: - Level:	Date: 18/12/2019
---	-------------------	----------------------	------------------

Location: Baglan	Dimensions: 2.40	Scale: 1:25
Client: Morgan Sindall Construction & Infrastructure Ltd	Depth 2.60	Logged: JRW

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20			0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)	
	0.50	ES					(Very dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. (MADE GROUND)	
	0.90	ES		0.80			(Loose) light brown locally grey slightly gravelly fine to coarse SAND. Gravel is subrounded fine to coarse sandstone.	1
								2
				2.60			End of Pit at 2.600m	3
								4
								5

Stability: Trial pit unstable below 1.30m, running sand.

Remarks: Groundwater encountered at 1.60m. Running sands. On completion, trial pit backfilled with materials arising.

Project Name: Swansea Bay Technology Centre	Project No: 15773	Co-ords: - Level:	Date: 18/12/2019
---	-------------------	----------------------	------------------

Location: Baglan	Dimensions: 2.80 Depth 3.00	0.70	Scale: 1:25 Logged: JRW
Client: Morgan Sindall Construction & Infrastructure Ltd			

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.50	ES		0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)	
				0.80			(Dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. (MADE GROUND)	
				1.50			(Loose) light brown slightly gravelly fine to coarse SAND with rare slag cobbles. Gravel is angular to subrounded fine to coarse sandstone and rare brick and slag. (MADE GROUND)	1
	2.10	ES		2.20			(Loose to medium dense) dark grey slightly silty slightly gravelly fine to coarse SAND with rare timber and steel fragments. (MADE GROUND)	2
							(Loose) dark grey fine to coarse SAND.	
	2.80 - 3.00	D		2.80			Soft dark grey peaty CLAY.	
				3.00			End of Pit at 3.000m	3
								4
								5

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater encountered at 1.90m. On completion, trial pit backfilled with materials arising.



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Trial Pit No:
TP08
Sheet 1 of 1

Project Name: Swansea Bay Technology Centre

Project No:
15773

Co-ords: -
Level:

Date:
08/01/2020

Location: Baglan

Dimensions: 2.10
Depth 1.20 0.70

Scale:
1:25
Logged:
JRW

Client: Morgan Sindall Construction & Infrastructure Ltd

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)
				0.50			(Dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. (MADE GROUND)
				0.70			(Loose) dark grey slightly gravelly fine to coarse SAND with rare slag cobbles. Gravel is angular to subrounded fine to coarse sandstone and rare brick and slag. (MADE GROUND)
				1.20			(Loose) dark grey to light brown fine to coarse SAND.
							End of Pit at 1.200m

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater encountered at 1.00m. On completion, trial pit backfilled with materials arising.



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Trial Pit No:
TP09
Sheet 1 of 1

Project Name: Swansea Bay Technology Centre
Project No: 15773
Co-ords: -
Level: -
Date: 08/01/2020

Location: Baglan
Dimensions: 2.10
Depth 0.80
0.70
Scale: 1:25
Logged: JRW

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)
				0.50			(Dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. (MADE GROUND)
				0.80			(Loose) dark grey slightly gravelly fine to coarse SAND with rare slag cobbles. Gravel is angular to subrounded fine to coarse sandstone and rare brick and slag. (MADE GROUND)
							End of Pit at 0.800m

Stability: Trial pit remained stable and vertical.
Remarks: Groundwater not encountered. On completion, trial pit backfilled with materials arising.



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Trial Pit No:
TP10
Sheet 1 of 1

Project Name: Swansea Bay Technology Centre
Project No: 15773
Co-ords: -
Level: -
Date: 08/01/2020

Location: Baglan
Dimensions: 1.80
Depth: 0.70
Client: Morgan Sindall Construction & Infrastructure Ltd
Scale: 1:25
Logged: JRW

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Grass over brown slightly sandy slightly gravelly silty CLAY. Gravel is angular to rounded fine to coarse sandstone, ash and rare slag. (MADE GROUND)
				0.50			(Dense) grey sandy angular and subangular fine to coarse brick and concrete GRAVEL with low cobble content. (MADE GROUND)
				0.60			(Loose) dark grey slightly gravelly fine to coarse SAND with rare slag cobbles. Gravel is angular to subrounded fine to coarse sandstone and rare brick and slag. (MADE GROUND)
				0.70			(Loose) light brown fine to coarse SAND. End of Pit at 0.700m
							1
							2
							3
							4
							5

Stability: Trial pit remained stable and vertical.

Remarks: Groundwater not encountered. On completion, trial pit backfilled with materials arising.

ANNEX C
Soakaway Test Results

SOAKAWAY TEST



Site Name: Swansea Bay Technology Centre
 Project Number: 15773
 Date: 08/01/2020

Trial Pit: **TP09**

TEST 1 <table border="1"> <tr><td>Length</td><td>2.10 m</td></tr> <tr><td>Bredth</td><td>0.70 m</td></tr> <tr><td>Depth</td><td>0.80 m</td></tr> <tr><td>Fill Level</td><td>0.43 m</td></tr> </table> V_{p75-25} 0.272 m³ a_{p50} 2.506 m² t_{p75-25} 130 minutes Soil Infiltration Rate, f 1.39E-05 ms⁻¹	Length	2.10 m	Bredth	0.70 m	Depth	0.80 m	Fill Level	0.43 m	Time (minutes)
Length	2.10 m								
Bredth	0.70 m								
Depth	0.80 m								
Fill Level	0.43 m								
TEST 2 <table border="1"> <tr><td>Length</td><td>2.10 m</td></tr> <tr><td>Bredth</td><td>0.70 m</td></tr> <tr><td>Depth</td><td>0.80 m</td></tr> <tr><td>Fill Level</td><td>0.40 m</td></tr> </table> V_{p75-25} 0.294 m³ a_{p50} 2.59 m² t_{p75-25} 152 minutes Soil Infiltration Rate, f 1.24E-05 ms⁻¹	Length	2.10 m	Bredth	0.70 m	Depth	0.80 m	Fill Level	0.40 m	Time (minutes)
Length	2.10 m								
Bredth	0.70 m								
Depth	0.80 m								
Fill Level	0.40 m								
TEST 3 <table border="1"> <tr><td>Length</td><td>2.10 m</td></tr> <tr><td>Bredth</td><td>0.70 m</td></tr> <tr><td>Depth</td><td>0.80 m</td></tr> <tr><td>Fill Level</td><td>0.35 m</td></tr> </table> V_{p75-25} 0.331 m³ a_{p50} 2.73 m² t_{p75-25} 198 minutes Soil Infiltration Rate, f 1.02E-05 ms⁻¹	Length	2.10 m	Bredth	0.70 m	Depth	0.80 m	Fill Level	0.35 m	Time (minutes)
Length	2.10 m								
Bredth	0.70 m								
Depth	0.80 m								
Fill Level	0.35 m								
REMARKS: Test carried out in accordance with BRE DIGEST 365 (2016)									

SOAKAWAY TEST



Site Name: Swansea Bay Technology Centre
Project Number: 15773
Date: 08/01/2020

Trial Pit: **TP10**

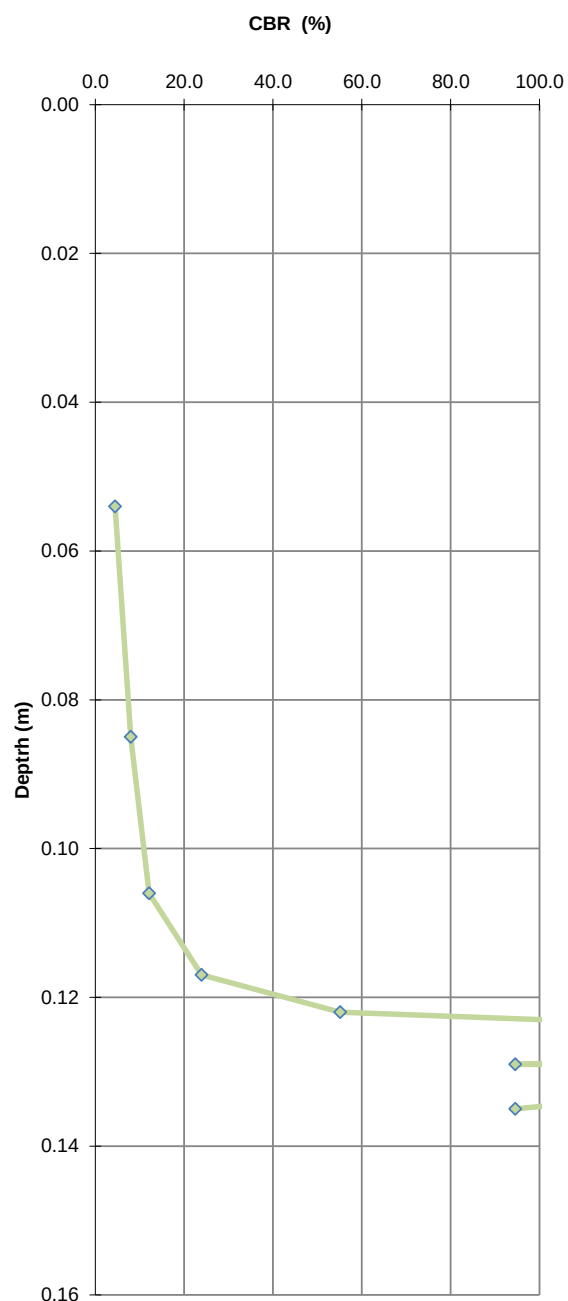
TEST 1 Length 1.80 m Bredth 0.70 m Depth 0.70 m Fill Level 0.41 m V_{p75-25} 0.183 m³ a_{p50} 1.985 m² t_{p75-25} 120 minutes Soil Infiltration Rate, f 1.28E-05 ms⁻¹	Time (minutes)
TEST 2 Length 1.80 m Bredth 0.70 m Depth 0.70 m Fill Level 0.45 m V_{p75-25} 0.158 m³ a_{p50} 1.885 m² t_{p75-25} 130 minutes Soil Infiltration Rate, f 1.07E-05 ms⁻¹	Time (minutes)
TEST 3 Length 1.80 m Bredth 0.70 m Depth 0.70 m Fill Level 0.43 m V_{p75-25} 0.17 m³ a_{p50} 1.935 m² t_{p75-25} 150 minutes Soil Infiltration Rate, f 9.77E-06 ms⁻¹	Time (minutes)
REMARKS: Test carried out in accordance with BRE DIGEST 365 (2016)	

