

Technical Note

Project title	Menai Shellfish (Bangor Beach Rd SPS)
Job number	275282
File reference	4.20
cc	
Prepared by	Vaibhavi Dhananath Wayal
Date	9 June 2025
Subject	Geo-Environmental Technical Note on Ground Investigation

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1. Introduction

Dŵr Cymru Welsh Water (DCWW) are proposing to construct a new revetement to prevent coastal erosion immediately southwest of the Bangor Beach Road Sewage Pumping Station (SPS), located on a short promontory extending from Bangor Promenade onto the foreshore of the Menai Strait in Bangor, Gwynedd. This work forms part of the DCWW Menai Strait – Shellfish Waters Project, which aims to enhance coastal infrastructure and protect water quality in designated shellfish waters. The site location is presented on the Exploratory Hole Location Plan as Figure 1.

Arup conducted a high-level desk study for the Bangor Beach Road Sewage Pumping Station (SPS) [1] site, which concluded there may be risk of contamination, primarily due to the potential to encounter Made Ground within the area during the construction works. Made ground was identified as a potential source of contamination and further investigation was recommended.

The site under investigation does not lie within the Bangor Beach Road SPS site boundary, however, lies in close proximity to it. Given this proximity, the risks identified in the previous study are considered relevant to the current site.

As part of the Menai Strait – Shellfish Waters Project, a ground investigation was undertaken at the current site to assess ground conditions in relation to the proposed wave protection measures. This investigation formed an extension to the previous Bangor Beach Road SPS scope. This included identifying the presence of Made Ground and evaluating any associated risks to construction workers.

In addition, given the location of the site which lies adjoining the Menai Strait, a controlled waters risk assessment was conducted to assess any risk posed to the surface waters from mobile contamination present in the potential Made Ground.

The objectives of the investigation were to:

- Gather data on the ground and groundwater conditions at the site
- Examine the structure of a concrete wall located beneath a brick dwarf wall.
- Obtain samples of site soils for chemical analysis to inform risk to construction workers and controlled waters.

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2 No. trial pits were excavated by Alun Griffiths (Contractors) Limited to depths of 1.02 m (TP1) and 1.40 m (TP2) below ground level on 25th February 2025, using a wheeled excavator and hand tools. The works were supervised on site by a geotechnical/geo-environmental engineer to assess ground conditions and collect samples for geotechnical and chemical analysis. The locations of the trial pits are shown on Figure 1.

This high level geo-environmental contamination assessment report details the findings of the trial pits and chemical laboratory data and provides an assessment as to the risk the site soils present to human health and the environment, as well as providing guidance on the potential re-use or offsite disposal of the soils.

2. Encountered Ground Conditions

The ground conditions encountered within the 2No trial pits are summarised in the below table, with the logs of the pits included within Appendix A.

Table 1: Encountered ground conditions

Strata	Strata Description	Thickness (m)	Depth to top (m bgl)	Depth to top (m OD)
Made Ground (Surface Layer)	Grey block paving, red brick wall (SE end), grey concrete wall	0.00 – 0.30 (brick), 0.30 – 1.02 (concrete)	0 – 0.70	5.25 – 5.18
Made Ground (Bedding Sand)	Yellowish brown fine to medium sand	~ 0.60	0.70 – 0.10	5.18 – 5.15
Made Ground (Gravel Fill)	Purplish grey sandy slightly silty angular gravel with slate and brick fragments	0.15 – 1.02 (TP1), 0.50 – 1.40 (TP2)	0.15 – 1.02	5.10 – 4.23
Note: All strata encountered were classified as Made Ground. No natural deposits were reached within the maximum depth of 1.40 m.				

A 100 mm diameter horizontal core was drilled at 0.80 m depth within Trial Pit TP1 to confirm the thickness of the existing concrete wall structure. The concrete wall was identified to be 220mm thick.

Although no natural ground was encountered during the ground investigation in either of the trial pits at maximum depths of 1.02m and 1.40m bgl, it is expected based on the review of nearby BGS boreholes located at a distance of 9.47m (SH57SE261) south and 30.5m (SH57SE262) west of TP02 that the made ground is underlain by natural ground which consists of stiff to very stiff grey and brown gravelly, sandy, very silty clay with occasional organic inclusions.

Groundwater was not encountered within either trial pits.

3. Human Health Risk Assessment

3.1 Conceptual Site Model

Given the development proposals it is not considered that there are any plausible pathways by which end site users will be at risk from contamination present in the site soils. On this basis they have been excluded from

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further assessment. The following Conceptual Site Model presents the potential source, pathway, receptor linkages relevant for the assessment of risk to construction workers only.

3.1.1 Sources

While no visual or olfactory evidence of contamination was identified within the made ground materials encountered on site, there remains potential that the materials may contain contaminants that may pose a risk to construction workers involved in the proposed works.

3.1.2 Pathways

On the basis of the development proposals the following pathways are deemed relevant to construction workers:

- Direct soil and dust ingestion;
- Dermal exposure;
- Inhalation of particulates/fibres;
- Inhalation of soil vapour.

Development proposals include construction of a new revetment to prevent coastal erosion to the southwest, it is not considered to introduce and as such only pathway to end site users is outdoor inhalation of vapours. Upon completion of the works, there are no end users anticipated for the site. However, during the construction phase the construction workers involved in the works may be exposed to the potential contamination present within the sub surface.

On this basis, it is considered that there will only be a pathway to human health receptors i.e. construction workers during the construction phase when exposing the site soils, through the above-mentioned pathways.

3.1.3 Receptors

Construction Phase: The primary human health receptor during the construction phase will be construction workers involved in the works, notably during any excavations into the site soils.

Site neighbours comprising residents of the nearby buildings may also be exposed to contamination within site soils should dust be generated as part of the works.

3.2 Tier 1 Soils Screen

3.2.1 Methodology

The available chemical data has been screened against the relevant published Generic Assessment Criteria (GACs). The following assessment criteria/scenarios have been considered for the assessment:

- **Residential without Plant Uptake:**
 - Risk to construction workers (in the absence of acute-term exposure GACs) – ‘construction phase’; and
 - Reuse of materials within the scheme based on the low sensitivity of the development proposals.

Laboratory testing was carried out on a total of three Made Ground soil samples and six leachate samples. Two samples were collected from Trial Pit TP01 at depths of 0.10–0.70 m bgl and 1.00 m bgl, while one sample was obtained from Trial Pit TP02 over the depth range of 0.50–1.40 m bgl. The analytical results have been assessed against the relevant screening criteria, as outlined in the preceding sections, and are presented in Appendix B.

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3.2.2 Results

The results of the Tier 1 Screen are summarised below:

- Asbestos was not detected within any of the samples;
- No exceedances of the applied GACs were recorded for heavy metals, BTEX, Petroleum Hydrocarbons, VOCs, SVOCs or PCBs;

3.2.3 Discussion and Recommendations

As no exceedances against the applied criteria for residential plant no uptake were identified for the GACs for any of the determinants including heavy metals, BTEX, Petroleum Hydrocarbons, VOCs, SVOCs, there is not considered to be a risk to human health receptors i.e. construction workers and maintenance workers.

While the results of the soil analysis have indicated a low risk to construction workers from contamination within the made ground soils on the site due to the inherent variability of made ground there remains a possibility that soils may be encountered that contain contaminants that could pose a risk. This includes the potential for asbestos given that the made ground soils appear to include some potential demolition materials and materials of anthropogenic origin, particularly given the historic prevalence of asbestos in construction.

On the above basis the Contractor involved in the works should adopt the following minimum requirements:

- Undertake health and safety risk assessments based on available information to ensure potential risks to workers are controlled and mitigated appropriately
- Provision of welfare facilities allowing for hands and face washing and application of appropriate PPE.
- Dust suppression measures should also be implemented where a risk of dust generation is identified.
- Management of arisings in an appropriate manner (e.g., plastic sheeting base and covered, and away from residential properties) in order to avoid creation of dust, leaching and surface run off.

Should materials different in nature to those encountered in the ground investigation or unforeseen contamination be encountered during the scheme construction the following is recommended:

- Works are halted;
- The encountered contamination is assessed by a suitably qualified and experienced person;
- Suitable risk assessments are undertaken by the contractor to confirm the level of PPE required for site operatives;
- Materials exhibiting evidence of contamination are separated from other arisings and placed on plastic sheeting (for further sampling and analysis);
- In the case of asbestos, a specialist asbestos contractor should be consulted in order to confirm the appropriate management and associated mitigation measures of any asbestos impacted materials or ACM should these be encountered.

4. Controlled Waters Risk Assessment

The following controlled waters assessment presents an assessment of the risk to controlled waters from this material, particularly in respect to its re-use within the scheme.

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4.1 Hydrogeological conceptual model

The Nant Ffrancon Siltstone bedrock aquifer at the site is classified as Secondary B which underlies the Coastal Zone Deposits. The Coastal Zone Deposits are anticipated to comprise stiff to very stiff grey and brown gravelly, sandy, very silty clay with occasional organic inclusions ([2]). Given the geological sequence comprises typically low permeability soils the potential for downward migration of leachable contaminants into the underlying aquifer is considered to be low. . During the construction works, site soils may be exposed to infiltration but since this is only likely to be for a short duration and given the low permeability of the underlying strata this is considered to present a low risk to the underlying aquifer.

The site does not lie within or in close proximity of a Source Protection Zone (SPZ).

The Menai Strait is located to the adjacent north and south of the site. Given the proximity to the scheme and the relative low sensitivity of the underlying aquifer this surface water feature is considered to be the primary controlled waters receptors. It is considered that the primary pathway in relation to this controlled waters receptor would be interaction of the site soils with the adjacent sea water in the Menai Strait and potential leaching of contaminants. On this basis, an assessment of the leachability of potential contaminants has been undertaken utilising Saltwater Environmental Quality Standards (S-EQS).

4.2 Tier 1 Leachate Screen

4.2.1 Methodology

All 3No soil samples were subject to 2:1 leachate analysis as part of the Waste Assessment Criteria laboratory testing.

A Tier 1 Leachate screen has been undertaken and the results screened against Saltwater Environmental Quality Standards – (S-EQS), on account of the primary controlled waters receptor, to ascertain the soil quality and subsequent risks of these materials to controlled waters (in the context of material reuse).

Some of the S-EQS are dependent on the bioavailability of certain contaminants (nickel, zinc, copper, and lead) which is based on chemical nature of the receiving waters. Since the chemical nature of the sea water has not been determined a conservative approach has been undertaken using un-corrected S-EQS.

4.2.2 Results

The results from the leachate analysis of the Made Ground soils are summarised below:

- Leachable copper and zinc exceeded the SEQS in all three samples;
- All other leachable heavy metals fell below the screening criteria;

The exceedances are summarised in the below table.

Table 2: Leachable contaminant exceedances of the FEQS

Exceeded Analyte (ug/l)	Screening criteria SEQS	TP01 0.07-0.10m	TP01 1.00m	TP02 0.50-1.40
Leachable copper	3.76	12	6	7.1
Leachable zinc	7.9	62.0	46	37

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4.2.3 Discussion

Minor heavy metal exceedances of the SEQS have been recorded, it is anticipated that these are derived from the general constituents of the made ground soils. However, the concentrations of leachable contaminants encountered are not considered indicative of significant contamination that would present a significant risk to the identified receptor. In addition, the exceedances are for substances that would have modified S-EQS values following a bioavailability assessment and as the assessment is likely to be overly conservative. On the basis of the results of leachate analysis it is considered that the materials do not present a risk to controlled waters.

4.3 Further recommendations

Based on the findings of the controlled waters leachate it is evident that the Made contains some isolated elevated levels of heavy metals. It is however considered that the leachable and dissolve concentrations recorded are not posing an ongoing risk to the offsite surface waters within the saline Menai Strait.

The Contractor should ensure that the works do not negatively impact the quality of adjacent watercourses. Surface water will require management during construction to limit the potential for infiltration whilst site soils are exposed in excavations. This should be done by following best practice guidelines as shown in the Guidance for Pollution Prevention (GPPs).

5. Material Reuse

The assessment undertaken to evaluate the potential risks associated with Made Ground materials in relation to human health particularly the construction workers involved in the construction phase and controlled waters, and to determine their suitability for reuse within the proposed scheme. Based on the human health risk assessment there is minimal risk to construction workers, and any risk posed should be mitigated by the contractor by implementation of mitigation measures outlined in Section 3.2.3. to manage potential exposure during excavation and handling activities.

From a human health perspective, the Made Ground materials are considered suitable for reuse within the scheme. The contamination levels observed were generally low, with no significant volatile risks identified. Furthermore, the assessment applied conservative criteria—specifically, residential without plant uptake—which likely overestimate potential risks, thereby reinforcing the conclusion of suitability.

In terms of environmental protection, the materials are also deemed suitable for reuse with respect to controlled waters. Although some leachable metals were detected, their concentrations were generally low. Additionally, the exceedances identified relate to substances that would likely have modified Soil Environmental Quality Standards (S-EQS) values following a bioavailability assessment. As such, the current assessment is likely conservative. The only plausible pathway for contaminant migration would be through leachate generation and lateral migration. However, this is considered highly unlikely due to the presence of capping and the anticipated low permeability of the underlying strata. Based on the results of leachate analysis, the materials do not pose a risk to controlled waters and are therefore considered suitable for reuse within the scheme.

