C J Construction

HEOL CRWYS, CWMAVON

Supplemental Site Investigation Report

14023/LW/24/SSI/RevD

Intégral
Géotechnique

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1.0 INTRODUCTION

1.1 GENERAL

C J Construction on behalf of Tai Tarian are proposing to redevelop a site at Heol Crwys in Cwmavon for residential end-use. The location of the site is shown in Figure 1. A site plan is presented in Figure 2.

Intégral Géotechnique (Wales) Limited have been appointed as the Geotechnical Engineers to undertake a supplemental site investigation in accordance with the recommended further works as detailed in our initial site investigation report (Report No. 14023/LW/23/SI dated November 2023) to enable an updated geotechnical and geoenvironmental appraisal of the site and provide a basis for design.

The following previous reports have been produced by Intégral Géotechnique (Wales) Limited for the site:

- Heol Crwys, Cwmavon, Desk Study Report, Report No. 14023/LP/22/DS dated March 2022
- Heol Crwys, Cwmavon, Coal Mining Risk Assessment, Report No. 14023/LP/22/CMRA dated July 2022.
- Heol Crwys, Cwmavon, Site Investigation Report, Report No. 14023/LW/23/SI dated November 2023.

The above referenced reports should be read in conjunction with this supplemental report in order to gain a detailed appraisal of the site.

This supplemental report presents the findings of the supplemental site investigation and gives recommendations for the design of foundations, floor slabs and other geotechnical and geoenvironmental aspects of the project.

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1.2 PROPOSED DEVELOPMENT

The development proposal include the construction of a number of low-rise residential properties with private gardens and areas of soft landscaping as illustrated in Spring Design Drawing Ref: 2575-525, dated January 2024.

The development will also include associated infrastructure such as access roads and car parking areas.

An extract of the proposed development plan is shown in Figure 3.

1.3 SCOPE OF WORKS

The desk study and previous site investigation information was used to make an initial assessment of the site and to design a supplemental site investigation to be carried out by Intégral Géotechnique (Wales) Limited.

The supplemental site investigation was designed in accordance with BS 5930:2015+A1:2020, the Code of Practice for Site Investigations, BS10175:2011+A2:2017, the Code of Practice for Investigation of Potentially Contaminated Sites, and 'Development of Land Affected by Contamination: A Guide for Developers' prepared by Welsh Local Government Association (WLGA)/Natural Resources Wales (NRW) Land Contamination Working Group, 2017.

The supplemental site investigation included:

- 13 No. machine excavated trial pits, 5 No. windowless sample boreholes, 3 No. cable percussion boreholes, and 12 No. rotary open hole boreholes during March 2024.
- Sampling of soil / fill for laboratory geotechnical testing.
- Sampling of groundwater for laboratory chemical testing.
- Monitoring for concentrations of methane, carbon dioxide, oxygen, hydrocarbon vapours and gas flow.
- In addition to the above works, during June 2024 and March 2025 (following demolition of the former buildings across the respective Phase 1 and 2 areas of the site) a series of additional soil samples were obtained for laboratory chemical testing.

1.4 LIMITATIONS

This document is intended to be a working document for further development in discussion with all concerned including the Local Planning Authority, Natural Resources Wales, and the relevant building control authority as appropriate.

"Contamination" is taken throughout the report to mean the "presence of one or more potentially harmful substances as a result of human activity". The use of the term in this way does not imply that harm is being or might be caused by the contamination. It should be noted that "contamination" can have different meanings under different regulatory regimes, for example, planning, building control and Part IIA of the Environmental Protection Act 1990. Naturally elevated concentrations of potentially harmful substances may also be of concern and the significance of any that have been found is also evaluated in this report.

It is important to recognise that there may be areas of contamination that have not been found, or that contaminants are present at concentrations above those that have been found. It is also important to recognise that contamination may be localised and that no investigation, however comprehensive, is capable of finding such occurrences other than by chance.

It should also be noted that vertical and lateral changes in ground conditions may be present between exploratory hole locations.