ANNEX D
Dynamic Cone Penetrometer Results

terrafirma

DCP01

Date: 09/01/2020

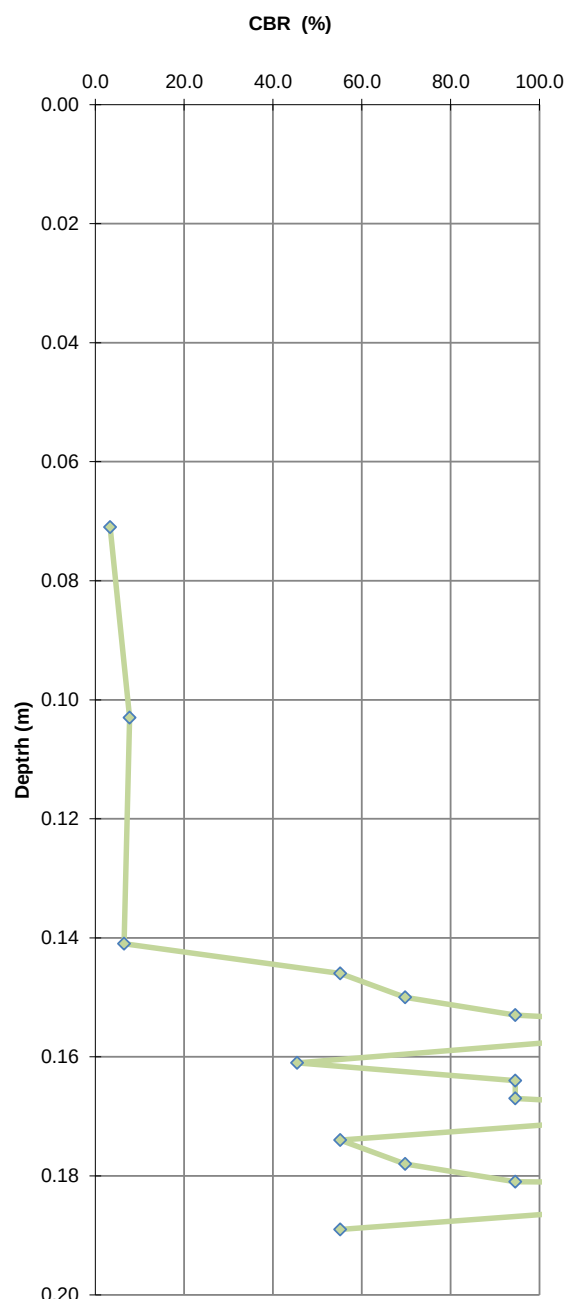
[illegible]

Highways Agency Interim Advice Note 73/06 - Design Guidance for Road Pavement Foundations (2009)

terrafirma

DCP02

Date: 09/01/2020

[illegible]

Highways Agency Interim Advice Note 73/06 - Design Guidance for Road Pavement Foundations (2009)

Dynamic Cone Penetrometer Testing



Site Name: Swansea Bay Technology Centre

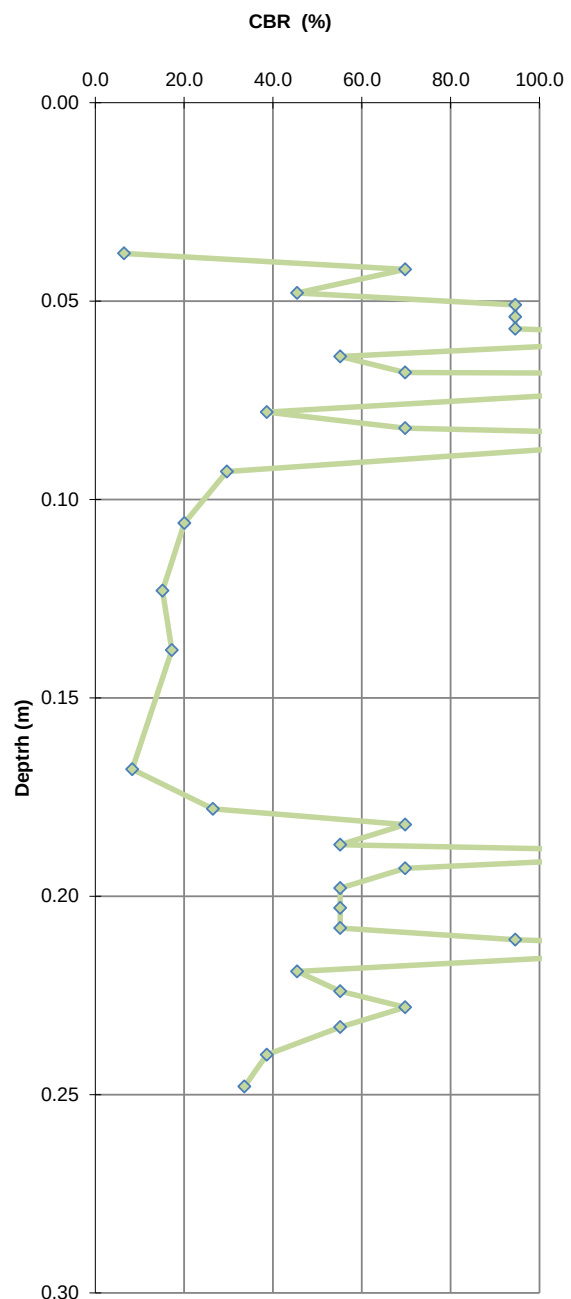
Project Number: 15773

Date: 09/01/2020

DCP03

Initial Scale Reading (mm) 72 Datum bgl (mm) 0

no. of blows	scale reading (mm)	penetration increment (mm)	depth bgl (m)	DCP (mm/blow)	CBR (%)
1	110	38	0.04	38	6.5
1	114	4	0.04	4	69.8
1	120	6	0.05	6	45.4
1	123	3	0.05	3	94.6
1	126	3	0.05	3	94.6
1	129	3	0.06	3	94.6
1	131	2	0.06	2	145.1
1	136	5	0.06	5	55.1
1	140	4	0.07	4	69.8
1	141	1	0.07	1	302.0
1	143	2	0.07	2	145.1
1	150	7	0.08	7	38.6
1	154	4	0.08	4	69.8
1	156	2	0.08	2	145.1
1	165	9	0.09	9	29.6
1	178	13	0.11	13	20.1
1	195	17	0.12	17	15.1
1	210	15	0.14	15	17.3
1	240	30	0.17	30	8.3
1	250	10	0.18	10	26.5
1	254	4	0.18	4	69.8
1	259	5	0.19	5	55.1
1	261	2	0.19	2	145.1
1	265	4	0.19	4	69.8
1	270	5	0.20	5	55.1
1	275	5	0.20	5	55.1
1	280	5	0.21	5	55.1
1	283	3	0.21	3	94.6
1	285	2	0.21	2	145.1
1	291	6	0.22	6	45.4
1	296	5	0.22	5	55.1
1	300	4	0.23	4	69.8
1	305	5	0.23	5	55.1
1	312	7	0.24	7	38.6
1	320	8	0.25	8	33.5



REMARKS:

Test carried out in accordance with operating instructions for the dynamic cone penetrometer Model A2465 by CNS Farnell Ltd.

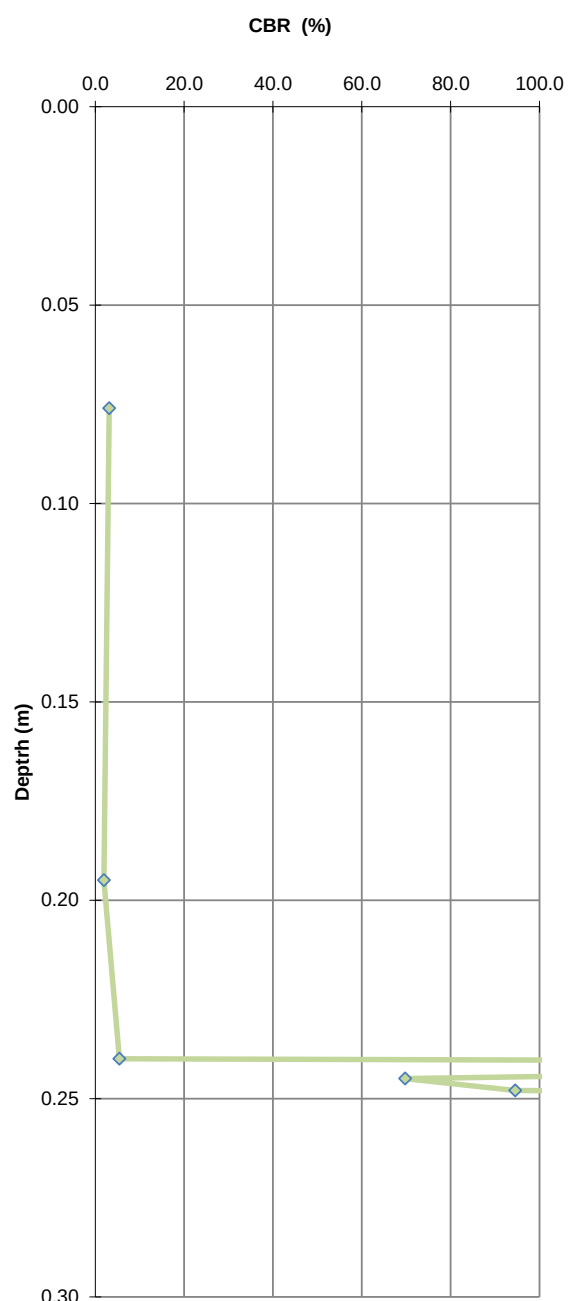
CBR correlation based on the relationship $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 * \text{Log}_{10}(\text{mm/blow})$ developed by TRL taken from The

Highways Agency Interim Advice Note 73/06 - Design Guidance for Road Pavement Foundations (2009)

terrafirma

Date: 09/01/2020

DCP04

[illegible]

Test carried out in accordance with operating instructions for the dynamic cone penetrometer Model A2465 by CNS Farnell Ltd.