Additional precautions are advised: any materials that exhibit visual or olfactory evidence of contamination, including suspected Asbestos Containing Materials (ACMs) or tarmac, should be tested to confirm their suitability prior to reuse or off-site disposal.

It is understood that reuse of site soils at the site is considered preferable and considerations on the potential re-use of site-won materials are provided below

- The soils need to be below hardstanding or a clean capping of surface soils.

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- Made ground from within the site is considered suitable for re-use on site within the proposed development.
- Materials exhibiting visual and/or olfactory evidence of contamination (including suspected ACM) are not considered suitable for re-use.

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Figures

Figure 1 – Exploratory Hole Location Plan

Appendices

Appendix A – Trial Pit Logs

Appendix B – Chemical Screening Tables

Appendix C – Factual Report

DOCUMENT CHECKING

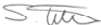
	Prepared by	Checked by	Approved by
Name	Vaibhavi Wayal	Stuart Tillet	Anna Grieve
Signature			

Figure 1 - Exploratory Hole Location Plan



Maxar, Microsoft

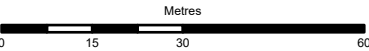
Legend

-  Tidal Flat Deposits
-  Made Ground
-  Coastal Zone Deposits
-  Exploratory Hole Location

P0	02/06/2025	VW	ST	AG
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Issue	Date	By	Chkd	Appd
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Signed



ARUP

Client
DCWW

Job Title
Menai Bangor Beach Road SPS

Exploratory Hole Location Plan

Scale at A3
1:800

Job No 275467	Drawing Status Preliminary
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Drawing No 001	Issue P0
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Appendix A - Trial Pit Logs

TRIAL PIT RECORD - Trial pit/trench

Project	Menai Shellfish (Bangor Beach Road SPS)	Engineer	Ove Arup & Partners Limited	Project No.	PN254711
Client	Alun Griffiths (Contractors) Limited	National Grid Coordinates	258646.3 E 372891.4 N	Location ID	TP1
				Ground Level	5.25 m OD

Samples and Tests				Strata		Scale 1:10	
Depth	Sample Type	Stratum No.	Results	Description	Depth	Legend	Level (m OD)
0.07 - 0.10	D			MADE GROUND: Grey block paving.	0.07		5.18
0.07 - 0.10	ES			Between 0.00-0.30m in SE end of pit, Red BRICK WALL (Extending 0.50m above ground level).	0.10		5.15
0.15 - 1.02	B			Between 0.30-1.02m in SE end of pit, Grey CONCRETE WALL (Base not proven in TP1).	0.15		5.10
				MADE GROUND: Yellowish brown fine to medium sand (Bedding sand).			
				MADE GROUND: Grey concrete.			
				MADE GROUND: Purplish grey sandy slightly silty angular fine to coarse gravel of slate and brick fragments.			
0.30	ES						
0.60	ES						
0.80	CONCC			At 0.80m depth. Celtest Limited drilled a 100mm diameter horizontal concrete core 220mm into exposed concrete wall. Concrete wall proven to be 220mm thick.			
1.00	ES				1.02		4.23
				End of Excavation			

Excavation				Groundwater			
Plant	4WD Excavator.	Width (B)	0.95	Depth Observed	Depth of Pit	Rose to	in Mins
Date	25/02/2025	Length (C)	2.00				
Shoring	None.	Date Backfilled					
Stability	Stable during excavation.						

Remarks	AGS Trial Pit TP1 excavated to 1.02m by Alun Griffiths (Contractors) Limited using a 4WD Excavator and hand tools. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1 litre plastic tub. At 0.80m depth. Celtest Limited drilled a 100mm diameter horizontal concrete core 220mm into exposed concrete wall. Concrete wall proven to be 220mm thick. The pit was backfilled and reinstated by Alun Griffiths (Contractors) Limited on completion. REFER TO PLAN AND CROSS SECTION DRAWINGS. Logged in accordance with BS5930:2015 + A1:2020 Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres. Logged by CE Checked by JK Figure Sheet 1 of 1 11/04/2025
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GEOTECHNICS

[illegible]

Appendix B - Chemical Screening Tables

Summary of Chemical Analysis

Menai Soil Screening						
Lab No Sample ID Depth Sample Type Sampling Date				2474129	2474130	2474131
				TP1	TP1	TP2
				0.07-0.10	1.00	0.50-1.40
				ES	ES	ES
				25/02/2025	25/02/2025	25/02/2025
Test	Screening criteria residential w/o PU	LOD	Units	Results		
Preparation						
Moisture Content		0.1	%	11	3.2	3.6
Metals						
Antimony	618	1	mg/kg	1.5	1.5	1.5
Arsenic	40	0.2	mg/kg	13	7.4	7.1
Beryllium	1.7	0.2	mg/kg	0.4	0.2	< 0.2
Boron, Water Soluble (2.5:1)	10775	0.2	mg/kg	0.4	< 0.2	< 0.2
Cadmium	85	0.1	mg/kg	0.1	< 0.1	< 0.1
Chromium	907	0.15	mg/kg	17	26	21
Chromium, Hexavalent	6	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	7130	0.2	mg/kg	29	100	34
Lead	310	0.3	mg/kg	19	8.2	7.4
Mercury	56	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	181	1	mg/kg	17	25	22
Selenium	430	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	1200	0.8	mg/kg	23	39	32
Zinc	40400	1	mg/kg	160	80	75
Inorganics						
Loss on Ignition at 440oC		0.01	%	1.4	0.27	0.28
pH			pH	8.9	9.6	9.4
Cyanide, Total		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Total Organic Carbon		0.5	%	< 0.5	< 0.5	< 0.5
Petroleum Hydrocarbons						
Aliphatic C5-C6	42.4	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	103.6	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	26.8	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12 Cleanup	132	1.5	mg/kg	23.88	73.83	56.80
Aliphatic >EC12-EC16 Cleanup	1061	1.2	mg/kg	18.25	57.30	10.58
Aliphatic >EC16-EC21 Cleanup	11925	1.5	mg/kg	3.00	11.03	2.69
Aliphatic >EC21-EC35 Cleanup	11925	3.4	mg/kg	< 3.40	8.23	< 3.40
Aliphatic >EC35-EC40 Cleanup	11925	3.4	mg/kg	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44 Cleanup	11925	3.4	mg/kg	< 3.40	< 3.40	< 3.40
Aromatic >EC10-EC12 Cleanup	250	0.9	mg/kg	58.85	53.51	12.26
Aromatic >EC12-EC16 Cleanup	1800	0.5	mg/kg	61.34	60.08	13.23
Aromatic >EC16-EC21 Cleanup	1400	0.6	mg/kg	6.95	35.86	1.80
Aromatic >EC21-EC35 Cleanup	1930	1.4	mg/kg	253.3	299.5	68.64
PCBs						
PCB 77		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 81		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 105		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 114		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 118		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 123		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 126		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 156		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 157		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 167		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 169		0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 189		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Phenols						
Phenol - Monohydric		0.3	mg/kg	< 0.3	< 0.3	< 0.3

Menai Soil Screening						
Lab No				2474129	2474130	2474131
Sample ID				TP1	TP1	TP2
Depth				0.07-0.10	1.00	0.50-1.40
Sample Type				ES	ES	ES
Sampling Date				25/02/2025	25/02/2025	25/02/2025
Test	Screening criteria residential w/o PU	LOD	Units	Results		
VOCs						
Vinyl Chloride		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromochloromethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
sec-butylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
Naphthalene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene		0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE		0.01	mg/kg	< 0.01	< 0.01	< 0.01
SVOCs						
Phenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aniline		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzyl Alcohol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylphenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether		0.1	mg/kg	< 0.1	< 0.1	< 0.1
3&4-Methylphenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Nitroaniline		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene		0.1	mg/kg	< 0.1	< 0.1	< 0.1

Menai Soil Screening						
Lab No				2474129	2474130	2474131
Sample ID				TP1	TP1	TP2
Depth				0.07-0.10	1.00	0.50-1.40
Sample Type				ES	ES	ES
Sampling Date				25/02/2025	25/02/2025	25/02/2025
Test	Screening criteria residential w/o PU	LOD	Units	Results		
Acenaphthylene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
3-Nitroaniline		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitrophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzofuran		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diethylphthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitroaniline		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine		0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(123cd)pyrene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(ah)anthracene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dimethylphthalate		0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Azobenzene		0.1	mg/kg	< 0.1	< 0.1	< 0.1
Carbazole		0.1	mg/kg	< 0.1	< 0.1	< 0.1

Leachate Screen 2:1					
Sample id			TP1	TP1	TP2
Depth (m)			0.07-0.12	1.02	0.50-1.42
Date sampled			14/03/2025	14/03/2025	14/03/2025
Test	Screening Criteria FEQS	Unit	Results		
Arsenic as As	25	ug/l	4.1	18	22
Barium as Ba	no gac	ug/l	71	86	92
Cadmium as Cd	0.2	ug/l	< 0.030	< 0.030	< 0.030
Chromium as Cr	4.7	ug/l	0.81	1.3	0.92
Copper as Cu	3.76	ug/l	12	6	7.1
Mercury as Hg	no gac	ug/l	< 0.010	< 0.010	< 0.010
Molybdenum as Mo	no gac	ug/l	< 1.1	< 1.1	1.3
Nickel as Ni	8.6	ug/l	1.1	0.84	0.58
Lead as Pb	1.3	ug/l	0.57	0.31	0.095
Antimony as Sb	no gac	ug/l	0.82	0.67	1.4
Selenium as Se	no gac	ug/l	0.3	< 0.25	< 0.25
Zinc as Zn	7.9	ug/l	62	46	37
Chloride as Cl	no gac	ug/l	7000	12000	8400
Fluoride as F	no gac	ug/l	110	130	140
Sulphate as SO4	no gac	ug/l	7600	6100	5700
Total Dissolved Solids	no gac	ug/l	100000	88000	84000
Phenol Index	no gac	µg/l	< 100	< 100	< 100
Dissolved Organic Carbon	no gac	ug/l	4200	3000	5000
pH	6-9	units	8.6	8.3	8.1

Appendix C - Factual Report



GEOTECHNICS

BUILD ON CONFIDENCE

MENAI SHELLFISH [BANGOR BEACH ROAD SPS]

Project No: PN254711

Client: Alun Griffiths [Contractors]
Limited

Engineer: Ove Arup & Partners
Limited

Date: April 2025

Factual Report

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1.0 INTRODUCTION

A geotechnical and geo-environmental investigation was undertaken by Geotechnics Limited at the site of a proposed new wave protection wall immediately southwest of Bangor Beach Road Sewage Pumping Station (SPS) on a short promontory jutting out from Bangor Promenade onto the foreshore of the Menai Strait in Bangor, Gwynedd. (This work forms part of the Welsh Water Menai Strait – Shellfish Waters Project).

The investigation was carried out to the instructions of the Engineer, Over Arup & Partners Limited, acting on behalf of the Client, Alun Griffiths (Contractors) Limited. This report describes the work undertaken and presents the data obtained.

2.0 OBJECT AND SCOPE OF THE INVESTIGATION

The object of the investigation was to obtain information on the ground and groundwater conditions at the site and to investigate the structure of the existing concrete wall which lies below a brick dwarf wall. This was undertaken within the limitations posed by exploratory hole numbers, locations, depths and methods adopted. The investigation comprised trial pits (machine-excavated by the Client) to expose the existing wall, along with concrete coring to determine the thickness of the concrete wall. A Factual Report was also commissioned.

3.0 PRESENTATION

A description of the site and a summary of the procedures followed during the investigation process are presented in Sections 4 to 6. The factual data so obtained are presented in Appendices 2 to 7 of this report. Attention is drawn to the General Notes and Investigation Procedures presented in Appendix 8 to aid an understanding of the procedures followed and the context in which the report should be read.

In addition, data in electronic format in accordance with "The Electronic Transfer of Geotechnical Data from Ground Investigations" published by the AGS (the AGS Format) are presented together with a copy of the report in electronic PDF format.

4.0 THE SITE

4.1 Location

The site lies immediately southwest of Bangor Beach Road Sewage Pumping Station (SPS) on a short promontory jutting out from Bangor Promenade onto the foreshore of the Menai Strait. The site lies approximately 1 kilometre northeast of Bangor Bus Station.

The approximate Ordnance Survey National Grid Reference for the site is SH 586 728 and an extract from the relevant 1:50,000 Scale O.S. Map (Sheet No. 115) is included in Appendix 1.

4.2 Description

The site occupies a level, block-paved footpath linking the Banor Beach Road SPS to Bangor Promenade, to the northeast of the Beach Road West Car Park, off the western site of Y Bae and north of the A5 Beach Road. The existing wall under investigation lies along the eastern side of the footpath, below which lies the foreshore.

Photographs of the site taken on 25th February 2025 are presented in Appendix 2.