Access for the intrusive supplemental site investigation was partially limited at the time due to the presence of existing buildings, buried services, and areas of dense vegetation.

Following demolition of the existing buildings and breaking out of the floor slabs (across the Phase 1 and Phase 2 area of the proposed development), post demolition soil sampling was undertaken during June 2024 and March 2025.

2.0 THE SITE

2.1 SITE LOCATION AND DESCRIPTION

The site is located off Heol Crwys in Cwmavon, at a National Grid Reference of 278280, 192530, see Figure 1.

The site is irregular in shape and occupies an area of approximately 1.58 hectares. The boundaries of the site are defined by Heol Crwys to the north, existing residential properties to the southwest, east, and southeast, Heol Jiwbili to the south and undeveloped land to the northeast.

A site plan is presented in Figure 2.

The elevation of the site varies from an approximate maximum 54m AOD in the north (adjacent to Heol Crwys), to an approximate minimum of 43m AOD in the south (adjacent to Heol Jiwbili).

The site comprises a developed elevated plateau area (accessed off Heol Crwys) surrounded by undeveloped vegetated slopes. A public footpath cuts through the centre of the site, connecting Heol Crwys to the north to the lower lying Heol Jiwbili to the south.

The elevated plateau area is occupied by numerous single storey residential properties accessed off Heol Crwys. The properties each have small private garden areas which are secured with low picket fencing. A number of trees are sporadically located within the developed area of the site. A small electric substation is located adjacent to the properties within the northeast area.

The elevated plateau area is bounded by undeveloped vegetated slopes of varying heights and gradients that typically fall towards the south and southeast, but locally towards the southwest. The slope is retained by a brick wall along the southeast edge of the site at the at the boundary with several existing residential properties.

During the supplementary site investigation works carried out in March 2024, the majority of the residential properties were vacant, however, the demolition of the properties had not commenced. Vegetation removal had locally been undertaken on the crest and toe of the slopes to accommodate the intrusive investigation.

During the post demolition soil sampling carried out in June 2024 and March 2025, demolition and site clearance works had been completed across the eastern (Phase 1) and western (Phase 2) areas of the site respectively.

2.2 SITE OPERATIONS

The southern and eastern slopes of the site remain undeveloped.

2.3 SURROUNDING LAND USE

The surrounding areas are mainly developed for residential use. A public house is located beyond Heol Crwys to the north of the site.

2.4 AVAILABLE SITE INVESTIGATION DATA

There is no available site investigation data to our knowledge.

2.5 CONSULTATIONS WITH REGULATORS

The Local Authority has not been contacted at this stage.

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

3.1 RISK ASSESSMENT FRAMEWORK

In order to be consistent with current UK government policies and legislation, it is necessary to identify, assess, estimate, evaluate, and take appropriate action to deal with land contamination, in accordance with the procedures specified in the Environment Agency guidance Land Contamination Risk Management (LCRM) published in October 2020. This replaces the now withdrawn 'Model Procedures for the Management of Land Contamination CLR-11' (Environment Agency 2004).

The risk assessment process is designed to provide a reasoned, structured and pragmatic mechanism for the identification of any potential human health and controlled waters risks associated with land contamination and where necessary to develop a robust remediation strategy to ensure protection of the sensitive receptors (human health of future residents, controlled waters, etc).

In accordance with LCRM, the term 'land contamination' is defined as:

- All land affected by contamination – land that might have contamination present which may, or may or may not, meet the statutory definition of contaminated land,
- Land determined as contaminated land under Part 2A of the Environmental Protection Act 1990.

LCRM provides a tiered approach to risk assessment, comprising a preliminary risk assessment (including the development of an initial conceptual site model), a generic quantitative risk assessment and a detailed quantitative risk assessment. For each tier of risk assessment, the following steps must be followed:

1. Identify the hazard - establish contaminant sources,
2. Assess the hazard – use a source-pathway-receptor linkage approach to determine if there is potential for unacceptable risk,
3. Estimate the risk – predict what degree of harm or pollution may result and how likely it is to occur, and
4. Evaluate the risk – decide whether a risk is unacceptable.