CBR correlation based on the relationship $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 * \text{Log}_{10}(\text{mm/blow})$ developed by TRL taken from The

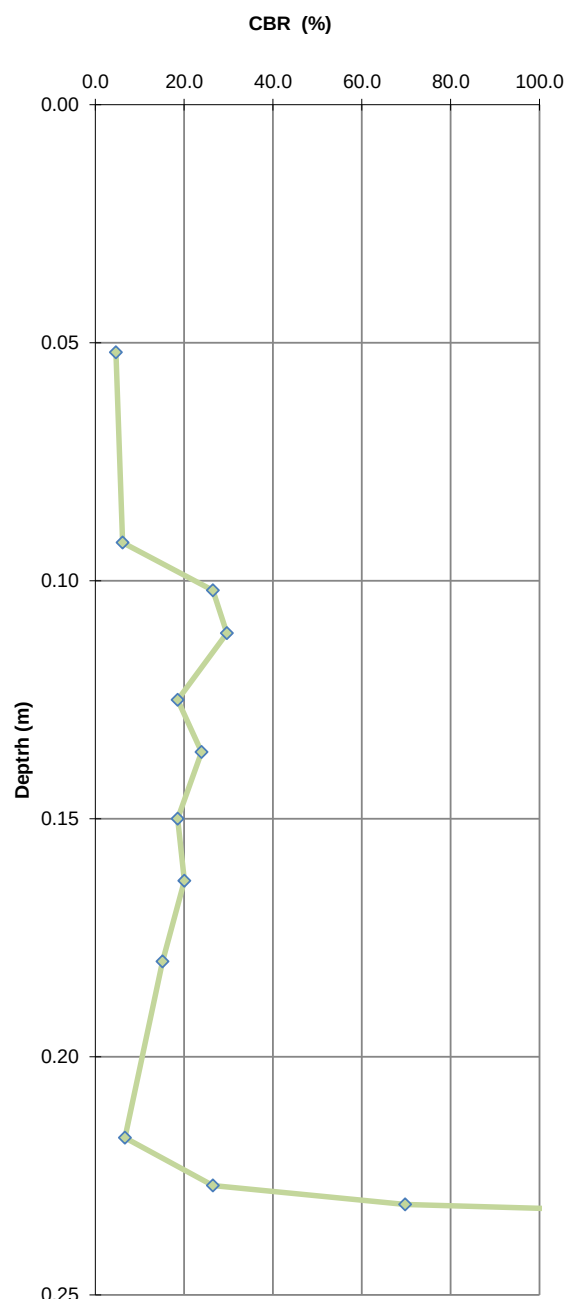
Highways Agency Interim Advice Note 73/06 - Design Guidance for Road Pavement Foundations (2009)

Site Name: Swansea Bay Technology Centre

Project Number: 15773

Date: 09/01/2020

DCP05

[illegible]

REMARKS:

Test carried out in accordance with operating instructions for the dynamic cone penetrometer Model A2465 by CNS Farnell Ltd.

CBR correlation based on the relationship $\text{Log}_{10}(\text{CBR}) = 2.48 - 1.057 * \text{Log}_{10}(\text{mm/blow})$ developed by TRL taken from The

Highways Agency Interim Advice Note 73/06 - Design Guidance for Road Pavement Foundations (2009)

ANNEX E
Laboratory Chemical Test Results



Amended Report

Report No.: 19-42519-2

Initial Date of Issue: 13-Jan-2020 **Date of Re-Issue:** 24-Jan-2020

Client Terra Firma (Wales) Ltd

Client Address: 5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HA

Contact(s): james@terrafirmawales.co.uk

Project Swansea Bay Technology Centre

Quotation No.: **Date Received:** 20-Dec-2019

Order No.: 15773/JRW **Date Instructed:** 20-Dec-2019

No. of Samples: 13

Turnaround (Wkdays): 22 **Results Due:** 28-Jan-2020

Date Approved: 24-Jan-2020

Approved By:

Details: Darrell Hall, Director
Glynn Harvey, Laboratory Manager

Results - Soil

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946805	946806	946808	946809	946810	946811	946812	946813	946814
	Client Sample ID.:				1	2	4	5	6	7	8	9	10
	Sample Location:				TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
	Asbestos Lab:				DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A	-		-	-	-	-	Fibres/Clumps	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	Chrysotile	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-		-	-	-	-	Stereo Microscopy	-	-
Asbestos by Gravimetry	U	2192	%	0.001							0.27		
Total Asbestos	N	2192	%	0.001							0.27		
Moisture	N	2030	%	0.020	7.5	11	12	6.5	11	20	17	11	
Soil Colour	N	2040		N/A	Brown,		Brown,	Brown,	Brown,	Brown,	Brown,	Brown,	
Other Material	N	2040		N/A	Stones,		Stones,	Stones,	Stones,	Stones,	Stones,	Stones,	
Soil Texture	N	2040		N/A	Sand,		Sand,	Sand,	Sand,	Sand,	Sand,	Sand,	
pH	M	2010		4.0	9.5		9.0	10.7	10.2	10.8	9.2	10.5	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.48		1.3	1.1	1.5	1.4	0.78	1.0	
Cyanide (Complex)	M	2300	mg/kg	0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Sulphate (Acid Soluble)	M	2430	%	0.010	0.089		0.45	0.065	0.59	0.36	0.092	0.43	
Arsenic	M	2450	mg/kg	1.0	17		26	12	27	16	22	23	
Beryllium	U	2450	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Cadmium	M	2450	mg/kg	0.10	0.36		0.46	0.25	0.41	0.26	0.86	0.44	
Chromium	M	2450	mg/kg	1.0	17		12	1100	42	61	39	21	
Mercury Low Level	M	2450	mg/kg	0.05	0.07		0.19	0.32	0.49	0.07	0.20	0.44	
Manganese	M	2450	mg/kg	5.0	780		480	15000	920	1400	1500	640	
Molybdenum	M	2450	mg/kg	2.0	< 2.0		< 2.0	3.7	< 2.0	< 2.0	< 2.0	< 2.0	
Antimony	N	2450	mg/kg	2.0	< 2.0		2.1	< 2.0	2.4	< 2.0	< 2.0	< 2.0	
Copper	U	2450	mg/kg	0.50	22		29	25	60	32	37	33	
Nickel	M	2450	mg/kg	0.50	13		16	22	22	9.2	24	21	
Lead	M	2450	mg/kg	0.50	76		250	31	150	65	120	130	
Selenium	M	2450	mg/kg	0.20	< 0.20		< 0.20	< 0.20	< 0.20	0.27	0.50	< 0.20	
Zinc	U	2450	mg/kg	0.50	140		250	110	200	180	220	150	
Chromium (Trivalent)	N	2490	mg/kg	1.0	17		12	1100	42	61	39	21	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	

Results - Soil

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:					19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:					946805	946806	946808	946809	946810	946811	946812	946813	946814
	Client Sample ID.:					1	2	4	5	6	7	8	9	10
	Sample Location:					TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5
	Date Sampled:					19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:					12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
	Asbestos Lab:					DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD										
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0		8.2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0		8.2	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0		38	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0		410	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0		< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0		450	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10		460	< 10	< 10	< 10	< 10	< 10	< 10	
Naphthalene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.0	
Anthracene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.18	
Fluoranthene	M	2700	mg/kg	0.10	< 0.10		3.7	1.5	1.6	< 0.10	< 0.10	< 0.10	1.5	
Pyrene	M	2700	mg/kg	0.10	< 0.10		2.7	0.81	1.1	< 0.10	< 0.10	< 0.10	1.5	
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10		< 0.10	0.56	0.53	< 0.10	< 0.10	< 0.10	0.74	
Chrysene	M	2700	mg/kg	0.10	< 0.10		< 0.10	0.66	0.50	< 0.10	< 0.10	< 0.10	0.85	
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0		6.4	3.5	3.7	< 2.0	< 2.0	< 2.0	5.8	
Dichlorodifluoromethane	U	2760	µg/kg	1.0		< 1.0				< 1.0				
Chloromethane	M	2760	µg/kg	1.0		< 1.0				< 1.0				
Vinyl Chloride	M	2760	µg/kg	1.0		< 1.0				< 1.0				
Bromomethane	M	2760	µg/kg	20		< 20				< 20				
Chloroethane	U	2760	µg/kg	2.0		< 2.0				< 2.0				
Trichlorofluoromethane	M	2760	µg/kg	1.0		< 1.0				< 1.0				

Results - Soil

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946805	946806	946808	946809	946810	946811	946812	946813	946814
	Client Sample ID.:				1	2	4	5	6	7	8	9	10
	Sample Location:				TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
	Asbestos Lab:				DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD									
1,1-Dichloroethene	M	2760	mg/kg	1.0		< 1.0				< 1.0			
Trans 1,2-Dichloroethene	M	2760	mg/kg	1.0		< 1.0				< 1.0			
1,1-Dichloroethane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Bromochloromethane	U	2760	µg/kg	5.0		< 5.0				< 5.0			
Trichloromethane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,1,1-Trichloroethane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Tetrachloromethane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,1-Dichloropropene	U	2760	µg/kg	1.0		< 1.0				< 1.0			
Benzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,2-Dichloroethane	M	2760	µg/kg	2.0		< 2.0				< 2.0			
Trichloroethene	N	2760	µg/kg	1.0		< 1.0				< 1.0			
1,2-Dichloropropane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Dibromomethane	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Bromodichloromethane	M	2760	µg/kg	5.0		< 5.0				< 5.0			
cis-1,3-Dichloropropene	N	2760	µg/kg	10		< 10				< 10			
Toluene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Trans-1,3-Dichloropropene	N	2760	µg/kg	10		< 10				< 10			
1,1,2-Trichloroethane	M	2760	µg/kg	10		< 10				< 10			
Tetrachloroethene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,3-Dichloropropane	U	2760	µg/kg	2.0		< 2.0				< 2.0			
Dibromochloromethane	U	2760	µg/kg	10		< 10				< 10			
1,2-Dibromoethane	M	2760	µg/kg	5.0		< 5.0				< 5.0			
Chlorobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0		< 2.0				< 2.0			
Ethylbenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
m & p-Xylene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
o-Xylene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Styrene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Tribromomethane	U	2760	µg/kg	1.0		< 1.0				< 1.0			
Isopropylbenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
Bromobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,2,3-Trichloropropane	N	2760	µg/kg	50		< 50				< 50			
N-Propylbenzene	U	2760	µg/kg	1.0		< 1.0				< 1.0			
2-Chlorotoluene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0			
4-Chlorotoluene	U	2760	µg/kg	1.0		< 1.0				< 1.0			