4.3 Site Geology

The British Geological Survey Onshore GeoIndex website, <https://mapapps2.bgs.ac.uk/geoindex/home.html>, accessed on 10th April 2025, shows the site to be underlain by Artificial Deposits (Made Ground) overlying Coastal Zone Deposits (Undifferentiated) comprising sand, silt and clay. The Coastal Zone Deposits are shown to extend out beneath the foreshore of the Menai Strait to the northeast of the site.

Inland, to the southwest of the site, Tidal Flat Deposits of clay and silt are indicated whereas to the northwest and southeast of the site areas of Glacial Till – Diamicton of Devensian age are shown.

The superficial deposits at the site are to overlie solid strata of the Nant Ffrancon Subgroup of comprising siltstone of Ordovician age.

The BGS Lexicon of Named Rock Units,

<https://webapps.bgs.ac.uk/lexicon/lexicon.cfm?pub=NFR>

accessed on 10th April 2025, records that the Nant Ffrancon Subgroup is described as follows:

"Mudstones, silty mudstones and sandstones; bioturbated, finely laminated, graptolitic: some volcanic units named as formations. Note that most of the Subgroup is not divided into formations. The named volcanic formations "float" within the undivided sedimentary Subgroup".

To the northeast of the site, out into the Menai Strait, the strata is described as Cambrian and Ordovician Rocks (Undifferentiated) of mudstone, siltstone and sandstone.

The 1:50,000 scale British Geological Survey Solid Edition geological map (Sheet 106) dated 1985 shows no faults in the immediate vicinity of the site.

A previous BGS Borehole Record is shown adjacent to the site, on Bangor Promenade. This relates to BGS Reference No. SH57SE261 (Hirael Ground Investigation BH4) at National Grid Ref: 258641.1mE, 372881.5mN, at an elevation of 5.44. It was sunk to 12.20m below ground level by GeoAssist Limited in 2021 and shows Made Ground comprised of silty sandy gravel with various inclusions extending to 5.10m depth, below which soft sandy silty clay (Coastal Zone Deposits) was revealed. Here, groundwater was struck at 3.00m below ground level.

It is understood that the adjacent King George's Field, the football pitch to the south of the site, previously formed part of an industrial area, and up to 1998 was used as a landfill site for the disposal of both household and industrial waste. It is understood that this field has been used as a recreation ground since 1929.

4.4 Hydrogeology

The 1:625,000 scale Hydrogeological Map of England and Wales, published by the British Geological Survey, dated 1977 shows the underlying Ordovician strata to be an impermeable rock where groundwater is only likely to exist at shallow depth.

The Government's DEFRA Magic Map website, <https://magic.defra.gov.uk/MagicMap.aspx>, accessed on 10th April 2025,

shows the underlying rocks of the Nant Ffrancon Subgroup to be classed as a Secondary B Aquifer.

5.0 PROCEDURE

5.1 Commissioning

The work was awarded following submission of a tender for work designed by the Engineer for ground investigation of the site in accordance with the Client's requirements.

5.2 General

The procedures followed in this site investigation are based on *BS 5930: 2015+A1:2020 – Code of Practice for Site Investigations*. The soils and rocks encountered have been described in accordance with BS5930:2015+A1:2020 and BS EN ISO 14688-1:2018 and BS EN ISO 14689:2018. The Exploratory Hole locations were specified by the Client and their positions are shown on the Exploratory Hole Location Plan in Appendix 7.

The co-ordinates and levels shown on the exploratory hole records were provided by the Client. The depths quoted on the Trial Pit Records and Cross Section Drawings are in metres below ground level.

5.3 Trial Pits and Horizontal Concrete Core

Two (2 No.) Trial Pits were excavated by Alun Griffiths (Contractors) Limited, using a wheeled excavator and hand tools, to depths of 1.02m (TP1) and 1.40m (TP2) below ground level on 25th February 2025. This work was supervised on site by a geotechnical / geo-environmental engineer.

The profiles of strata or other features were recorded as excavation proceeded and measurements taken from ground level. Representative samples were taken, where appropriate, for laboratory examination and analysis, and in addition, Environmental Soil (ES) samples were recovered at the depths indicated on the Trial Pit Records, presented in Appendix 3. Soil samples taken specifically for chemical analyses were contained within appropriate receptacles and stored alongside ice packs in a cool box to preclude any sample deterioration prior to delivery to the testing laboratory.

Groundwater observations and trench stability notes are included on the Trial Pit Records.

At 0.80m depth in Trial Pit TP1, a 100mm diameter horizontal cored hole was drilled to determine the thickness of the existing concrete wall.

Photographs of the trial pits excavated, and the concrete core recovered during the investigation are presented in Appendix 4.

The trial pits were backfilled and reinstated by Alun Griffiths (Contractors) Limited.

5.4 Installations and Monitoring

No installations or monitoring were commissioned by the Client.

6.0 LABORATORY TESTING

6.1 Geotechnical

The laboratory testing schedule was specified by the Engineer. Unless otherwise stated, the tests were carried out in Professional Soils Laboratory Limited's UKAS accredited Laboratory (Testing No. 4043) and were undertaken in accordance with the appropriate Standards as indicated below and on the Laboratory Test Certificate in Appendix 5. Any descriptions, opinions and interpretations are outside the scope of UKAS accreditation.

The tests undertaken can be summarised as follows:-

Standard	Test Description	Quantity
BS EN ISO 17892-3:2015	Particle Density Determination	1
BS EN ISO 17892-4:2016	Particle Size Distribution Determination – Sieving Method	3
BS 1377:1990 Part 4: 3.3	Dry Density/Moisture Content relationship determination. Compaction Test - British Standard (2.5 kg Hammer)	1

The following testing was carried out at the laboratories of NORMEC DETS Limited (UKAS Laboratory No. 2139).

Test Description	Quantity
BRE Special Digest 1 Suite D comprising:- Soluble Sulphate Acid Soluble Sulphate Total Sulphur Soluble Magnesium Ammonium Nitrate Chloride pH	2

The geotechnical test results are presented in Appendix 5.

6.2 Contamination

Selected samples of soil were tested at the laboratories of NORMEC DETS Limited (UKAS Laboratory No. 2139) for a number of determinands in order to check on potential site contamination. The determinands were specified by the Client and are detailed on the results sheets in Appendix 6, together with the test result as well as the test method, accreditation and detection limit.

Signed for and on behalf of Geotechnics Limited.

Prepared by:

John Knowles,
BSc (Hons), PGCE, MSc, C.Geol, FGS
UK Registered Ground Engineering Adviser (RoGEP)
Principal Engineer

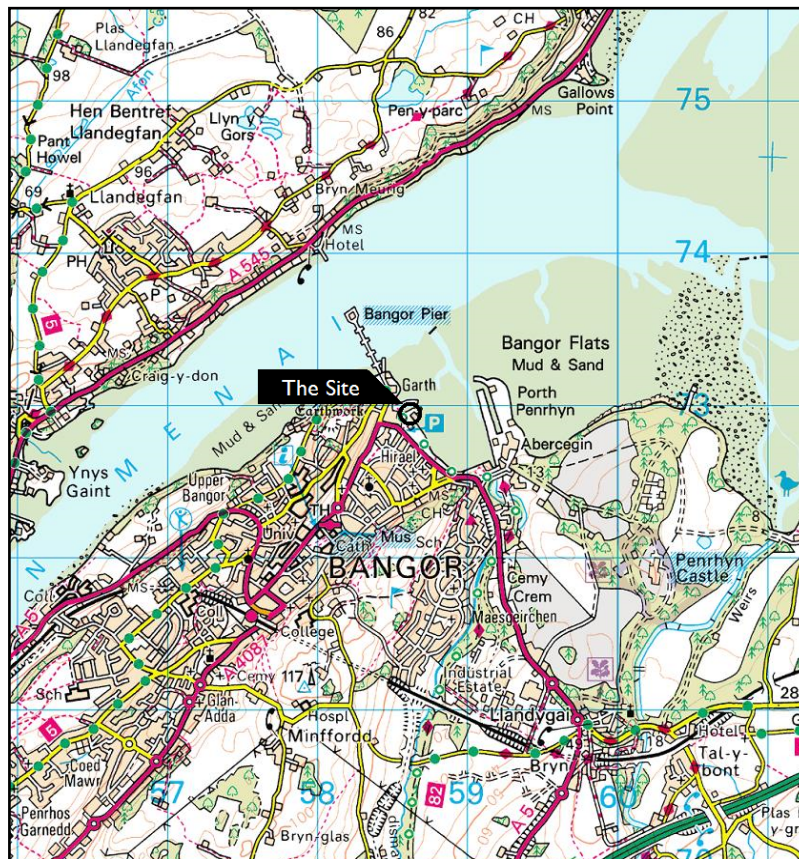
Reviewed by:

Jeremy Jones,
BSc (Hons), EurGeol, C.Geol, FGS
Principal Engineer

APPENDIX 1

Site Location Plan

Site Location Plan



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APPENDIX 2

**Site Photographs
[Taken 25th February 2025]**

1] Location of Trial Pit TP1 [looking NE towards Pumping Station]



2] Location of Trial Pit TP1 [looking SW] with Trial Pit TP2 beyond



3] Location of Trial Pit TP2 [looking NE towards TP1 and Pumping Station]



APPENDIX 3

Trial Pit Records

DATA SHEET - Symbols and Abbreviations used on Records



Sample Types

B	Bulk disturbed sample
BLK	Block sample
C	Core sample
D	Small disturbed sample (tub/jar)
E	Environmental test sample
ES	Environmental soil sample
EW	Environmental water sample
G	Gas sample
L	Liner sample
LB	Large bulk disturbed sample
P	Piston sample (PF - failed P sample)
TW	Thin walled push in sample
U	Open Tube - 102mm diameter with blows to take sample. (UF - failed U sample)
UT	Thin wall open drive tube sampler - 102mm diameter with blows to take sample. (UTF - failed UT sample)
V	Vial sample
W	Water sample
#	Sample Not Recovered

Insitu Testing / Properties

CBRP	CBR using TRL probe
CHP	Constant Head Permeability Test
COND	Electrical conductivity
TC	Thermal Conductivity
TR	Thermal Resistivity
HV	Strength from Hand Vane
ICBR	CBR Test
IDEN	Density Test
IRES	Resistivity Test
MEX	CBR using Mexecon Probe Test
PKR	Packer Permeability Test
PLT	Plate Load Test
PP	Strength from Pocket Penetrometer
Temp	Temperature
VHP	Variable Head Permeability Test
VN	Strength from Insitu Vane
w%	Water content
(All other strengths from undrained triaxial testing)	
S	Standard Penetration Test (SPT)
C	SPT with cone
N	SPT Result
-/-	Blows/penetration (mm) after seating drive
-*/- (mm)	Total blows/penetration
()	Extrapolated value

Groundwater

Water Strike	
Depth Water Rose To	

Instrumentation

Seal

Filter

Seal

Strata

Made Ground Granular

Made Ground Cohesive

Topsoil

Cobbles and Boulders

Gravel

Sand

Silt

Clay

Peat

Note: Composite soil types shown by combined symbols

Chalk

Limestone

Sandstone

Coal

Strata, Continued

Mudstone

Siltstone

Metamorphic Rock

Fine Grained

Medium Grained

Coarse Grained

Igneous Rock

Fine Grained

Medium Grained

Coarse Grained

Backfill Materials

Arisings

Bentonite

Concrete

Sand

Grout

Gravel

Asphalt/Tarmacadam

Rotary Core

RQD Rock Quality Designation (% of intact core >100mm)

FRACTURE INDEX

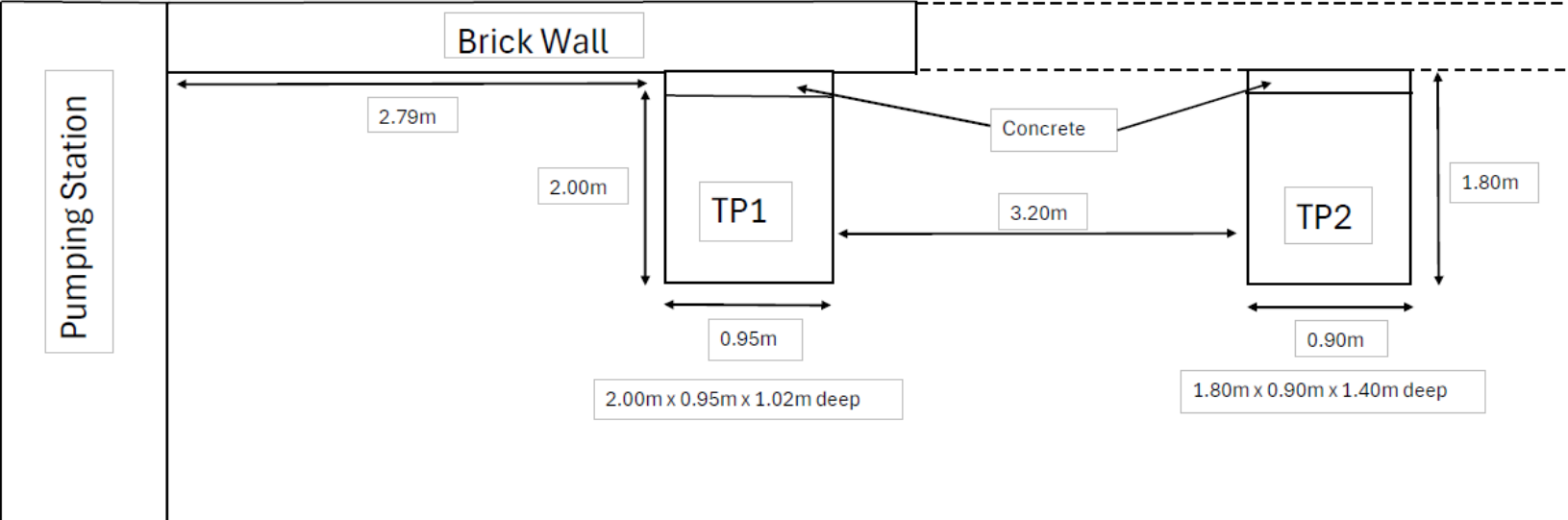
Fractures/metre

NI Non-intact core

NR No core recovery

AZCL Assumed zone of core loss

Plan View



NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

Alun Griffiths (Contractors) Limited

Project:

Menai Shellfish (Bangor Beach Road SPS)

Project No: PN254711

Title:

Trial Pits TP1 and TP2

View: Plan

Date Excavated: 25/02/2025

Drawn by: CE

Date Drawn: 26/02/2025

Contact: CEdwards@geotechnics.co.uk



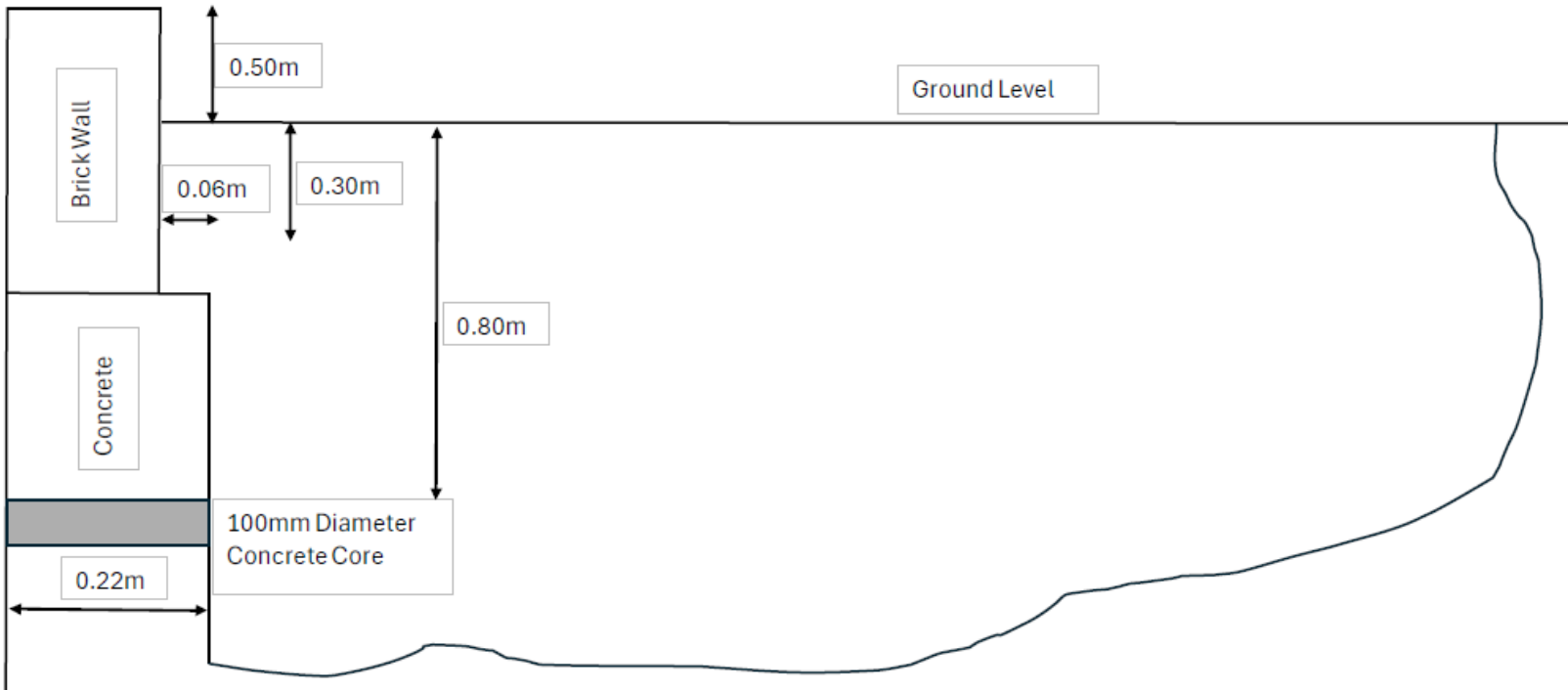
The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel:

Nº

Project	Menai Shellfish (Bangor Beach Road SPS)						Engineer	Ove Arup & Partners Limited	Project No.	PN254711			
Client	Alun Griffiths (Contractors) Limited						National Grid Coordinates	258646.3 E 372891.4 N	Location ID	TP1			
									Ground Level	5.25 m OD			
Samples and Tests							Strata					Scale 1:10	
Depth	Sample Type	Stratum No.	Results	Description				Depth	Legend		Level (m OD)		
0.07 - 0.10	D			MADE GROUND: Grey block paving. Between 0.00-0.30m in SE end of pit, Red BRICK WALL (Extending 0.50m above ground level). Between 0.30-1.02m in SE end of pit, Grey CONCRETE WALL (Base not proven in TP1). MADE GROUND: Yellowish brown fine to medium sand (Bedding sand). MADE GROUND: Grey concrete. MADE GROUND: Purplish grey sandy slightly silty angular fine to coarse gravel of slate and brick fragments.				0.07			5.18		
0.07 - 0.10	ES		0.10					5.15					
0.15 - 1.02	B		0.15					5.10					
0.30	ES												
0.60	ES												
0.80	CONCC			At 0.80m depth. Celtest Limited drilled a 100mm diameter horizontal concrete core 220mm into exposed concrete wall. Concrete wall proven to be 220mm thick.									
1.00	ES												
				End of Excavation				1.02			4.23		
Excavation							Groundwater						
Plant	4WD Excavator.			Width (B)	0.95		Depth Observed	Depth of Pit	Rose to	in Mins	Remarks		
Date	25/02/2025			Length (C)	2.00						None encountered.		
Shoring	None.			Date Backfilled									
Stability	Stable during excavation.												
Remarks	Trial Pit TP1 excavated to 1.02m by Alun Griffiths (Contractors) Limited using a 4WD Excavator and hand tools. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1 litre plastic tub. At 0.80m depth. Celtest Limited drilled a 100mm diameter horizontal concrete core 220mm into exposed concrete wall. Concrete wall proven to be 220mm thick. The pit was backfilled and reinstated by Alun Griffiths (Contractors) Limited on completion. REFER TO PLAN AND CROSS SECTION DRAWINGS. Logged in accordance with BS5930:2015 + A1:2020							Logged by		CE			
Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres.								Checked by		JK			
								Figure		Sheet 1 of 1			
										11/04/2025			

Cross Section



NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:
Alun Griffiths (Contractors) Limited

Project:
Menai Shellfish
(Bangor Beach Road SPS)

Project No: PN254711

Title:
Trial Pit TP1

View:	Cross Section
Date Excavated:	25/02/2025
Drawn by:	CE
Date Drawn:	26/02/2025
Contact:	CEdwards@geotechnics.co.uk

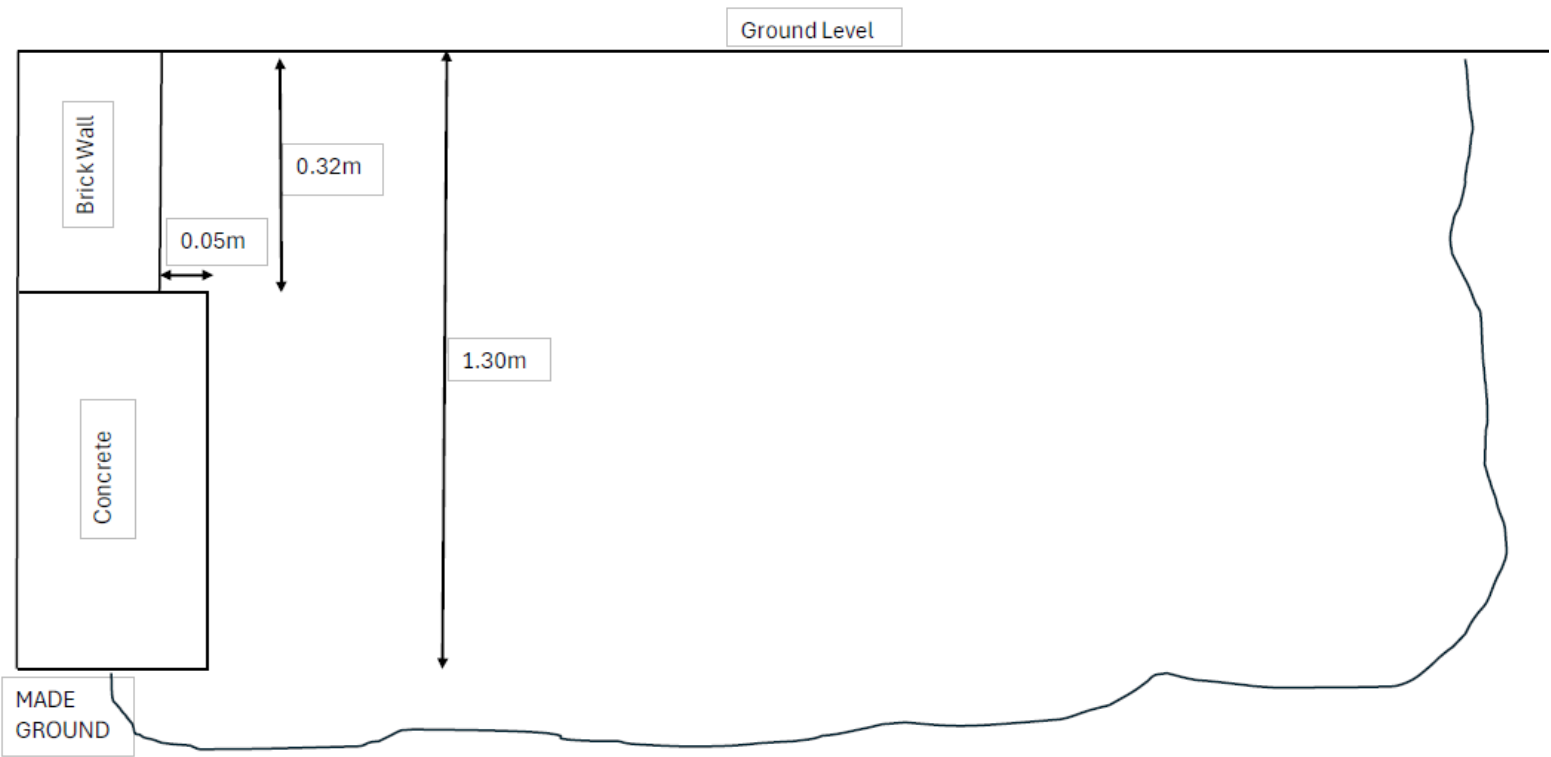


The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel:	
Nº	

Project	Menai Shellfish (Bangor Beach Road SPS)			Engineer	Ove Arup & Partners Limited			Project No.	PN254711		
Client	Alun Griffiths (Contractors) Limited			National Grid Coordinates	258643.0 E 372889.1 N			Location ID	TP2		
								Ground Level	5.35 m OD		
Samples and Tests				Strata					Scale 1:10		
Depth	Sample Type	Stratum No.	Results	Description				Depth	Legend	Level (m OD)	
0.07 - 0.10	B			MADE GROUND: Grey block paving. Between 0.00-0.32m in SE end of pit, Red BRICK WALL.				0.07		5.28	
0.07 - 0.10	D			Between 0.32-1.30m in SE end of pit, Grey CONCRETE WALL (Base proven in TP2).				0.10		5.25	
0.07 - 0.10	ES			MADE GROUND: Yellowish brown fine to medium sand (Bedding sand)							
0.10 - 0.50	B			MADE GROUND: Purplish grey very sandy silty angular fine to coarse gravel of slate and brick fragments.							
0.10 - 0.50	D										
0.10 - 0.50	ES										
				Below 0.50m, sandy.							
0.50 - 1.40	B										
0.50 - 1.40	D										
0.50 - 1.40	ES										
				End of Excavation				1.40		3.95	
Excavation				Groundwater							
Plant	4WD Excavator.			Width (B)	0.90	Depth Observed	Depth of Pit	Rose to	in Mins	Remarks	
Date	25/02/2025			Length (C)	1.80					None encountered.	
Shoring	None.			Date Backfilled							
Stability	Stable during excavation.										
Remarks	Trial Pit TP2 excavated to 1.40m by Alun Griffiths (Contractors) Limited. ES sample = 1 x 60ml glass vial, 2 x 258ml amber glass jars and 1 x 1 litre plastic tub. The pit was backfilled and reinstated by Alun Griffiths (Contractors) on completion. REFER TO PLAN AND CROSS SECTION DRAWINGS.								Logged by CE Checked by JK Figure Sheet 1 of 1 11/04/2025		
Symbols and abbreviations are explained on the accompanying key sheets. All dimensions are in metres. Logged in accordance with BS5930:2015 + A1:2020 GEOTECHNICS											

Cross Section



NOT TO SCALE

All Measurements in Metres

All references to the origin and/or ownership of existing underground plant/services are based on the correlation of service drawings provided by the Client and visual inspection of underground plant/services during excavation. Actual origin and/or ownership remains unconfirmed.