LCRM also provides definitions of the following terms:

- Hazard – a property or situation that in particular circumstances could lead to harm or pollution,

3.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

- Risk – a combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence,
- Risk assessment – the formal process of identifying, assessing and evaluating the health and environmental risks that may be associated with a hazard,
- Risk management – the formal process to identify, assess and determine the risks, and to select and take action to mitigate them.

The three essential elements to any risk are defined by LCRM as follows:

- A contaminant, or pollutant, that is in, on, or under the land and that has the potential to cause harm, or pollution (Source)
- A route by which a receptor is, or could be affected by a contaminant (Pathway)
- A receptor, i.e. something that could be adversely affected by a contaminant, for example a person, controlled waters, an organism, an ecosystem, or Part 2A receptors such as buildings, crops or animals (Receptor).

In order for there to be a potential risk, all three of the above elements must be present. If there is a source of contamination and a receptor (for example a resident or site user), then there is only a potential risk if there is a pathway linking the two. Such an active pathway is known as a relevant pollutant linkage. It is possible for the same contaminant to be linked to a receptor via a number of pathways, and hence it is important that all relevant pollutant linkages, to both human health and controlled waters, are separately identified on a site in order that a comprehensive conceptual model can be formed and ultimately a robust remediation strategy designed.

Current practice during Generic Quantitative Risk Assessment of land affected by contamination is to use generic soil screening values based on the appropriate proposed end use. These usually comprise risk based Soil Guideline values (SGVs) or Generic Assessment Criteria (GACs) derived by the Environment Agency's Contaminated Land Exposure Assessment Model (CLEA). The SGVs and the supporting technical guidance were developed in order to assist in the assessment of long term risk to human health from the exposure to contaminated soils.

Revised Statutory Guidance, published in 2012, to support Part 2A of the Environmental Protection Act 1990, introduced a new four category system for classifying land under Part 2A. Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is considered to be acceptably low. Under Part 2A, land would be determined as contaminated if it falls within Categories 1 or 2.

3.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

The revised Part 2A Statutory Guidance was accompanied by an Impact Assessment that identified a role for new 'Category 4 Screening Levels' (C4SLs) that would provide a simple test for determining when land is suitable for use and definitely not contaminated land. A Policy Companion Document including the C4SLs was published in March 2014 (England) and May 2014 (Wales).

The C4SLs have been based on the CLEA methodology and derived using the CLEA model, with modified toxicological and exposure parameters. To date, C4SLs have been released for six substances (arsenic, cadmium, chromium (VI), lead, benzo(a)pyrene and benzene).

The C4SLs have been derived on the assumption that where they exist, they will be used as generic screening criteria within generic quantitative risk assessment.

Following publication of the C4SLs, Land Quality Management (LQM), in conjunction with the Chartered Institute for Environmental Health (CIEH) released Suitable 4 Use Levels (S4ULs) in January 2015.

The S4ULs have been derived in accordance with UK legislation, and using a modified version of the Environment Agency's CLEA software. As such, the S4ULs are based on the concept of minimal or tolerable risk as described in Human Health Toxicological Assessment of Contaminants in Soil (Science Report SR2, Environment Agency 2009a).

S4ULs have been derived for a wider number of substances.

In addition to the existing SGVs, C4SLs and S4ULs, Atkins ATRISK^{soil} also provide a set of Soil Screening Values. These are currently intended to be used in conjunction with SGVs, although they intend to update these values in line with the C4SLs in due course.

We have reviewed all sets of values and intend to use the most appropriate assessment criteria as Tier 1 screening values in the first instance. Where a published S4UL is available, and considered appropriate, this will be used in the first instance.

3.2 CONCEPTUAL MODEL FRAMEWORK

The preliminary stage of the risk assessment process is to develop and define a conceptual site model, based on the desk study and any existing site investigation data. This is used to establish any potential contaminant sources, identify existing and future receptors and assess if there are any potentially active pathways by which a potential risk may be present.