Results - Soil

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946805	946806	946808	946809	946810	946811	946812	946813	946814	
	Client Sample ID.:				1	2	4	5	6	7	8	9	10	
	Sample Location:				TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06	
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):				0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5	
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	
	Time Sampled:				12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	
	Asbestos Lab:				DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	Accred.	SOP	Units	LOD										
Tert-Butylbenzene	U	2760	µg/kg	1.0		< 1.0				< 1.0				
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0				
Sec-Butylbenzene	U	2760	µg/kg	1.0		< 1.0				< 1.0				
1,3-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0				
4-Isopropyltoluene	U	2760	µg/kg	1.0		< 1.0				< 1.0				
1,4-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0				
N-Butylbenzene	U	2760	µg/kg	1.0		< 1.0				< 1.0				
1,2-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0				
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50		< 50				< 50				
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0		< 1.0				< 1.0				
Hexachlorobutadiene	U	2760	µg/kg	1.0		< 1.0				< 1.0				
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0		< 2.0				< 2.0				
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		< 1.0				< 1.0				
N-Nitrosodimethylamine	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Phenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
2-Chlorophenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Bis-(2-Chloroethyl)Ether	M	2790	mg/kg	0.50		< 0.50				< 0.50				
1,3-Dichlorobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
1,4-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50				< 0.50				
1,2-Dichlorobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
2-Methylphenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Bis(2-Chloroisopropyl)Ether	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Hexachloroethane	N	2790	mg/kg	0.50		< 0.50				< 0.50				
N-Nitrosodi-n-propylamine	M	2790	mg/kg	0.50		< 0.50				< 0.50				
4-Methylphenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Nitrobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Isophorone	M	2790	mg/kg	0.50		< 0.50				< 0.50				
2-Nitrophenol	N	2790	mg/kg	0.50		< 0.50				< 0.50				
2,4-Dimethylphenol	N	2790	mg/kg	0.50		< 0.50				< 0.50				
Bis(2-Chloroethoxy)Methane	M	2790	mg/kg	0.50		< 0.50				< 0.50				
2,4-Dichlorophenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
1,2,4-Trichlorobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
Naphthalene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
4-Chloroaniline	N	2790	mg/kg	0.50		< 0.50				< 0.50				
Hexachlorobutadiene	M	2790	mg/kg	0.50		< 0.50				< 0.50				
4-Chloro-3-Methylphenol	M	2790	mg/kg	0.50		< 0.50				< 0.50				
2-Methylnaphthalene	M	2790	mg/kg	0.50		< 0.50				< 0.50				

Results - Soil

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946805	946806	946808	946809	946810	946811	946812	946813	946814
	Client Sample ID.:				1	2	4	5	6	7	8	9	10
	Sample Location:				TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
	Asbestos Lab:				DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD									
4-Nitrophenol	N	2790	mg/kg	0.50		< 0.50				< 0.50			
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50		< 0.50				< 0.50			
2,4,6-Trichlorophenol	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2,4,5-Trichlorophenol	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2-Chloronaphthalene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2-Nitroaniline	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Acenaphthylene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Dimethylphthalate	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2,6-Dinitrotoluene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Acenaphthene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
3-Nitroaniline	N	2790	mg/kg	0.50		< 0.50				< 0.50			
Dibenzofuran	M	2790	mg/kg	0.50		< 0.50				< 0.50			
4-Chlorophenylphenylether	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2,4-Dinitrotoluene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Fluorene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Diethyl Phthalate	M	2790	mg/kg	0.50		< 0.50				< 0.50			
4-Nitroaniline	M	2790	mg/kg	0.50		< 0.50				< 0.50			
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50		< 0.50				< 0.50			
Azobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
4-Bromophenylphenyl Ether	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Hexachlorobenzene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Pentachlorophenol	N	2790	mg/kg	0.50		< 0.50				< 0.50			
Phenanthrene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Anthracene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Carbazole	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Di-N-Butyl Phthalate	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Fluoranthene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Pyrene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Butylbenzyl Phthalate	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Benzo[a]anthracene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Chrysene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50		< 0.50				< 0.50			
Di-N-Octyl Phthalate	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Benzo[b]fluoranthene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Benzo[k]fluoranthene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Benzo[a]pyrene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Indeno(1,2,3-c,d)Pyrene	M	2790	mg/kg	0.50		< 0.50				< 0.50			

Results - Soil

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946805	946806	946808	946809	946810	946811	946812	946813	946814
	Client Sample ID.:				1	2	4	5	6	7	8	9	10
	Sample Location:				TP01	TP01	TP02	TP03	TP04	TP04	TP05	TP05	TP06
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.5	1.0	0.6	0.3	0.5	1.6	0.2	1.0	0.5
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00	12:00
	Asbestos Lab:				DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD									
Dibenz(a,h)Anthracene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Benzo[g,h,i]perylene	M	2790	mg/kg	0.50		< 0.50				< 0.50			
Total Phenols	M	2920	mg/kg	0.30	< 0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	
Organic Matter BS1377	N	2930	%	0.10	2.1		1.1	0.50	0.60	0.30	2.5	1.4	

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Asbestos by Gravimetry	U	2192	%	0.001			
Total Asbestos	N	2192	%	0.001			
Moisture	N	2030	%	0.020	13	13	17
Soil Colour	N	2040		N/A	Brown,	Brown,	Brown,
Other Material	N	2040		N/A	NONE,	Stones, Brick,	Stones,
Soil Texture	N	2040		N/A	Sand,	Sand,	Sand,
pH	M	2010		4.0	10.0	9.7	9.9
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.94	0.59	1.5
Cyanide (Complex)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	M	2430	%	0.010	0.11	0.24	0.10
Arsenic	M	2450	mg/kg	1.0	15	30	15
Beryllium	U	2450	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Cadmium	M	2450	mg/kg	0.10	0.41	0.56	0.93
Chromium	M	2450	mg/kg	1.0	43	16	62
Mercury Low Level	M	2450	mg/kg	0.05	< 0.05	0.18	< 0.05
Manganese	M	2450	mg/kg	5.0	1200	460	1400
Molybdenum	M	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	2.9	< 2.0
Copper	U	2450	mg/kg	0.50	27	55	32
Nickel	M	2450	mg/kg	0.50	12	17	12
Lead	M	2450	mg/kg	0.50	49	290	64
Selenium	M	2450	mg/kg	0.20	0.30	< 0.20	0.54
Zinc	U	2450	mg/kg	0.50	160	400	230
Chromium (Trivalent)	N	2490	mg/kg	1.0	43	16	62
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	< 0.10	1.8	< 0.10
Pyrene	M	2700	mg/kg	0.10	< 0.10	1.6	< 0.10
Benzo[a]anthracene	M	2700	mg/kg	0.10	< 0.10	0.76	< 0.10
Chrysene	M	2700	mg/kg	0.10	< 0.10	0.74	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	1.2	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	0.35	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	0.88	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	0.62	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	0.16	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	1.2	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	9.3	< 2.0
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0		< 1.0
Chloromethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0		< 1.0
Bromomethane	M	2760	µg/kg	20	< 20		< 20
Chloroethane	U	2760	µg/kg	2.0	< 2.0		< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0		< 1.0

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
1,1-Dichloroethene	M	2760	mg/kg	1.0	< 1.0		< 1.0
Trans 1,2-Dichloroethene	M	2760	mg/kg	1.0	< 1.0		< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0		< 5.0
Trichloromethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Benzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0		< 2.0
Trichloroethene	N	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0		< 1.0
Dibromomethane	M	2760	µg/kg	1.0	< 1.0		< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0		< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10		< 10
Toluene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10		< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10		< 10
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0		< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10		< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0		< 5.0
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0		< 2.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	< 1.0		< 1.0
o-Xylene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Styrene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0		< 1.0
Isopropylbenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Bromobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50		< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0		< 1.0

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50		< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0		< 1.0
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0		< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0		< 1.0
N-Nitrosodimethylamine	M	2790	mg/kg	0.50	< 0.50		< 0.50
Phenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Chlorophenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
Bis-(2-Chloroethyl)Ether	M	2790	mg/kg	0.50	< 0.50		< 0.50
1,3-Dichlorobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
1,2-Dichlorobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methylphenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Chloroisopropyl)Ether	M	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50		< 0.50
N-Nitrosodi-n-propylamine	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Methylphenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
Nitrobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Isophorone	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Chloroethoxy)Methane	M	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dichlorophenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
1,2,4-Trichlorobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Naphthalene	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorobutadiene	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chloro-3-Methylphenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methylnaphthalene	M	2790	mg/kg	0.50	< 0.50		< 0.50

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4,6-Trichlorophenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
2,4,5-Trichlorophenol	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Chloronaphthalene	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Nitroaniline	M	2790	mg/kg	0.50	< 0.50		< 0.50
Acenaphthylene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Dimethylphthalate	M	2790	mg/kg	0.50	< 0.50		< 0.50
2,6-Dinitrotoluene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Acenaphthene	M	2790	mg/kg	0.50	< 0.50		< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
Dibenzofuran	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chlorophenylphenylether	M	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dinitrotoluene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Fluorene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Diethyl Phthalate	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Nitroaniline	M	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Azobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
4-Bromophenylphenyl Ether	M	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorobenzene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Phenanthrene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Anthracene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Carbazole	M	2790	mg/kg	0.50	< 0.50		< 0.50
Di-N-Butyl Phthalate	M	2790	mg/kg	0.50	< 0.50		< 0.50
Fluoranthene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Pyrene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Butylbenzyl Phthalate	M	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[a]anthracene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Chrysene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
Di-N-Octyl Phthalate	M	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[b]fluoranthene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[k]fluoranthene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[a]pyrene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Indeno(1,2,3-c,d)Pyrene	M	2790	mg/kg	0.50	< 0.50		< 0.50

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				19-42519	19-42519	19-42519
Quotation No.:	Chemtest Sample ID.:				946815	946816	946817
	Client Sample ID.:				11	12	13
	Sample Location:				TP06	TP07	TP07
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.9	0.5	2.1
	Date Sampled:				19-Dec-2019	19-Dec-2019	19-Dec-2019
	Time Sampled:				12:00	12:00	12:00
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Dibenz(a,h)Anthracene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[g,h,i]perylene	M	2790	mg/kg	0.50	< 0.50		< 0.50
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30
Organic Matter BS1377	N	2930	%	0.10	1.1	0.80	1.4

Results - 2 Stage WAC

Project: Swansea Bay Technology Centre

Chemtest Job No: 19-42519							Landfill Waste Acceptance Criteria		
Chemtest Sample ID: 946806							Limits		
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID: 2									
Sample Location: TP01									
Top Depth(m): 1.0									
Bottom Depth(m):									
Sampling Date: 19-Dec-2019									
Determinand	SOP	Accred.	Units						
Total Organic Carbon	2625	M	%				3		
Loss On Ignition	2610	M	%				5		
Total BTEX	2760	M	mg/kg				6		
Total PCBs (7 Congeners)	2815	M	mg/kg				1		
TPH Total WAC (Mineral Oil)	2670	M	mg/kg				150		
Total (Of 17) PAH's	2700	N	mg/kg				100		
pH	2010	M					9.1		
Acid Neutralisation Capacity	2015	N	mol/kg	0.065					
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.010	0.010	< 0.050	0.10	0.5	2	25
Barium	1450	U	0.024	0.019	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	0.00012	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	0.0024	0.0013	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	0.0044	0.0042	< 0.050	< 0.050	2	50	100
Mercury	1450	U	0.0019	0.0018	0.0038	0.018	0.01	0.2	2
Molybdenum	1450	U	0.0010	0.0022	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.016	0.0037	0.032	0.054	0.5	10	50
Antimony	1450	U	0.0011	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.0018	< 0.010	0.015	0.1	0.5	7
Zinc	1450	U	0.034	0.0019	< 0.50	< 0.50	4	50	200
Chloride	1220	U	< 1.0	1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	1.4	0.72	2.8	8.1	10	150	500
Sulphate	1220	U	5.5	6.9	11	67	1000	20000	50000
Total Dissolved Solids	1020	N	85	72	170	730	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	4.0	6.1	< 50	58	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	11