Client:

Alun Griffiths (Contractors) Limited

Project:

Menai Shellfish
(Bangor Beach Road SPS)

Project No: PN254711

Title:

Trial Pit TP2

View: Cross Section

Date Excavated: 25/02/2025

Drawn by: CE

Date Drawn: 26/02/2025

Contact: CEdwards@geotechnics.co.uk



The Geotechnical Centre
Unit 1
Borders Industrial Park
River Lane
Saltney
Chester
CH4 8RJ

Tel:

Nº

APPENDIX 4

**Trial Pit Photographs
including Concrete Core Photograph**

Trial Pit TP1 [1]



Trial Pit TP1 [2]



Trial Pit TP1 [3]



Trial Pit TP1 [4]



Trial Pit TP1 [5]



Trial Pit TP1 [6]



Trial Pit TP1 [7] with cored hole through concrete wall



Trial Pit TP1 [8] with cored hole through concrete wall



Trial Pit TP1 [9] with cored hole through concrete wall



Trial Pit TP1 [10] with cored hole through concrete wall



Trial Pit TP1 [11] with cored hole reinstated



Trial Pit TP1 [12] with cored hole reinstated



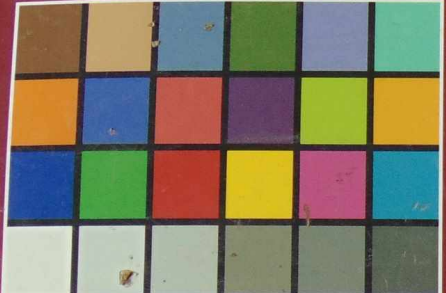
Trial Pit TP1 [13] Arisings



Trial Pit TP1 [14] Arisings



100mm Dia. Horizontal Core drilled at 0.80m b.g.l. in Trial Pit TP1

GEOTECHNICS geotechnical and geoenvironmental specialists COVENTRY CHESTER EXETER YORK BRIDGEND		PHOTOGRAPHIC BOARD	
	PROJECT NAME	Menai Shellfish	
	PROJECT NUMBER	PN254711	
	HOLE ID	TP1	
	DATE	25/02/25	
NOTES		Horizontal Core at 0.80m b.g.l.	

cm 10 20 30 40



REAR

Trial Pit TP2 [1]



Trial Pit TP2 [2]



Trial Pit TP2 [3]



Trial Pit TP2 [4]



Trial Pit TP2 [5]



Trial Pit TP2 [6]



Trial Pit TP2 [7]



Trial Pit TP2 [8]



Trial Pit TP2 [9] Arisings



APPENDIX 5

Laboratory Test Results - Geotechnical

Classification and Strength

Symbol	C - Clay (0 - containing organic matter) Plasticity	M - Silt L - Low I - Intermediate H - High V - Very High E - Extremely High
I_p	Plasticity Index	
%	% retained on 425 μ m sieve, shown under I_p value	
w_L	Liquid Limit	
w_p	Plastic Limit	
NP	Non-Plastic	
NAT	Sample tested in natural state	
w	Water Content	
ρ_d	Particle Density	
Test	Quick undrained triaxial tests	
	SS	Single stage - 102mm diameter.
	S3	Single stage - set of 3 38mm diameter.
	MS	Multistage - 102mm diameter.
	D	Drained Test
	HV	Hand Vane
	PP	Pocket Penetrometer (kg/cm^2)
	NST	Not suitable for test
γ_b	Bulk Density	
σ_3	Triaxial Cell Pressure	
$\sigma_1 - \sigma_3$	Deviator Stress	
##	Excessive Strain	
c_u	Undrained Cohesion	
c	Cohesion Intercept	
ϕ	Angle of Shearing Resistance	
Linear Shrink	Linear Shrinkage	
Stab add-	Stabiliser which is added	

Consolidation

m_v	Coefficient of Volume Compressibility
c_{v50}	Coefficient of Consolidation - Log t
c_{v90}	Coefficient of Consolidation - $\sqrt{t}$

Rock

UF	Unacceptable Failure
----	----------------------

Chemical Analysis

Acid Soluble	Total sulphate in specimen, expressed as SO_3 %, value in brackets expressed as SO_4 %
Water Soluble	Soluble sulphate in 2:1 water : soil extract, expressed as SO_3 g/l, value in brackets expressed as SO_4 g/l
In Water	Sulphate content of groundwater, expressed as SO_3 g/l, value in brackets expressed as SO_4 g/l
pH	pH value
Organic content	Organic content expressed as a percentage of dry weight
Chloride	Chloride Ion content expressed as a percentage of dry weight

MCV, Compaction, CBR

MCV	Moisture Condition Value at natural water content
MCC	Moisture Condition Calibration
CCV	Chalk Crushing Value

Compaction

Type	2.5	=	2.5 kg Rammer
	4.5	=	4.5 kg Rammer
	V	=	Vibrating Hammer
γ_b	Bulk Density		
γ_d	Dry Density		
CBR California Bearing Ratio			
Type	2.5	=	Test on Specimen Recompacted using 2.5 kg Rammer
	4.5	=	As above but using 4.5 kg Rammer
	V	=	As above but using Vibrating Hammer
	M	=	Test on open drive mould specimen cut in field
	S	=	Soaked Specimen

Top	CBR at top of mould
Bottom	CBR at bottom of mould
ND	None Detected

* In the Sample Description denotes a laboratory only description



LABORATORY REPORT



Contract Number: PSL25/1779

Report Date: 10 April 2025

Client's Reference: PN254711/1

Client Name: Geotechnics
Kirkby Lane
Pinxton
Nottinghamshire
NG16 6JA

For the attention of: Conor Southall

Contract Title: Menai Shellfish (Bangor Beach Road SP5)

Date Received: 10/03/2025

Date Commenced: 10/03/2025

Date Completed: 10/04/2025

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. 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 other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Managing Director)

R Berriman
(Associate Director)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)


D Nicholson
(Senior Technician)

T Watkins
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awatkins@prosoils.co.uk

Page 1 of

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Menai Shellfish (Bangor Beach Road SPS)

Contract No:**PSL25/1779****Client Ref:**

PN254711

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377 - Part 2 : 2022 in accordance with BS EN ISO 17892 (as below)

[illegible]

Water Content - BS 1377 - Part 2 : 2022 : Clause 4 in accordance with BS EN ISO 17892 - 1 : 2014 + A1 : 2022

Linear Shrinkage - BS 1377 - Part 2 : 2022 : Clause 7

Particle Density (Gas Jar method) - BS 1377 - Part 2 : 2022 : Clause 9

Liquid, Plastic Limit & Plasticity Index - BS 1377 - Part 2 : 2022 : Clause 5 & 6 in accordance with BS EN ISO 17892 - 12 : 2018 + A2 : 2022

SYMBOLS : NP = Non Plastic



Menai Shellfish (Bangor Beach Road SPS)

Contract No:

PSL25/1779

Client Ref:

PN254711

PARTICLE SIZE DISTRIBUTION TEST

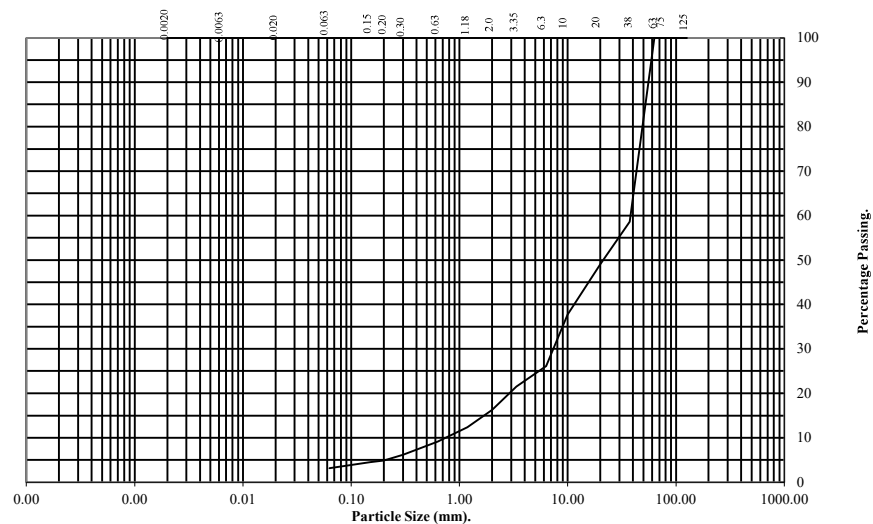
BS 1377 - Part 2 : 2022 : Clause 10 in accordance with BS EN ISO 17892 - 4 : 2016

Sieve Method, Clause 5.2

Hole Number: TP1 Top Depth (m): 0.15

Sample Number: Base Depth (m): 1.02

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	59
20	49
10	38
6.3	26
3.35	22
2	16
1.18	12
0.63	9
0.3	6
0.2	5
0.15	4
0.063	3

Soil Fraction	Total Percentage
Cobbles	0
Gravel	84
Sand	13
Silt/Clay	3

Remarks:

See Summary of Soil Descriptions



Menai Shellfish (Bangor Beach Road SPS)

Contract No:
PSL25/1779
Client Ref:
PN254711

PARTICLE SIZE DISTRIBUTION TEST

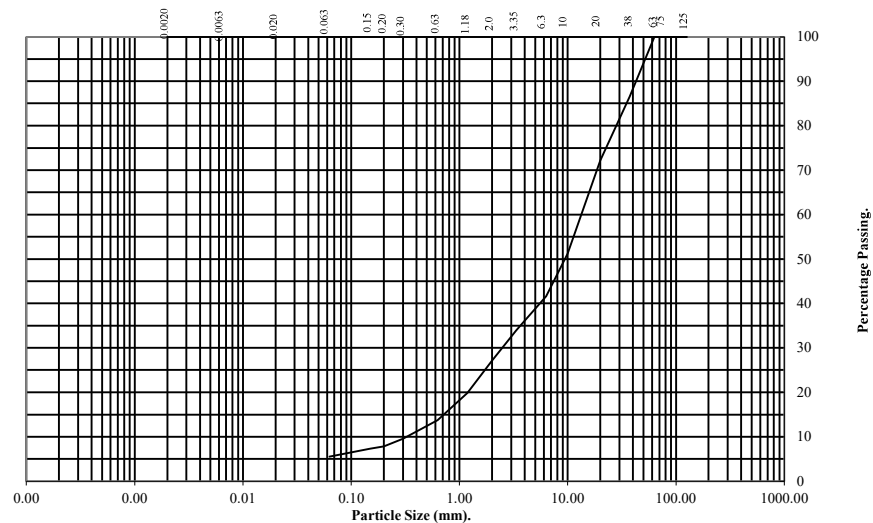
BS 1377 - Part 2 : 2022 : Clause 10 in accordance with BS EN ISO 17892 - 4 : 2016

Sieve Method, Clause 5.2

Hole Number: TP2 Top Depth (m): 0.10

Sample Number: Base Depth (m): 0.50

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	87
20	72
10	51
6.3	42
3.35	34
2	27
1.18	20
0.63	14
0.3	10
0.2	8
0.15	7
0.063	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	73
Sand	21
Silt/Clay	6

Remarks:

See Summary of Soil Descriptions



Menai Shellfish (Bangor Beach Road SPS)

Contract No:

PSL25/1779

Client Ref:

PN254711

PARTICLE SIZE DISTRIBUTION TEST

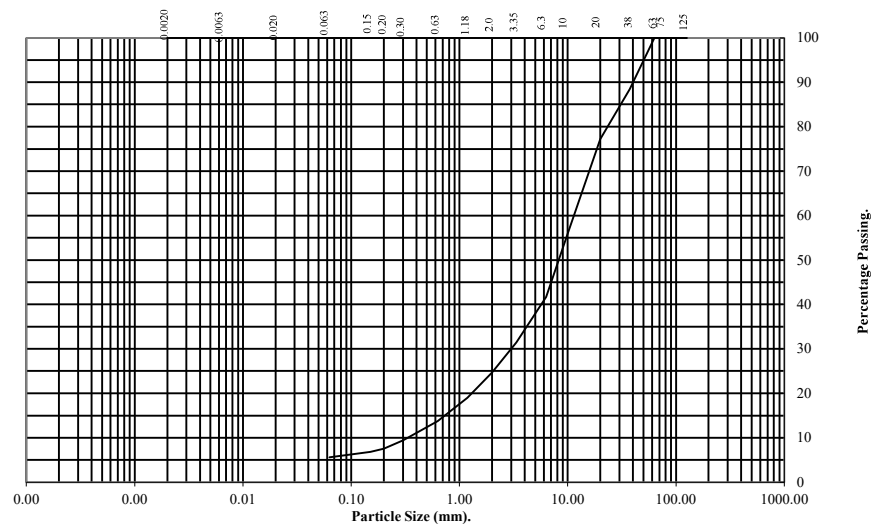
BS 1377 - Part 2 : 2022 : Clause 10 in accordance with BS EN ISO 17892 - 4 : 2016