The preliminary conceptual site model will be developed and refined as site specific data is gathered, such as actual ground conditions and chemical data, resulting in a more robust conceptual understanding of the site.

3.3 CRITICAL SENSITIVE RECEPTOR – HUMAN HEALTH

The proposed redevelopment of the site is for a residential end use. Therefore, as detailed in the previously issued Desk Study Report, Report No. 14023/LP/22/DS, dated March 2022, the critical sensitive receptor from a human health perspective is an on-site residential receptor with homegrown produce.

In accordance with S4UL/C4SL and CLEA guidance for a standard residential scenario, the critical sensitive receptor for a residential end use risk assessment is a female child, with exposure from 0 to 6 years.

The standard residential end-use conceptual model defined by S4UL/C4SL and CLEA is assumed to be suitable for the purposes of this assessment.

3.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS

As detailed in the previously issued Desk Study Report, Report No. 14023/LP/22/DS, dated March 2022, the critical sensitive receptor from a controlled water perspective is considered to be groundwater within the Secondary ‘A’ Aquifer of the superficial deposits and the underlying bedrock strata South Wales Middle Coal Measures Formation.

By considering groundwater as the critical sensitive receptor for controlled waters, the groundwater/hydrogeological risk assessment will also be protective of any nearby surface water features.

3.5 POTENTIAL CONTAMINANT SOURCES

As detailed in the previously issued Desk Study Report, Report No. 14023/LP/22/DS, dated March 2022, the site has an industrial history with spoil mounds deposited across the site, tramways constructed (associated with the adjacent works and the colliery), and with works buildings encroaching onto the site.

The site was subsequently reclaimed and subject to earthworks in order to create a development plateau for the existing residential dwellings which have occupied the site from the 1970's up until the present day.

The potential types of contaminants of concern are listed below:

- Metals, semi-metals, and inorganics within the shallow made ground
- Polyaromatic hydrocarbons (PAH) within the shallow made ground
- Petroleum Hydrocarbons (VPH/EPH) within the shallow made ground
- Volatile and Semi Volatile Organic Compounds (VOC's/SVOC's)
- Polychlorinated Biphenyls (PCBs) within the shallow made ground in the vicinity of the electrical substation
- Asbestos within the shallow made ground and within the building fabric.

3.6 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways for the critical receptors (both human health and controlled waters) are listed below:

- Dermal contact with soil and/or soil derived dust
- Ingestion of soil and/or soil attached to home-grown produce
- Ingestion of home-grown produce
- Inhalation of soil derived dust
- Inhalation of vapours – indoor and outdoor air
- Leaching of contaminants from made ground to groundwater
- Transportation of contaminants within groundwater.

In addition, the following exposure pathways have also been considered:

- Ground gas generation and migration
- Building materials durability.

3.7 SUMMARY OF CONCEPTUAL EXPOSURE MODEL

A preliminary conceptual exposure model has been developed for the site. This is based on the findings of the desk study, historical review and site walk over and includes all potential sources, pathways and receptors that may be present on site. Those that have been identified as being potentially active require further investigation in the form of sampling and testing of soils and groundwater, followed by appropriate risk assessment.

The preliminary conceptual exposure model will be reviewed and refined following the completion of the site works and laboratory testing.

The preliminary conceptual exposure model is presented below in Table 1.

Table 1: Preliminary Conceptual Exposure Model

Source		Receptor	Pathway	Potentially Active Pathway?
Origin	Contaminant			
Made Ground of unknown origin and historical land uses	Metals, semi-metals, non-metals, PAH, TPH, VOC's/SVOC's, asbestos	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil and/or soil attached to home-grown produce	✓
			Ingestion of home-grown produce	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Metals, semi-metals, inorganics, PAH TPH, VOC's/SVOC's	Groundwater quality	Leaching from made ground	✓
	Metals, semi-metals, inorganics, PAH TPH, VOC's/SVOC's	Surface water quality	Transportation within groundwater	✓