Leachate Test Information	
Leachant volume 1st extract/l	0.327
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.244

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Swansea Bay Technology Centre

Chemtest Job No: 19-42519							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 946807							Limits			
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: 3										
Sample Location: TP02										
Top Depth(m): 0.1										
Bottom Depth(m):										
Sampling Date: 19-Dec-2019										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				0.95	3	5	6
Loss On Ignition	2610	M	%				3.6	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg				< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				< 2.0	100	--	--
pH	2010	M					8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.040	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1450	U	< 0.0010	0.0012	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.10	0.080	< 0.50	0.81	20	100	300	
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5	
Chromium	1450	U	< 0.0010	0.0010	< 0.050	< 0.050	0.5	10	70	
Copper	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	0.0019	0.0013	0.0038	0.014	0.01	0.2	2	
Molybdenum	1450	U	0.0017	0.0024	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40	
Lead	1450	U	0.0019	0.0067	< 0.010	0.063	0.5	10	50	
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5	
Selenium	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.1	0.5	7	
Zinc	1450	U	0.0031	0.0062	< 0.50	< 0.50	4	50	200	
Chloride	1220	U	1.1	< 1.0	< 10	< 10	800	15000	25000	
Fluoride	1220	U	0.32	0.32	< 1.0	3.2	10	150	500	
Sulphate	1220	U	4.5	1.7	< 10	19	1000	20000	50000	
Total Dissolved Solids	1020	N	98	91	190	910	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	6.7	4.0	< 50	< 50	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	12

Leachate Test Information	
Leachant volume 1st extract/l	0.326
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.138

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Swansea Bay Technology Centre

Chemtest Job No: 19-42519 Chemtest Sample ID: 946809 Sample Ref: Sample ID: 5 Sample Location: TP03 Top Depth(m): 0.3 Bottom Depth(m): Sampling Date: 19-Dec-2019							Landfill Waste Acceptance Criteria Limits		
							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill
Determinand	SOP	Accred.	Units						
Total Organic Carbon	2625	M	%				3	5	6
Loss On Ignition	2610	M	%				--	--	10
Total BTEX	2760	M	mg/kg				6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg				500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				100	--	--
pH	2010	M					--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg		
Arsenic	1450	U	0.0020	0.0031	< 0.050	< 0.050	0.5	2	25
Barium	1450	U	0.016	0.012	< 0.50	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	2	50	100
Mercury	1450	U	0.0014	0.0032	0.0028	0.029	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	0.0012	< 0.050	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.0010	< 0.050	< 0.050	0.4	10	40
Lead	1450	U	0.0012	< 0.0010	< 0.010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	0.0011	< 0.010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	0.0055	< 0.50	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 1.0	< 10	< 10	800	15000	25000
Fluoride	1220	U	0.62	1.2	1.2	11	10	150	500
Sulphate	1220	U	< 1.0	1.5	< 10	12	1000	20000	50000
Total Dissolved Solids	1020	N	64	65	130	650	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-
Dissolved Organic Carbon	1610	U	3.1	4.0	< 50	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	6.5

Leachate Test Information	
Leachant volume 1st extract/l	0.338
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.314

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - 2 Stage WAC

Project: Swansea Bay Technology Centre

Chemtest Job No: 19-42519							Landfill Waste Acceptance Criteria			
Chemtest Sample ID: 946810							Limits			
Sample Ref:							Inert Waste Landfill	Stable, Non-reactive hazardous waste in non-hazardous Landfill	Hazardous Waste Landfill	
Sample ID: 6										
Sample Location: TP04										
Top Depth(m): 0.5										
Bottom Depth(m):										
Sampling Date: 19-Dec-2019										
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	M	%				2.3	3	5	6
Loss On Ignition	2610	M	%				4.6	--	--	10
Total BTEX	2760	M	mg/kg				< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	M	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	M	mg/kg				< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg				3.7	100	--	--
pH	2010	M					10.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.15	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative mg/kg 10:1	Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg			
Arsenic	1450	U	0.0029	0.0020	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.025	0.021	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	< 0.00010	< 0.00010	< 0.010	< 0.010	0.04	1	5	
Chromium	1450	U	0.0053	0.0043	< 0.050	< 0.050	0.5	10	70	
Copper	1450	U	0.012	0.0033	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.00050	< 0.00050	< 0.0010	< 0.0050	0.01	0.2	2	
Molybdenum	1450	U	0.0036	0.0022	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.0016	0.0013	< 0.050	< 0.050	0.4	10	40	
Lead	1450	U	< 0.0010	< 0.0010	< 0.010	< 0.010	0.5	10	50	
Antimony	1450	U	0.0015	0.0033	< 0.010	0.030	0.06	0.7	5	
Selenium	1450	U	0.0012	< 0.0010	< 0.010	< 0.010	0.1	0.5	7	
Zinc	1450	U	0.0018	0.0014	< 0.50	< 0.50	4	50	200	
Chloride	1220	U	2.3	< 1.0	< 10	< 10	800	15000	25000	
Fluoride	1220	U	0.23	0.29	< 1.0	2.8	10	150	500	
Sulphate	1220	U	4.3	70	< 10	580	1000	20000	50000	
Total Dissolved Solids	1020	N	200	240	400	2300	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	6.1	5.2	< 50	53	500	800	1000	

Solid Information	
Dry mass of test portion/kg	0.175
Moisture (%)	11

Leachate Test Information	
Leachant volume 1st extract/l	0.329
Leachant volume 2nd extract/l	1.400
Eluant recovered from 1st extract/l	0.313

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
2030	Moisture and Stone Content of Soils (Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description (Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44	Dichloromethane extraction / GCxGC FID detection

SOP	Title	Parameters included	Method summary
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2790	Semi-Volatile Organic Compounds (SVOCs) in Soils by GC-MS	Semi-volatile organic compounds(cf. USEPA Method 8270)	Acetone/Hexane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
2930	Organic Matter	Organic Matter	Acid Dichromate digestion/Titration
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

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- > "greater than"

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- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



2183

Final Report

Report No.:	20-00641-1		
Initial Date of Issue:	15-Jan-2020		
Client	Terra Firma (Wales) Ltd		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	james@terrafirmawales.co.uk		
Project	Baglan		
Quotation No.:		Date Received:	09-Jan-2020
Order No.:	15773/JRW	Date Instructed:	10-Jan-2020
No. of Samples:	2		
Turnaround (Wkdays):	5	Results Due:	16-Jan-2020
Date Approved:	15-Jan-2020		
Approved By:			
Details:	Glynn Harvey, Laboratory Manager		

Project: Baglan

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				20-00641	20-00641
Quotation No.:	Chemtest Sample ID.:				951120	951121
	Client Sample ID.:				1	2
	Sample Location:				BH03	BH03
	Sample Type:				SOIL	SOIL
	Top Depth (m):				5	9.5
	Bottom Depth (m):				5.45	9.95
	Date Sampled:				07-Jan-2020	07-Jan-2020
	Time Sampled:				12:00	12:00
Determinand	Accred.	SOP	Units	LOD		
Moisture	N	2030	%	0.020	32	22
pH	U	2010		4.0	9.9	9.3
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.34	0.035
Sulphate (Acid Soluble)	U	2430	%	0.010	0.17	0.037

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

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Sample Retention and Disposal

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All water samples will be retained for 14 days from the date of receipt

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customerservices@chemtest.com



2183

Final Report

Report No.:	20-00675-1		
Initial Date of Issue:	15-Jan-2020		
Client	Terra Firma (Wales) Ltd		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	james@terrafirmawales.co.uk		
Project	Swansea Bay Technology Centre		
Quotation No.:		Date Received:	10-Jan-2020
Order No.:	15773/JRW	Date Instructed:	10-Jan-2020
No. of Samples:	2		
Turnaround (Wkdays):	5	Results Due:	16-Jan-2020
Date Approved:	15-Jan-2020		
Approved By:			
Details:	Glynn Harvey, Laboratory Manager		

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				20-00675	20-00675
Quotation No.:	Chemtest Sample ID.:				951231	951232
	Client Sample ID.:				1	2
	Sample Location:				BH02	BH02
	Sample Type:				SOIL	SOIL
	Top Depth (m):				4	8
	Bottom Depth (m):				4.45	8.45
	Date Sampled:				09-Jan-2020	09-Jan-2020
	Time Sampled:				12:00	12:00
Determinand	Accred.	SOP	Units	LOD		
Moisture	N	2030	%	0.020	33	21
pH	U	2010		4.0	9.3	9.3
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.36	0.093
Sulphate (Acid Soluble)	U	2430	%	0.010	0.16	0.033

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

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The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

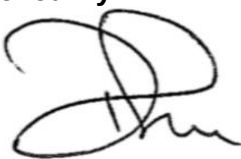
If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



2183

Final Report

Report No.:	20-02679-1		
Initial Date of Issue:	05-Feb-2020		
Client	Terra Firma (Wales) Ltd		
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA		
Contact(s):	james@terrafirmawales.co.uk		
Project	Swansea Bay Technology Centre		
Quotation No.:		Date Received:	28-Jan-2020
Order No.:	15773/JRW	Date Instructed:	28-Jan-2020
No. of Samples:	3		
Turnaround (Wkdays):	5	Results Due:	03-Feb-2020
Date Approved:	05-Feb-2020		
Approved By:			
Details:	Darrell Hall, Director		