Sieve Method, Clause 5.2

Hole Number: TP2 Top Depth (m): 0.50

Sample Number: Base Depth (m): 1.40

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	88
20	77
10	56
6.3	42
3.35	31
2	25
1.18	19
0.63	14
0.3	9
0.2	8
0.15	7
0.063	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	75
Sand	19
Silt/Clay	6

Remarks:

See Summary of Soil Descriptions



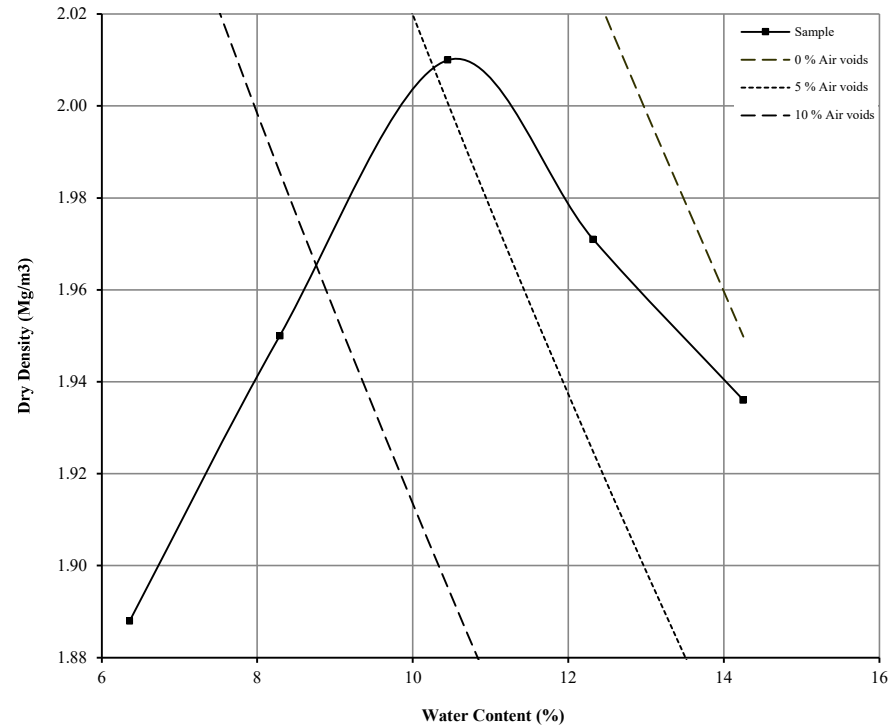
Menai Shellfish (Bangor Beach Road SPS)

Contract No:
PSL25/1779
Client Ref:
PN254711

DRY DENSITY/WATER CONTENT RELATIONSHIP

Non compliance with BS 1377 - Part 2 : Clause 11 : 2022

Hole Number: TP2 Top Depth (m): 0.10
Sample Number: Base Depth (m): 0.50
Sample Type: B



Initial Water Content:		4.2	Method of Compaction:	2.5kg	Separate Samples
Particle Density (Mg/m3):	2.70	Measured	Material Retained on 37.5 mm Test Sieve (%):		13
Maximum Dry Density (Mg/m3):		2.01	Material Retained on 20.0 mm Test Sieve (%):		15
Optimum Water Content (%):		10	Grading Zone:		X
Remarks See summary of soil descriptions					



Menai Shellfish (Bangor Beach Road SPS)

Contract No.
PSL25/1779
Client Ref
PN254711

Certificate of Analysis

Certificate Number 25-05278

Issued: 20-Mar-25

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 25-05278

Client Reference ~ PN254711

Order No ~ ON43165

Contract Title ~ Menai Shellfish

Description 2 Soil samples.

Date Received 11-Mar-25

Date Started 11-Mar-25

Date Completed 20-Mar-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 By

A handwritten signature in black ink, appearing to read "J Coffey".

John Coffey
Quality Manager



Summary of Chemical Analysis Soil Samples

Our Ref 25-05278

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish

Lab No	2476466	2476467
Sample ID ~	TP2	TP2
Depth ~	0.10-0.50	0.50-1.40
Other ID ~		
Sample Type ~	D	D
Sampling Date ~	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s

Test	Method	LOD	Units		
Metals					
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	< 10	< 10
Inorganics					
pH	DETSC 2008#		pH	9.4	9.9
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	4.2	7.9
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	17	16
Sulphur as S, Total	DETSC 2320	0.01	%	0.06	0.01
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.01	0.01

Information in Support of the Analytical Results

Our Ref 25-05278
 Client Ref ~ PN254711
 Contract ~ Menai Shellfish

Containers Received & Deviating Samples

					Inappropriate container for tests
Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	
2476466	TP2 0.10-0.50 SOIL	25/02/25	GJ 250ml	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	
2476467	TP2 0.50-1.40 SOIL	25/02/25	PT 1L	Total Sulphur ICP (7 days), pH + Conductivity (7 days)	

Key: G-Glass J-Jar P-Plastic T-Tub

Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results

* -not accredited.

-MCERTS (accreditation only applies if report carries the MCERTS logo).

\$ -subcontracted.

n/s -not supplied.

I/S -insufficient sample.

U/S -unsuitable sample.

t/f -to follow.

nd -not detected.

End of Report

APPENDIX 6

Laboratory Test Results - Contamination

Certificate of Analysis

Certificate Number 25-04891

Issued: 14-Mar-25

Client Geotechnics LTD
The Geotechnical Centre
Unit 1B Borders Ind. Park
River Lane
Saltney
Chester
CH4 8RJ

Our Reference 25-04891

Client Reference ~ PN254711

Order No ~ ON43165

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Description 3 Soil samples, 6 Leachate prepared by DETS samples.

Date Received 05-Mar-25

Date Started 05-Mar-25

Date Completed 14-Mar-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 By



Reyhan Irfan
Operations Manager



Summary of Chemical Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	2474129	2474130	2474131
Sample ID ~	TP1	TP1	TP2
Depth ~	0.07-0.10	1.00	0.50-1.40
Other ID ~			
Sample Type ~	ES	ES	ES
Sampling Date ~	25/02/2025	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
Preparation						
Moisture Content	DETSC 1004	0.1	%	11	3.2	3.6
Metals						
Antimony	DETSC 2301*	1	mg/kg	1.5	1.5	1.5
Arsenic	DETSC 2301#	0.2	mg/kg	13	7.4	7.1
Beryllium	DETSC 2301#	0.2	mg/kg	0.4	0.2	< 0.2
Boron, Water Soluble (2.5:1)	DETSC 2311#	0.2	mg/kg	0.4	< 0.2	< 0.2
Cadmium	DETSC 2301#	0.1	mg/kg	0.1	< 0.1	< 0.1
Chromium	DETSC 2301#	0.15	mg/kg	17	26	21
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	29	100	34
Lead	DETSC 2301#	0.3	mg/kg	19	8.2	7.4
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	17	25	22
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg	23	39	32
Zinc	DETSC 2301#	1	mg/kg	160	80	75
Inorganics						
Loss on Ignition at 440oC	DETSC 2003#	0.01	%	1.4	0.27	0.28
pH	DETSC 2008#		pH	8.9	9.6	9.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Total Organic Carbon	DETSC 2084#	0.5	%	< 0.5	< 0.5	< 0.5
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aliphatic >EC10-EC12 Cleanup	DETSC 3521*	1.5	mg/kg	23.88	73.83	56.80
Aliphatic >EC12-EC16 Cleanup	DETSC 3521*	1.2	mg/kg	18.25	57.30	10.58
Aliphatic >EC16-EC21 Cleanup	DETSC 3521*	1.5	mg/kg	3.00	11.03	2.69
Aliphatic >EC21-EC24 Cleanup	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40
Aliphatic >EC21-EC35 Cleanup	DETSC 3521*	3.4	mg/kg	< 3.40	8.23	< 3.40
Aliphatic >EC24-EC35 Cleanup	DETSC 3521*	3.4	mg/kg	< 3.40	8.23	< 3.40
Aliphatic >EC35-EC40 Cleanup	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40
Aliphatic >EC40-EC44 Cleanup	DETSC 3521*	3.4	mg/kg	< 3.40	< 3.40	< 3.40
Aliphatic >EC10-EC35 Cleanup	DETSC 3521*	10	mg/kg	45.13	150.4	70.08
Aliphatic >EC10-EC40 Cleanup	DETSC 3521*	10	mg/kg	45.13	150.4	70.08
Aliphatic C5-C35 Cleanup	DETSC 3521*	10	mg/kg	45.13	150.4	70.08
Aliphatic C5-C40 Cleanup	DETSC 3521*	10	mg/kg	45.13	150.4	70.08
Aliphatic C5-C44 Cleanup	DETSC 3521*	10	mg/kg	45.13	150.4	70.08
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	2474129	2474130	2474131
Sample ID ~	TP1	TP1	TP2
Depth ~	0.07-0.10	1.00	0.50-1.40
Other ID ~			
Sample Type ~	ES	ES	ES
Sampling Date ~	25/02/2025	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
Aromatic >EC10-EC12 Cleanup	DETSC 3521*	0.9	mg/kg	58.85	53.51	12.26
Aromatic >EC12-EC16 Cleanup	DETSC 3521*	0.5	mg/kg	61.34	60.08	13.23
Aromatic >EC16-EC21 Cleanup	DETSC 3521*	0.6	mg/kg	6.95	35.86	1.80
Aromatic >EC21-EC24 Cleanup	DETSC 3521*	1.4	mg/kg	65.07	82.83	17.16
Aromatic >EC21-EC35 Cleanup	DETSC 3521*	1.4	mg/kg	253.3	299.5	68.64
Aromatic >EC24-EC35 Cleanup	DETSC 3521*	1.4	mg/kg	188.2	216.6	51.47
Aromatic >EC35-EC40 Cleanup	DETSC 3521*	1.4	mg/kg	< 1.40	5.87	< 1.40
Aromatic >EC40-EC44 Cleanup	DETSC 3521*	1.4	mg/kg	< 1.40	< 1.40	< 1.40
Aromatic C5-C35 Cleanup	DETSC 3521*	10	mg/kg	380.4	448.9	95.93
Aromatic >EC10-EC35 Cleanup	DETSC 3521*	10	mg/kg	380.4	448.9	95.93
Aromatic >EC10-EC40 Cleanup	DETSC 3521*	10	mg/kg	380.4	454.8	95.93
Aromatic C5-C40 Cleanup	DETSC 3521*	10	mg/kg	380.4	454.8	95.93
Aromatic C5-C44 Cleanup	DETSC 3521*	10	mg/kg	380.4	454.8	95.93
TPH Ali/Aro Total C5-C35 Cleanup	DETSC 3521*	10	mg/kg	425.5	599.3	166.0
TPH Ali/Aro C5-C40 Cleanup	DETSC 3521*	10	mg/kg	425.5	605.2	166.0
TPH Ali/Aro C5-C44 Cleanup	DETSC 3521*	10	mg/kg	425.5	605.2	166.0
PCBs						
PCB 77	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 81	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 105	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 114	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 118	DETSC 3401#	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 123	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 126	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 156	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 157	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 167	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 169	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
PCB 189	DETSC 3401*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	2474129	2474130	2474131
Sample ID ~	TP1	TP1	TP2
Depth ~	0.07-0.10	1.00	0.50-1.40
Other ID ~			
Sample Type ~	ES	ES	ES
Sampling Date ~	25/02/2025	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
VOCs						
Vinyl Chloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	2474129	2474130	2474131
Sample ID ~	TP1	TP1	TP2
Depth ~	0.07-0.10	1.00	0.50-1.40
Other ID ~			
Sample Type ~	ES	ES	ES
Sampling Date ~	25/02/2025	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
sec-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
Naphthalene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431	0.01	mg/kg	< 0.01	< 0.01	< 0.01
MTBE	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01
SVOCs						
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	2474129	2474130	2474131
Sample ID ~	TP1	TP1	TP2
Depth ~	0.07-0.10	1.00	0.50-1.40
Other ID ~			
Sample Type ~	ES	ES	ES
Sampling Date ~	25/02/2025	25/02/2025	25/02/2025
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Indeno(123cd)pyrene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dibenzo(ah)anthracene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1

Summary of Asbestos Analysis Soil Samples

Our Ref 25-04891

Client Ref ~ PN254711

Contract Title ~ Menai Shellfish (Bangor Beach Road SPS)

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2474129	TP1 0.07-0.10	SOIL	NAD	none	Steven Lambert
2474130	TP1 1.00	SOIL	NAD	none	Steven Lambert
2474131	TP2 0.50-1.40	SOIL	NAD	none	Steven Lambert

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 25-04891

Client Ref PN254711

Contract Title Menai Shellfish (Bangor Beach Road SPS)

Sample Id TP1 0.07-0.10

Sample Numbers 2474129 2474132 2474179

Date Analysed 14/03/2025

Test Results On Waste					WAC Limit Values		
Determinand and Method Reference		Units	Result		Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon		%	< 0.5		3	5	6
DETSC 2003# Loss On Ignition		%	1.4		n/a	n/a	10
DETSC 3321# BTEX		mg/kg	< 0.04		6	n/a	n/a
DETSC 3401# PCBs (7 congeners)		mg/kg	< 0.01		1	n/a	n/a
DETSC 3521* Mineral Oil >C10-C40 + Clean Up		mg/kg	430.0		500	n/a	n/a
DETSC 3301 PAHs		mg/kg	< 1.6		100	n/a	n/a
DETSC 2008# pH		pH Units	8.9		n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)		mol/kg	< 1.0		n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)		mol/kg	< 1.0		n/a	TBE	TBE

Test Results On Leachate					WAC Limit Values		
Determinand and Method Reference		Conc in Eluate ug/l		Amount Leached* mg/kg		Limit values for LS10 Leachate	
		2:1	8:1	LS2	LS10	Inert Waste	SNRHW
DETSC 2306 Arsenic as As		4.1	1.6	0.008	0.019	0.5	2
DETSC 2306 Barium as Ba		71	38	0.14	0.42	20	100
DETSC 2306 Cadmium as Cd		< 0.030	< 0.030	< 0.004	< 0.02	0.04	1
DETSC 2306 Chromium as Cr		0.81	< 0.25	< 0.02	< 0.1	0.5	10
DETSC 2306 Copper as Cu		12	3.5	0.024	0.045	2	50
DETSC 2306 Mercury as Hg		< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2
DETSC 2306 Molybdenum as Mo		< 1.1	< 1.1	< 0.02	< 0.1	0.5	10
DETSC 2306 Nickel as Ni		1.1	< 0.50	< 0.02	< 0.1	0.4	10
DETSC 2306 Lead as Pb		0.57	3.3	< 0.01	< 0.05	0.5	10
DETSC 2306 Antimony as Sb		0.82	< 0.17	< 0.01	< 0.05	0.06	0.7
DETSC 2306 Selenium as Se		0.3	< 0.25	< 0.006	< 0.03	0.1	0.5
DETSC 2306 Zinc as Zn		62	68	0.124	0.673	4	50
DETSC 2055 Chloride as Cl		7000	1100	< 20	< 100	800	15,000
DETSC 2055* Fluoride as F		110	< 100	0.22	0.13	10	150
DETSC 2055 Sulphate as SO4		7600	1200	< 20	< 100	1000	20,000
DETSC 2009* Total Dissolved Solids		100000	35000	200	428.3	4000	60,000
DETSC 2130 Phenol Index		< 100	< 100	< 0.2	< 1	1	n/a
DETSC 2085 Dissolved Organic Carbon		4200	< 2000	< 10	< 50	500	800

Additional Information		
DETSC 2008 pH	8.6	8.1
DETSC 2009 Conductivity uS/cm	143.0	49.9
* Temperature*	14.0	14.0

Mass of Sample Kg*	0.140
Mass of dry Sample Kg*	0.125

Stage 1

Volume of Leachant L2*	0.234
Volume of Eluate VE1*	0.15

Stage 2

Volume of Leachant L8*	0.997
Volume of Eluate VE2*	0.929

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. Normec DETS does not accept responsibility for errors or omissions.
Values are correct at time of issue.

* Normec DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 25-04891

Client Ref PN254711

Contract Title Menai Shellfish (Bangor Beach Road SPS)

Sample Id TP1 1.00

Sample Numbers 2474130 2474133 2474180

Date Analysed 14/03/2025

Test Results On Waste					WAC Limit Values		
Determinand and Method Reference	Units	Result			Inert Waste	SNRHW	Hazardous Waste
DETS 2084# Total Organic Carbon	%	< 0.5			3	5	6
DETS 2003# Loss On Ignition	%	0.27			n/a	n/a	10
DETS 3321# BTEX	mg/kg	< 0.04			6	n/a	n/a
DETS 3401# PCBs (7 congeners)	mg/kg	< 0.01			1	n/a	n/a
DETS 3521* Mineral Oil >C10-C40 + Clean Up	mg/kg	610.0			500	n/a	n/a
DETS 3301 PAHs	mg/kg	< 1.6			100	n/a	n/a
DETS 2008# pH	pH Units	9.6			n/a	>6	n/a
DETS 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0			n/a	TBE	TBE
DETS 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0			n/a	TBE	TBE

Test Results On Leachate					WAC Limit Values		
Determinand and Method Reference	Conc in Eluate ug/l		Amount Leached* mg/kg		Limit values for LS10 Leachate		
	2:1	8:1	LS2	LS10	Inert Waste	SNRHW	Hazardous Waste
DETS 2306 Arsenic as As	18	2.4	0.036	0.049	0.5	2	25
DETS 2306 Barium as Ba	86	30	0.17	0.39	20	100	300
DETS 2306 Cadmium as Cd	< 0.030	< 0.030	< 0.004	< 0.02	0.04	1	5
DETS 2306 Chromium as Cr	1.3	< 0.25	< 0.02	< 0.1	0.5	10	70
DETS 2306 Copper as Cu	6	1	0.012	< 0.02	2	50	100
DETS 2306 Mercury as Hg	< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2	2
DETS 2306 Molybdenum as Mo	< 1.1	< 1.1	< 0.02	< 0.1	0.5	10	30
DETS 2306 Nickel as Ni	0.84	< 0.50	< 0.02	< 0.1	0.4	10	40
DETS 2306 Lead as Pb	0.31	0.57	< 0.01	< 0.05	0.5	10	50
DETS 2306 Antimony as Sb	0.67	< 0.17	< 0.01	< 0.05	0.06	0.7	5
DETS 2306 Selenium as Se	< 0.25	< 0.25	< 0.006	< 0.03	0.1	0.5	7
DETS 2306 Zinc as Zn	46	47	0.092	0.468	4	50	200
DETS 2055 Chloride as Cl	12000	980	24	< 100	800	15,000	25,000
DETS 2055* Fluoride as F	130	100	0.26	1.05	10	150	500
DETS 2055 Sulphate as SO4	6100	900	< 20	< 100	1000	20,000	50,000
DETS 2009* Total Dissolved Solids	88000	75000	176	771	4000	60,000	100,000
DETS 2130 Phenol Index	< 100	< 100	< 0.2	< 1	1	n/a	n/a
DETS 2085 Dissolved Organic Carbon	3000	< 2000	< 10	< 50	500	800	1000

Additional Information		
DETS 2008 pH	8.3	9.9
DETS 2009 Conductivity uS/cm	126.0	108.0
* Temperature*	14.0	14.0

Mass of Sample Kg*	0.120
Mass of dry Sample Kg*	0.116

Stage 1

Volume of Leachant L2*	0.228
Volume of Eluate VE1*	0.188

Stage 2

Volume of Leachant L8*	0.929
Volume of Eluate VE2*	0.795

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. Normec DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* Normec DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

WASTE ACCEPTANCE CRITERIA TESTING ANALYTICAL REPORT

Our Ref 25-04891

Client Ref PN254711

Contract Title Menai Shellfish (Bangor Beach Road SPS)

Sample Id TP2 0.50-1.40

Sample Numbers 2474131 2474134 2474181

Date Analysed 14/03/2025

Test Results On Waste					WAC Limit Values		
Determinand and Method Reference		Units	Result		Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon		%	< 0.5		3	5	6
DETSC 2003# Loss On Ignition		%	0.28		n/a	n/a	10
DETSC 3321# BTEX		mg/kg	< 0.04		6	n/a	n/a
DETSC 3401# PCBs (7 congeners)		mg/kg	< 0.01		1	n/a	n/a
DETSC 3521* Mineral Oil >C10-C40 + Clean Up		mg/kg	170.0		500	n/a	n/a
DETSC 3301 PAHs		mg/kg	< 1.6		100	n/a	n/a
DETSC 2008# pH		pH Units	9.4		n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)		mol/kg	< 1.0		n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)		mol/kg	< 1.0		n/a	TBE	TBE

Test Results On Leachate					WAC Limit Values		
Determinand and Method Reference		Conc in Eluate ug/l		Amount Leached* mg/kg		Limit values for LS10 Leachate	
		2:1	8:1	LS2	LS10	Inert Waste	SNRHW
DETSC 2306 Arsenic as As		22	3.6	0.044	0.063	0.5	2
DETSC 2306 Barium as Ba		92	31	0.18	0.4	20	100
DETSC 2306 Cadmium as Cd		< 0.030	< 0.030	< 0.004	< 0.02	0.04	1
DETSC 2306 Chromium as Cr		0.92	0.27	< 0.02	< 0.1	0.5	10
DETSC 2306 Copper as Cu		7.1	2.9	0.014	0.035	2	50
DETSC 2306 Mercury as Hg		< 0.010	< 0.010	< 0.0004	< 0.002	0.01	0.2
DETSC 2306 Molybdenum as Mo		1.3	< 1.1	< 0.02	< 0.1	0.5	10
DETSC 2306 Nickel as Ni		0.58	< 0.50	< 0.02	< 0.1	0.4	10
DETSC 2306 Lead as Pb		0.095	1	< 0.01	< 0.05	0.5	10
DETSC 2306 Antimony as Sb		1.4	0.22	< 0.01	< 0.05	0.06	0.7
DETSC 2306 Selenium as Se		< 0.25	< 0.25	< 0.006	< 0.03	0.1	0.5
DETSC 2306 Zinc as Zn		37	40	0.074	0.396	4	50
DETSC 2055 Chloride as Cl		8400	1100	< 20	< 100	800	15,000
DETSC 2055* Fluoride as F		140	130	0.28	1.31	10	150
DETSC 2055 Sulphate as SO4		5700	1300	< 20	< 100	1000	20,000
DETSC 2009* Total Dissolved Solids		84000	200000	168	1827.5	4000	60,000
DETSC 2130 Phenol Index		< 100	< 100	< 0.2	< 1	1	n/a
DETSC 2085 Dissolved Organic Carbon		5000	2900	10	< 50	500	800

Additional Information		
DETSC 2008 pH	8.1	10.0
DETSC 2009 Conductivity uS/cm	121.0	285.0
* Temperature*	14.0	15.0

Mass of Sample Kg*	0.120
Mass of dry Sample Kg*	0.116

Stage 1

Volume of Leachant L2*	0.227
Volume of Eluate VE1*	0.172

Stage 2

Volume of Leachant L8*	0.925
Volume of Eluate VE2*	0.88

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. Normec DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

* Normec DETS are accredited for the testing of leachates and not the leachate preparation stage which is unaccredited.

Information in Support of the Analytical Results

Our Ref 25-04891
 Client Ref ~ PN254711
 Contract ~ Menai Shellfish (Bangor Beach Road SPS)

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
		Sampled ~			
2474129	TP1 0.07-0.10 SOIL	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
2474130	TP1 1.00 SOIL	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
2474131	TP2 0.50-1.40 SOIL	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH + Conductivity (7 days), VOC (7 days)	
2474132	TP1 0.07-0.10 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	
2474133	TP1 1.00 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	
2474134	TP2 0.50-1.40 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	
2474179	TP1 0.07-0.10 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	
2474180	TP1 1.00 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	
2474181	TP2 0.50-1.40 LEACHATE	25/02/25	GJ 250ml x2, GJ 60ml, PT 1L	pH/Cond (1 days)	

Lab No	Sample ID	Comments
2474132	TP1 0.07-0.10 LEACHATE	Insufficient sample 1895g (<2kg) Sample received
2474133	TP1 1.00 LEACHATE	Insufficient sample 1797g (<2kg) Sample received
2474134	TP2 0.50-1.40 LEACHATE	Insufficient sample 1773g (<2kg) Sample received
2474179	TP1 0.07-0.10 LEACHATE	Insufficient sample 1895g (<2kg) Sample received
2474180	TP1 1.00 LEACHATE	Insufficient sample 1797g (<2kg) Sample received
2474181	TP2 0.50-1.40 LEACHATE	Insufficient sample 1773g (<2kg) Sample received

Key: G-Glass P-Plastic J-Jar T-Tub

Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results

* -not accredited.

-MCERTS (accreditation only applies if report carries the MCERTS logo).

\$ -subcontracted.

n/s -not supplied.

I/S -insufficient sample.

Information in Support of the Analytical Results

Our Ref 25-04891

Client Ref ~ PN254711

Contract ~ Menai Shellfish (Bangor Beach Road SPS)

U/S -unsuitable sample.

t/f -to follow.

nd -not detected.