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				20-02679	20-02679	20-02679
Quotation No.:	Chemtest Sample ID.:				960185	960186	960187
	Client Sample ID.:				1	2	3
	Sample Location:				BH01	BH02	BH03
	Sample Type:				WATER	WATER	WATER
	Date Sampled:				27-Jan-2020	27-Jan-2020	27-Jan-2020
	Time Sampled:				12:00	12:00	12:00
Determinand	Accred.	SOP	Units	LOD			
pH	U	1010		N/A	8.3	8.4	8.8
Electrical Conductivity	U	1020	µS/cm	1.0	520	900	570
Biochemical Oxygen Demand	N	1090	mg O ₂ /l	4.0	< 4.0	< 4.0	< 4.0
Chemical Oxygen Demand	U	1100	mg O ₂ /l	10	18	27	28
Sulphate	U	1220	mg/l	1.0	140	96	69
Cyanide (Total) Low-Level	N	1300	mg/l	0.0050	0.0060	< 0.0050	< 0.0050
Sulphide	U	1325	mg/l	0.050	0.38	< 0.050	0.31
Hardness	N	1415	mg/l	1.0	240	160	140
Arsenic (Dissolved)	U	1450	µg/l	1.0	9.0	73	98
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	1.7	3.1	2.4
Copper (Dissolved)	U	1450	µg/l	1.0	1.5	< 1.0	< 1.0
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	5.2	3.6	3.9
Zinc (Dissolved)	U	1450	µg/l	1.0	3.4	2.5	2.5
Mercury Low Level	U	1460	µg/l	0.010	< 0.010	< 0.010	< 0.010
Chromium (Trivalent)	N	1490	µg/l	20	< 20	< 20	< 20
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20	< 20
Total TPH >C6-C40	U	1670	µg/l	10	62	130	53
Naphthalene	N	1800	µg/l	0.010	< 0.010	< 0.010	3.3
Acenaphthylene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Fluorene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Chrysene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1800	µg/l	0.010	< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1800	µg/l	0.10	< 0.10	< 0.10	< 0.10
Resorcinol	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Phenol	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050

Project: Swansea Bay Technology Centre

Client: Terra Firma (Wales) Ltd	Chemtest Job No.:				20-02679	20-02679	20-02679
Quotation No.:	Chemtest Sample ID.:				960185	960186	960187
	Client Sample ID.:				1	2	3
	Sample Location:				BH01	BH02	BH03
	Sample Type:				WATER	WATER	WATER
	Date Sampled:				27-Jan-2020	27-Jan-2020	27-Jan-2020
	Time Sampled:				12:00	12:00	12:00
Determinand	Accred.	SOP	Units	LOD			
Cresols	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Xylenols	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
1-Naphthol	N	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Trimethylphenols	U	1920	mg/l	0.0050	< 0.0050	< 0.0050	< 0.0050
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030	< 0.030

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1090	Biochemical Oxygen Demand	Biochemical Oxygen demand (BOD)	Colorimetric determination of dissolved oxygen in seeded sample after 5 days incubation at 20°C.
1100	Chemical Oxygen Demand	Chemical Oxygen demand (COD)	Dichromate oxidation of organic matter in sample followed by colorimetric determination of residual Cr[VI].
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N-dimethyl-p-phenylenediamine.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1460	Mercury low-level in Waters by AFS	Mercury	Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm.
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

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ANNEX F
Geotechnical Test Results



Contract Number: 47311

Client Ref: **15773**
Client PO: **15773/JRW**

Report Date: **29-01-2020**

Client **Terrafirma Wales Ltd**
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HB

Contract Title: **Swansea Bay Technology Park**
For the attention of: **James Williams**

Date Received: **13-01-2020**
Date Completed: **29-01-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	11
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	5
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	4
PSD: Sedimentation by pipette carried out with Wet Sieve (Wet Sieve must also be selected) BS 1377:1990 - Part 2 : 9.4 - * UKAS	1
Disposal of samples for job	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 except in full, without the prior written approval of the laboratory.

Approved Signatories:

Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

Natural Moisture Content
(BS 1377:1990 - Part 2 : 3.2)

DESCRIPTIONS

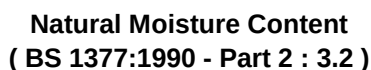
Contract Number	47311	
Site Name	Swansea Bay Technology Park	
Date Tested	27/01/2020	

[illegible]

Operators	Checked	29/01/2020	Wayne Honey (Administrative/Quality Assistant)
Clayton Jenkins	Approved	29/01/2020	Paul Evans (Quality/Technical Manager)



2788



Contract Number

47311

Site Name

Swansea Bay Technology Park

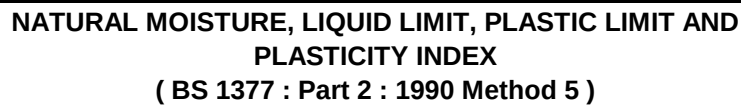
Date Tested

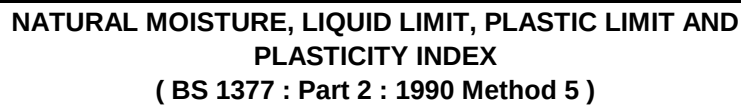
27/01/2020

Operators	Checked	29/01/2020	Wayne Honey (Administrative/Quality Assistant)
Clayton Jenkins	Approved	29/01/2020	Paul Evans (Quality/Technical Manager)

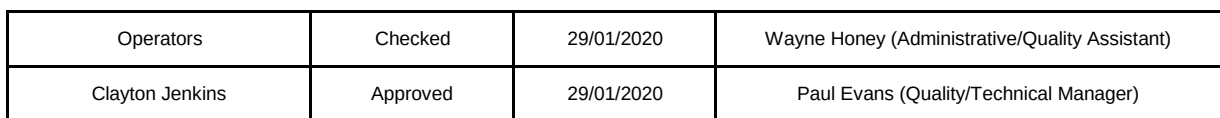


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[illegible]

[illegible]

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

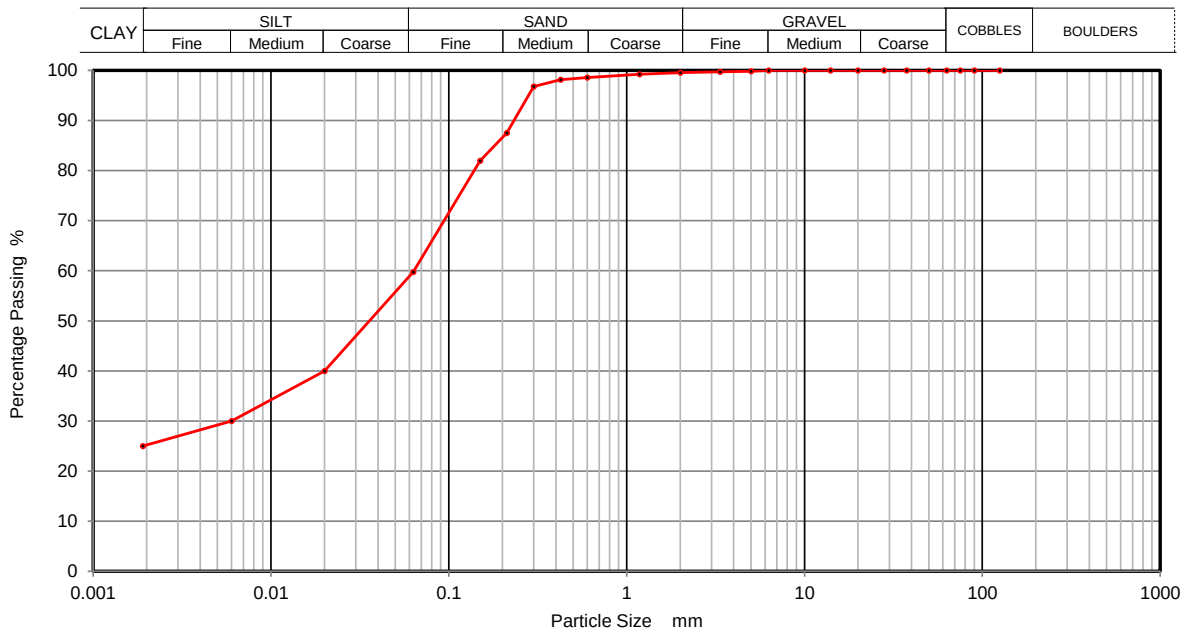




PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Contract Number	47311
Borehole/Pit No.	BH02
Sample No.	
Depth Top	4.00
Depth Base	4.45
Sample Type	B

Site Name	Swansea Bay Technology Park
Soil Description	Grey clayey silty fine to coarse SAND
Date Tested	25/01/2020



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	40
90	100	0.0060	30
75	100	0.0020	25
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	99		
0.6	99		
0.425	98		
0.3	97		
0.212	87		
0.15	82		
0.063	60		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	40
Silt	35
Clay	25

Remarks
 Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	28/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	29/01/2020	Paul Evans	<i>P. Evans</i>





**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number **47311**

Borehole/Pit No. **BH02**

Site Name **Swansea Bay Technology Park**

Sample No.

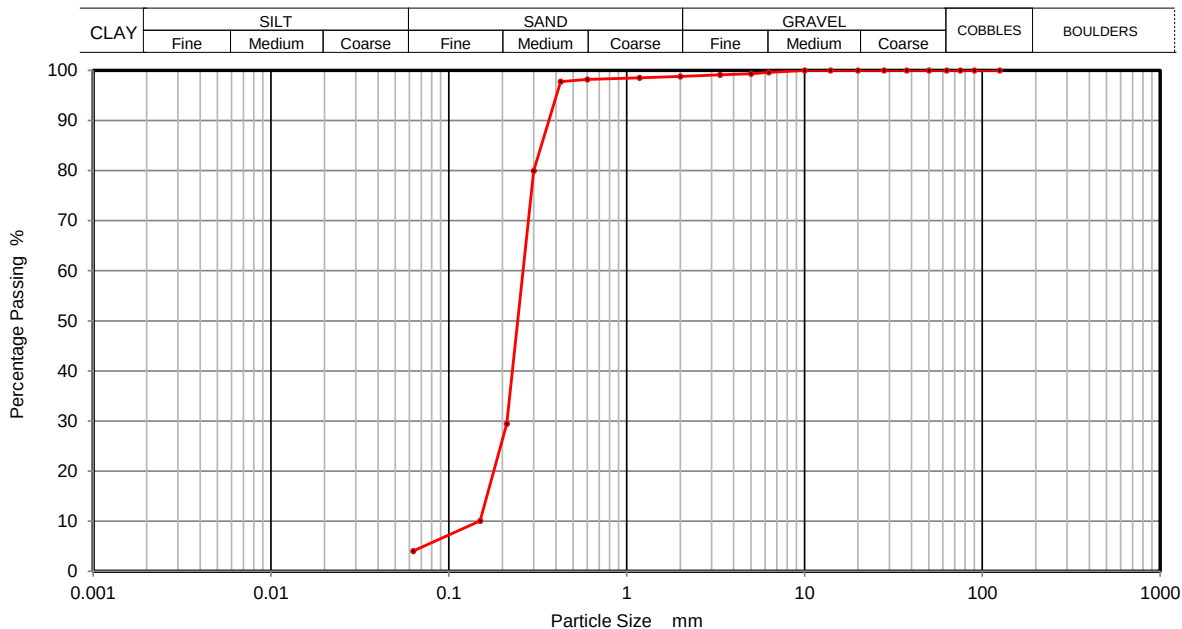
Soil Description **Brownish grey slightly fine to medium gravelly slightly clayey/silty fine to coarse SAND**

Depth Top **9.50**

Depth Base **9.95**

Date Tested **25/01/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	99		
3.35	99		
2	99		
1.18	99		
0.6	98		
0.425	98		
0.3	80		
0.212	29		
0.15	10		
0.063	4		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	95
Silt and Clay	4

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	28/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	29/01/2020	Paul Evans	<i>P. Evans</i>





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **47311**

Borehole/Pit No. **BH02**

Site Name **Swansea Bay Technology Park**

Sample No.