End of Report

APPENDIX 7

Exploratory Hole Location Plan

FIELDWORK RESULTS - *Location Summary*

Project Menai Shellfish (Bangor Beach Road SPS) **Engineer** Ove Arup & Partners Limited **Project No.** PN254711

Client Alun Griffiths (Contractors) Limited

Location	Location Type	Easting (m)	Northing (m)	Ground Level (m OD)	Final Depth (m bgl)
TP1	TP	258646.3	372891.4	5.25	1.02
TP2	TP	258643.0	372889.1	5.35	1.40



Legend

 Locations By Type - TP



Unit 1B Borders Industrial Park River Lane Saltney Chester CH4 8RJ	Phone: 01244 671117 Email: mail@geotechnics.co.uk www.geotechnics.co.uk
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Engineer:
Ove Arup & Partners Limited

Client:
Alun Griffiths (Contractors) Limited

Project:
Menai Shellfish (Bangor Beach Road SPS)

Drawing Title:
Exploratory Hole Location Plan

Scale: 1:500 at A3	Date: 11/04/2025
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Project No.: PN254711	Exploratory Hole Location Plan
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APPENDIX 8

Investigation Techniques and General Notes

INTRODUCTION

The following brief review of Ground Investigation techniques, generally used as part of most Site Investigations in the UK, summarises their methodology, advantages and limitations. Detailed descriptions of the techniques are available and can be provided on request. This review should be read in conjunction with the accompanying General Notes.

TRIAL PITS

The trial pit is amongst the simplest yet most effective means of identifying shallow ground conditions on a site. Its advantages include simplicity, speed, potential accuracy and cost-effectiveness. The trial pit is most commonly formed using a back-acting excavator which can typically determine ground conditions to some 4 metres below ground level. Hand excavation is often used to locate, expose and detail existing foundations, features or services. In general, it is difficult to extend pits significantly below the water table in predominantly granular soils, where flows can cause instability. Unless otherwise stated, the trial pits will not have been provided with temporary side support during their construction. Under such circumstances, entrance into the pit is not permitted and hence observations will have been made from the ground surface and samples taken from the excavator bucket.

Where access for personnel is required to allow close observation of the exposed strata, the taking of samples and the carrying out of in situ tests, the sides of the trial pits (Observation Pits in BS 5930:2015) will be made safe using temporary supports or the sides battered back to a stable angle. Some limited access to such Trial Pits (Observation Pits) at depths less than 1m may be allowed in stable conditions or where the sides are benched or battered back to a safe angle.

Trends in strata type, level and thickness can be determined, shear surfaces identified and the behaviour of plant, excavation sides and excavated materials can be related to the construction process. They are particularly valuable in land slip investigations. Some types of in situ test can be undertaken in such pits and large disturbed or block samples obtained.

CABLE PERCUSSION BORING

The light Cable Percussion technique of soft ground boring, typically at a diameter of 150mm, is a well-established simple and flexible method of boring vertical holes and generally allows data to be obtained in respect of strata conditions other than rock. A tubular cutter (for cohesive soils) or shell with a flap valve (for granular soils) is repeatedly lifted and dropped using a winch and rope operating from an "A" frame. Soil which enters these tools is regularly removed and either sampled for subsequent examination or test, or laid to one side for later removal off site and licensed disposal or, if permitted by the Client, use as backfill. Steel casing will have been used to prevent collapse of the borehole sides where necessary. A degree of disturbance of soil and mixing of layers is inevitable and the presence of very thin layers of different soils within a particular stratum may not be identified. Changes in strata type can only be detected on recognition of a change in soil samples at the surface, after the interface has been passed. For the foregoing reasons, depth measurements should not be considered to be more accurate than 0.10 metre. The technique can determine ground conditions to depths in excess of 30 metres under suitable circumstances and usually causes less surface disturbance than trial pitting.

In cohesive soils cylindrical samples are retrieved by driving or pushing in 100mm nominal diameter tubes. In soft soils, piston sampling or vane testing may be undertaken. In granular soils and often in cohesive materials, in situ Standard Penetration Tests (SPT's) are performed. The SPT records the number of standard blows required to drive a 50mm diameter open or cone ended probe for 300mm after an initial 150mm penetration. A modified method of recording is used in denser strata. Small disturbed samples are obtained throughout.

ROTARY DRILLING

Rotary Drilling to produce cores by rotating an annular diamond-impregnated tube or barrel into the ground is the technique most appropriate to the forming of site investigation boreholes through rock or other hard strata. It has the advantage of being able to be used vertically or at an angle. Core diameters of less than 100mm are most common for site investigation purposes. Core is normally retrieved in plastic lining tubes. A flushing fluid such as air, water or foam is used to cool the bit and carry cuttings to the surface. Depths in excess of 60 metres can be achieved under suitable circumstances using rotary techniques, with minimal surface disturbance.

Examination of cores allows detailed rock description and generally enables angled discontinuity surfaces to be observed. However, vertical holes do not necessarily reveal the presence of vertical or near-vertical fissures or joint discontinuities. The core type and/or techniques used will depend on the ground conditions. Where open hole rotary drilling is employed, descriptions of strata result from examination at the surface of small particles ejected from the borehole in the flushing medium. In consequence, no indication of fissuring, bedding, consistency or degree of weathering can be obtained.

DYNAMIC SAMPLING

This technique involves the driving of an open-ended tube into the ground and retrieval of the soil which enters the tube. It was previously called window or windowless sampling. The term "window sample" arose from the original device which had a "window" or slot cut into the side of the tube through which samples were taken. This was superseded by the use of a thin-walled plastic liner to retrieve the soil sample from within a sampler (windowless sampling) which has a solid wall. Line diameters range from 36 to 86mm. Such samples can be used for qualitative logging, selection of samples for classification and chemical analysis and for obtaining a rudimentary assessment of strength.

Driving devices can be hand-held or machine mounted and the drive tubes are typically in 1m lengths. Depending on the type of rig used, the hole formed can be cased to prevent collapse of the borehole sides. Where the type of rig does not allow the insertion of casing, the success of this technique can be limited when soils and groundwater conditions are such that the sides of the hole collapse on withdrawal of the sampler. Obstructions within the ground, the density of the material or its strength can also limit the depth and rate of penetration of this light-weight investigation technique. Nevertheless, it is a valuable tool where access is constrained such as within buildings or on embankments. Depths of up to 10m can be achieved in suitable circumstances depending on the rig type but depths of 5m to 6m are more common.

EXPLORATORY HOLE RECORDS

The data obtained by these techniques are generally presented on Trial Pit, Borehole, Drillhole or Dynamic Sample Records. The descriptions of strata result from information gathered from a number of sources which may include published geological data, preliminary field observations and descriptions, in situ test results, laboratory test results and specimen descriptions. A key to the symbols and abbreviations used accompanies the records. The descriptions on the exploratory hole records accommodate but may not necessarily be identical to those on any preliminary records or the laboratory summaries.

The records show ground conditions at the exploratory hole locations. The degree to which they can be used to represent conditions between or beyond such holes, however, is a matter for geological interpretation rather than factual reporting and the associated uncertainties must be recognised.

DYNAMIC PROBING

This technique typically measures the number of blows of a standard weight falling over a standard height to advance a cone-ended rod over sequential standard distances (typically 100mm). Some devices measure the penetration of the probe per standard blow. It is essentially a profiling tool and is best used in conjunction with other investigation techniques where site-specific correlation can be used to delineate the distribution of soft or loose soils or the upper horizon of a dense or strong layer such as rock.

Both machine-driven and hand-driven equipment is available, the selection depending upon access restrictions and the depth of penetration required. It is particularly useful where access for larger equipment is not available, disturbance is to be minimised or where there are cost constraints. No samples are recovered and some techniques leave a sacrificial cone head in the ground. As with other lightweight techniques, progress is limited in strong or dense soils. The results are presented both numerically and graphically. Depths of up to 10m are commonly achieved in suitable circumstances.

The hand-driven DCP probing device has been calibrated by the Highways Agency to provide a profile of CBR values over a range of depths.

INSTRUMENTATION

The most common form of instrument used in site investigation is either the standpipe or else the standpipe piezometer which can be installed in investigation holes. They are used to facilitate monitoring of groundwater levels and water sampling over a period of time following site work. Normally a standpipe would be formed using rigid plastic tubing which has been perforated or slotted over much of its length whilst a standpipe piezometer would have a filter tip which would be placed at a selected level and the hole sealed above and sometimes below to isolate the zone of interest. Groundwater levels are determined using an electronic "dip meter" to measure the depth to the water surface from ground level. Piezometers can also be used to measure permeability. They are simple and inexpensive instruments for long term monitoring but response times can limit their use in tidal areas and access to the ground surface at each instrument is necessary. Remote reading requires more sophisticated hydraulic, electronic or pneumatic equipment.

Settlement can be monitored using surface or buried target plates whilst lateral movement over a range of depths is monitored using slip indicator or inclinometer equipment.

1. The report is prepared for the exclusive use of the Client named in the document and copyright subsists with Geotechnics Limited. Prior written permission must be obtained to reproduce all or part of the report. It is prepared on the understanding that its contents are only disclosed to parties directly involved in the current investigation, preparation and development of the site.
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3. The report and/or opinion is prepared for the specific purpose stated in the document and in relation to the nature and extent of proposals made available to Geotechnics Limited at that time. Re-consideration will be necessary should those details change. The recommendations should not be used for other schemes on or adjacent to the site without further reference to Geotechnics Limited.
4. The assessment of the significance of the factual data, where called for, is provided to assist the Client and their Engineer and/or Advisers in the preparation of their designs.
5. The report is based on the ground conditions encountered in the exploratory holes together with the results of field and laboratory testing in the context of the proposed development. The data from any commissioned desk study and site reconnaissance are also drawn upon. There may be special conditions appertaining to the site, however, which are not revealed by the investigation and which may not be taken into account in the report.
6. Methods of construction and/or design other than those proposed by the designers or referred to in the report may require consideration during the evolution of the proposals and further assessment of the geotechnical and any geoenvironmental data would be required to provide discussion and evaluations appropriate to these methods.
7. The accuracy of results reported depends upon the technique of measurement, investigation and test used and these values should not be regarded necessarily as characteristics of the strata as a whole (see accompanying notes on Investigation Techniques). Where such measurements are critical, the technique of investigation will need to be reviewed and supplementary investigation undertaken in accordance with the advice of the Company where necessary.
8. The samples selected for laboratory test are prepared and tested in accordance with the relevant Clauses and Parts of BS EN ISO 17892 and BS 1377 Parts 1 to 8, where appropriate, in Geotechnics Limited's UKAS accredited Laboratory, where possible. A list of tests is given.
9. Tests requiring the use of another laboratory having UKAS accreditation where possible are identified.
10. Any unavoidable variations from specified procedures are identified in the report.
11. Specimens are cut vertically, where this is relevant and can be identified, unless otherwise stated
12. All the data required by the test procedures are recorded on individual test sheets but the results in the report are presented in summary form to aid understanding and assimilation for design purposes. Where all details are required, these can be made available.
13. Whilst the report may express an opinion on possible configurations of strata between or beyond exploratory holes, or on the possible presence of features based on either visual, verbal, written, cartographical, photographic or published evidence, this is for guidance only and no liability can be accepted for its accuracy.
14. The Code of Practice for Ground Investigations – BS 5930:2015 calls for man-made soils to be described as Anthropogenic Ground with soils placed in an un-controlled manner classified as Made Ground and soils placed in a controlled manner as Fill. In view of the difficulty in always accurately determining the origin of man-made soils in exploratory holes, Geotechnics Limited classify such materials as Made Ground. Where soils can be clearly identified as being placed in a controlled manner then further classification of the soils as Fill has been added to the Exploratory Hole Records.
15. Classification of man-made soils is based on the inspection of retrieved samples or exposed excavations. Where it is obvious that foreign matter such as paper, plastic or metal is present, classification is clear. Frequently, however, for man-made soils that arise from the adjacent ground or from the backfilling of excavations, their visual characteristics can closely resemble those of undisturbed ground. Other evidence such as site history, exploratory hole location or other tests may need to be drawn upon to provide clarification. For these reasons, classification of soils on the exploratory hole records as either Made Ground or naturally occurring strata, the boundary between them and any interpretation that this gives rise to should be regarded as provisional and subject to re-evaluation in the light of further data.
16. The classification of materials as Topsoil is generally based on visual description and should not be interpreted to mean that the material so described complies with the criteria for Topsoil used in BS 3882:2015. Specific testing would be necessary where such a definition is a requirement.
17. Ground conditions should be monitored during the construction of the works and the report should be re-evaluated in the light of these data by the supervising geotechnical engineers.
18. Any comments on groundwater conditions are based on observations made at the time of the investigation, unless specifically stated otherwise. It should be noted, however, that the observations are subject to the method and speed of boring, drilling or excavation and that groundwater levels will vary due to seasonal or other effects.
19. Any bearing capacities for conventional spread foundations which are given in the report and interpreted from the investigation are for bases at a minimum depth of 1m below finished ground level in naturally occurring strata and at broadly similar levels throughout individual structures, unless otherwise stated. Typically they are based on serviceability criteria taking account of an assessment of the shear strength and/or density data obtained by the investigation. The foundations should be designed in accordance with the good practice embodied in BS 8004:2015 - Foundations, supplemented for housing by NHBC Standards. Foundation design is an iterative process and bearing pressures may need adjustment or other measures may need to be taken in the context of final layouts and levels prior to finalisation of proposals.
20. Unless specifically stated, the investigation does not take account of the possible effects of mineral extraction or of gases from fill or natural sources within, below or outside the site.
21. The costs or economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, will depend on very many factors in addition to geotechnical or geoenvironmental considerations and hence their evaluation is outside the scope of the report.