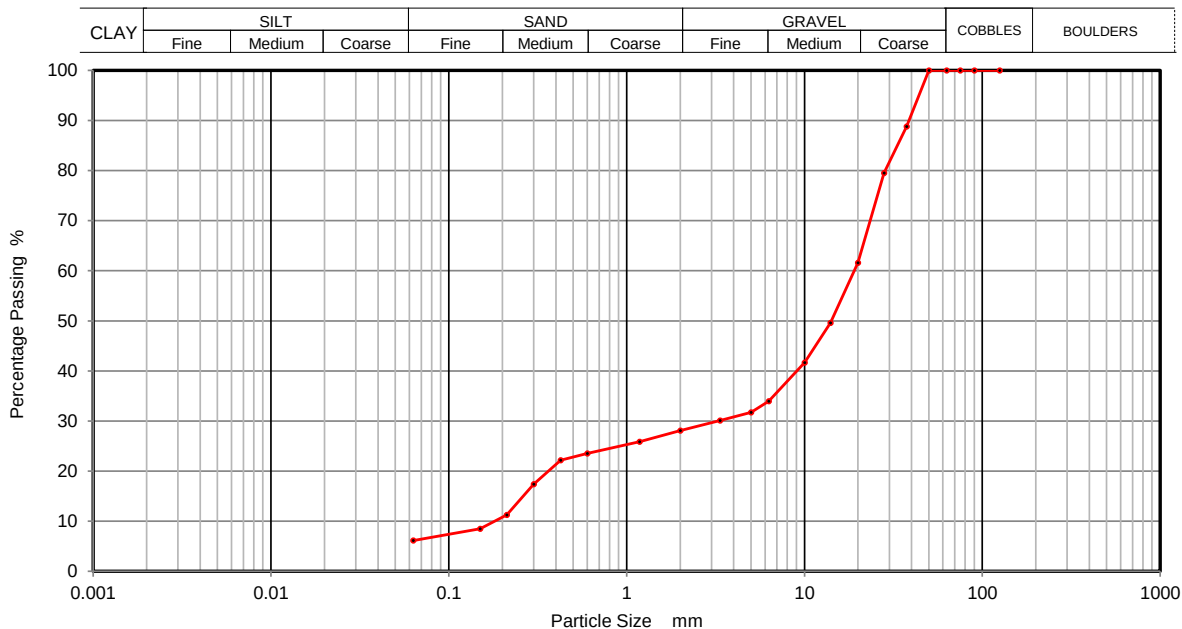
Soil Description **Grey slightly clayey/silty fine to coarse sandy fine to coarse GRAVEL**

Depth Top **14.00**

Depth Base **14.45**

Date Tested **25/01/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	89		
28	80		
20	62		
14	50		
10	42		
6.3	34		
5	32		
3.35	30		
2	28		
1.18	26		
0.6	24		
0.425	22		
0.3	17		
0.212	11		
0.15	9		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	72
Sand	22
Silt and Clay	6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	28/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	29/01/2020	Paul Evans	<i>P. Evans</i>





**PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2**

Contract Number **47311**

Borehole/Pit No. **BH03**

Site Name **Swansea Bay Technology Park**

Sample No.

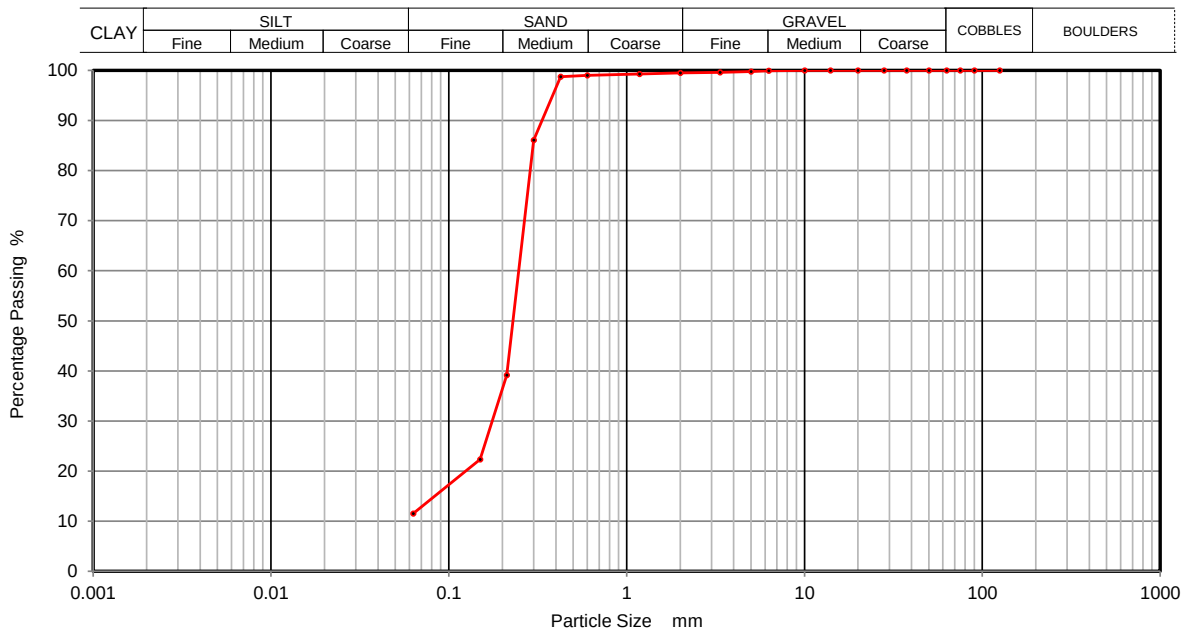
Soil Description **Brownish grey slightly fine to medium gravelly clayey/silty fine to coarse SAND**

Depth Top **6.50**

Depth Base **6.95**

Date Tested **25/01/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	99		
1.18	99		
0.6	99		
0.425	99		
0.3	86		
0.212	39		
0.15	22		
0.063	12		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	87
Silt and Clay	12

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	28/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	29/01/2020	Paul Evans	<i>DP Evans</i>





Contract Number: 47319

Client Ref: **15773**
Client PO: **15773/JRW**

Report Date: **25-01-2020**

Client **Terrafirma Wales Ltd**
5 Deryn Court
Wharfedale Road
Pentwyn
Cardiff
CF23 7HB

Contract Title: **Swansea Bay Technology Park**
For the attention of: **James Williams**

Date Received: **13-01-2020**
Date Completed: **25-01-2020**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	2
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	1
PSD Wet Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	2
Disposal of samples for job	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 except in full, without the prior written approval of the laboratory.

Approved Signatories:

Emma Sharp (Office Manager) - Paul Evans (Quality/Technical Manager) - Richard John (Advanced Testing Manager)
Sean Penn (Administrative/Accounts Assistant) - Shaun Jones (Laboratory manager) - Wayne Honey (Administrative/Quality Assistant)

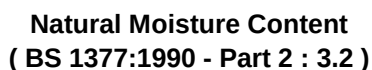
Natural Moisture Content
(BS 1377:1990 - Part 2 : 3.2)

DESCRIPTIONS

Contract Number	47319	
Site Name	Swansea Bay Technology Park	
Date Tested	22/01/2020	

[illegible]

Operators	Checked	25/01/2020	Wayne Honey (Administrative/Quality Assistant)
Daniel Bassett	Approved	25/01/2020	Paul Evans (Quality/Technical Manager)

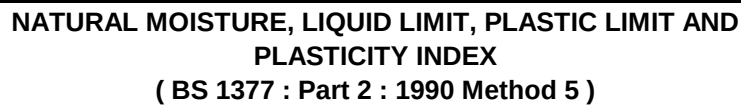


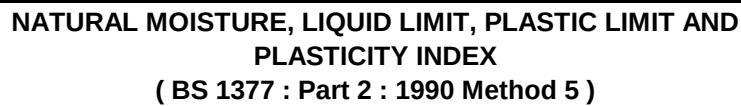
Contract Number	47319	
Site Name	Swansea Bay Technology Park	
Date Tested	22/01/2020	

[illegible]

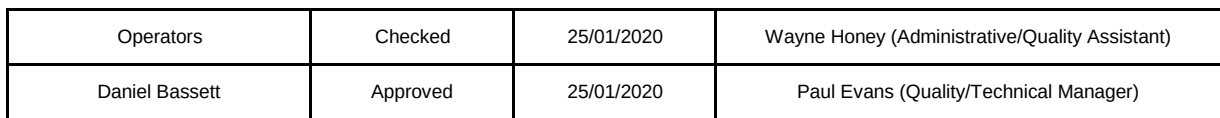
Operators	Checked	25/01/2020	Wayne Honey (Administrative/Quality Assistant)
Daniel Bassett	Approved	25/01/2020	Paul Evans (Quality/Technical Manager)



[illegible]

[illegible]

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





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **47319**

Borehole/Pit No. **BH01**

Site Name **Swansea Bay Technology Park**

Sample No.

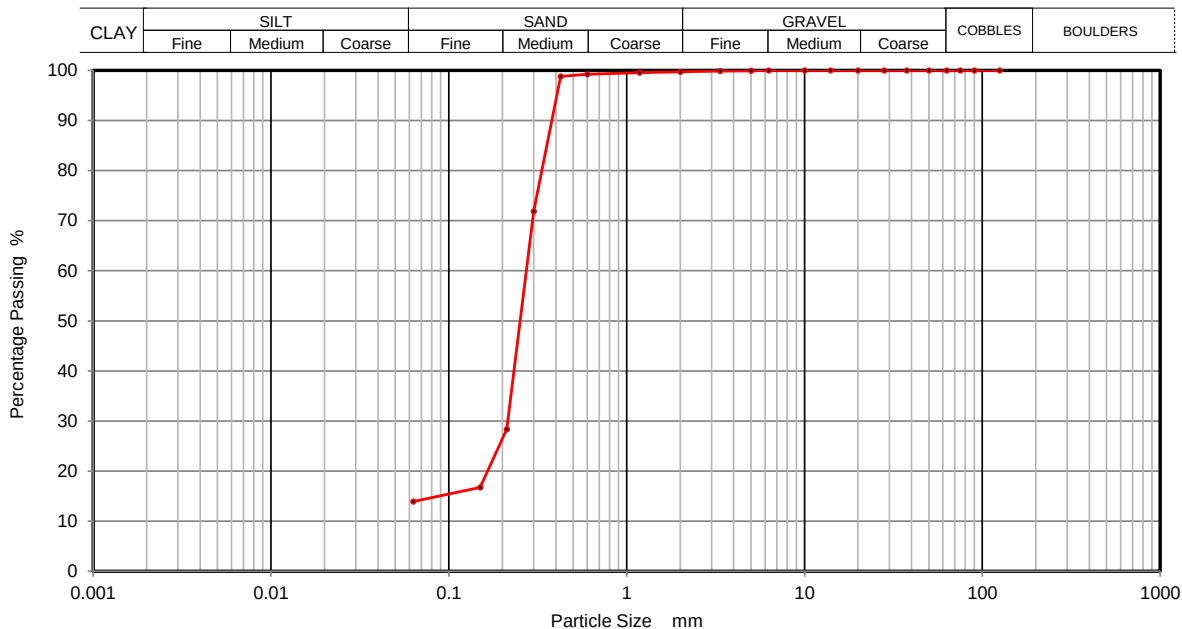
Soil Description **Grey clayey/silty fine to coarse SAND**

Depth Top **4.00**

Depth Base **4.45**

Date Tested **22/01/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	72		
0.212	28		
0.15	17		
0.063	14		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	86
Silt and Clay	14

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operators	Checked	24/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	25/01/2020	Paul Evans	<i>P. Evans</i>





PARTICLE SIZE DISTRIBUTION
BS 1377 Part 2:1990
Wet Sieve, Clause 9.2

Contract Number **47319**

Borehole/Pit No. **BH01**

Site Name **Swansea Bay Technology Park**

Sample No.

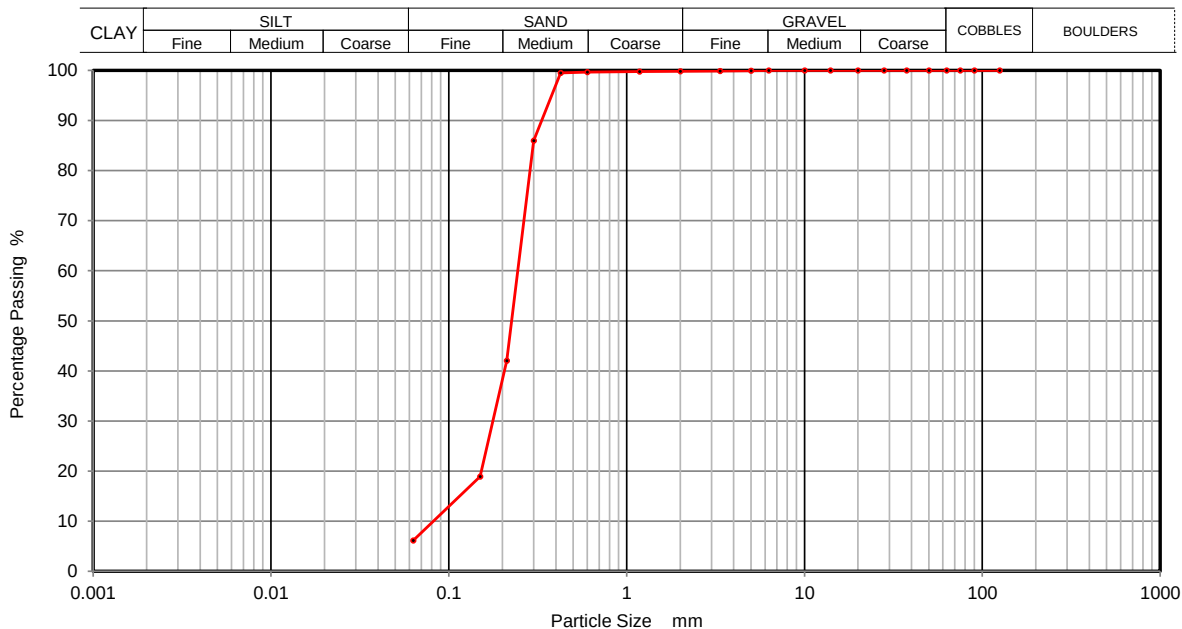
Soil Description **Brown slightly clayey/silty fine to coarse SAND**

Depth Top **8.00**

Depth Base **8.45**

Date Tested **22/01/2020**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	86		
0.212	42		
0.15	19		
0.063	6		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	94
Silt and Clay	6

Remarks

Preparation and testing in accordance with BS1377 unless noted below

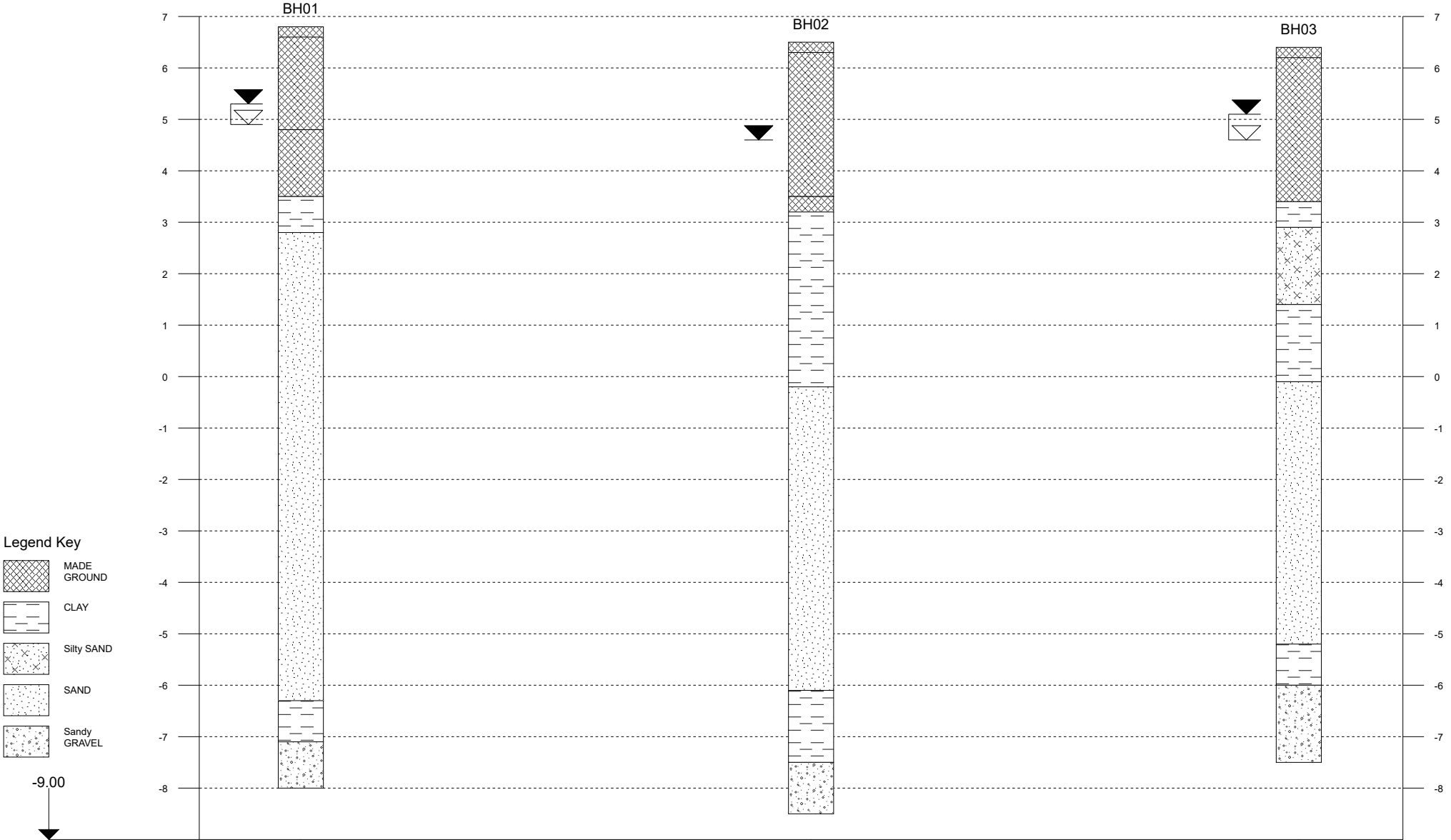
Operators	Checked	24/01/2020	Wayne Honey	<i>W. Honey</i>
RO/MH	Approved	25/01/2020	Paul Evans	<i>DP Evans</i>



ANNEX G
Geological Cross Section

Project Id: 15773
Project Title: Swansea Bay Technology Centre
Location: Baglan
Client: Morgan Sindall Construction & Infrastructure Ltd

Title: Section Line
Vertical Scale: 1:105
Horizontal Scale: 1:179
Engineer: JRW



Chainage (m)	0.00	16.91	33.06
Elevation (mAOD)	6.80	6.50	6.40

ANNEX H
Gas Monitoring Results

In-Situ Gas Monitoring Results

Job Number 15773

Job Name Swansea Bay Technology Centre



Round 1

Date: 24/01/2020

Barometric Pressure: 1021mb

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01	0.0	10.6	0.0	0.0	1.5
BH02	0.0	2.7	0.0	0.0	2.4
BH03	29.6	3.8	0.0	0.0	1.6

Round 2

Date: 04/02/20

Barometric Pressure: 1027mb

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01	0.1	2.3	0.1	0.0	1.63
BH02	0.6	0.8	0.1	0.0	2.33
BH03	35.9	19.1	7.3	7.6	1.5

Notes: VOC recorded BH01 - 0.9ppm, BH02 - 0.6ppm, BH03 - 1.3ppm

Round 3

Date:

Barometric Pressure:

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01					
BH02					
BH03					

Round 4

Date:

Barometric Pressure:

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01					
BH02					
BH03					

In-Situ Gas Monitoring Results

Job Number 15773

Job Name Swansea Bay Technology Centre



Round 5

Date:

Barometric Pressure:

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01					
BH02					
BH03					

Round 6

Date:

Barometric Pressure:

Gas Monitoring Well Number	Methane (CH ₄) (%)	Oxygen (O ₂) (%)	Carbon Dioxide (CO ₂) (%)	Flow (l/hr)	Ground Water Level (m)
BH01					
BH02					
BH03					

DRAWINGS

Project Id: 15773 Title: Site Plan
Project Title: Swansea Bay Technology Centre Scale: 1:1500
Location: Baglan Engineer: JRW
Client: Morgan Sindall Construction & Infrastructure Ltd Contractor:



Legend Key

- Locations By Type - Empty
- ⊕ Locations By Type - CP
- Locations By Type - DCP
- ⊞ Locations By Type - TP