3.7 SUMMARY OF CONCEPTUAL EXPOSURE MODEL (CONTINUED)

Table 1: Preliminary Conceptual Exposure Model

Source		Receptor	Pathway	Potentially Active Pathway?
Origin	Contaminant			
Hot spots/areas in the vicinity of the electrical substation	Polychlorinated Biphenyls (PCBs)	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil and/or soil attached to home-grown produce	✓
			Ingestion of home-grown produce	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Polychlorinated Biphenyls (PCBs)	Groundwater quality	Leaching from made ground	✓
	Polychlorinated Biphenyls (PCBs)	Surface water quality	Transportation within groundwater	✓
Asbestos containing materials within the building fabric	Asbestos Containing Material (ACM)	Resident – human health	Inhalation of dust/fibres	✓
Made Ground of unknown origin and natural ground	pH and water-soluble sulphate	Building Materials Durability	Direct contact	✓
Ground Gas – organic, gas producing materials present within site or adjacent to the site	Methane, carbon dioxide	Human health	Accumulation of gases in confined spaces, and/or migration off site, leading to asphyxiation, or risk of explosion	✓ Possible on and off-site sources

4.0 THE SITE INVESTIGATION

4.1 FIELDWORKS

A site investigation was designed in accordance with BS 5930:2015+A1:2020, the Code of Practice for Site Investigations, BS10175:2011+A2:2017, the Code of Practice for Investigation of Potentially Contaminated Sites, and 'Development of Land Affected by Contamination: A Guide for Developers' prepared by Welsh Local Government Association (WLGA)/Natural Resources Wales (NRW) Land Contamination Working Group, 2017.

The site investigation was also designed to provide information to support and refine the preliminary conceptual site model/conceptual exposure model.

4.1.1 Initial Site Investigation Works (September 2023)

An initial intrusive investigation comprising the drilling of 13 No. windowless sample boreholes and 1 No. hand dug trial pit was carried out during September 2023.

The windowless sample boreholes (referenced WS01 to WS10, WS05A, WS08A, and WS08B) were positioned across the existing developed area only, where access was available and drilled to a maximum depth of approximately 5.0m below existing ground level (bgl). In-situ strength testing (SPT/CPTs) was carried out in the windowless sample boreholes at regular intervals.

Falling head infiltration testing was carried out in selected windowless boreholes in order to assess/monitor the likely permeability of the ground.

The hand dug trial pit (referenced HD01) was positioned in the south-eastern area of the site where the historical maps indicate coke ovens encroached into the site. It should be noted that due to access constraints it was not possible to undertake any windowless sample boreholes in this area. The hand excavated trial pit was excavated to a refusal depth of approximately 0.60m bgl.

Representative soil samples were taken from the exploratory holes for laboratory chemical and geotechnical testing and placed in the appropriate sample containers deemed suitable for the analysis required. Strict protocols were adopted during this process to limit the cross contamination of samples.

The fieldworks were supervised by a qualified Geotechnical Engineer from Intégral Géotechnique (Wales) Limited who also logged the trial pits and windowless sample boreholes and prepared their detailed engineering logs.

4.1 FIELDWORKS (CONTINUED)

4.1.2 Supplemental Site Investigation Works (March 2024)

A supplemental intrusive investigation comprising 13 No. machine excavated trial pits, 5 No. windowless sample boreholes, 3 No. cable percussion boreholes, and 12 No. rotary open boreholes was undertaken during March 2024.

The trial pits (referenced TP01 to TP13) were positioned across accessible areas of the site and excavated to a maximum depth of approximately 3.9m bgl, using a 5-tonne tracked excavator.

The windowless sample boreholes (referenced WS101 to WS105) were positioned across the proposed development area and drilled to a maximum depth of approximately 5.0m bgl. In-situ strength testing (SPT/CPTs) was carried out in the windowless sample boreholes at regular intervals.

The purpose of the trial pits and windowless sample boreholes was to prove the shallow ground conditions and allow an assessment of the most appropriate foundation type for the proposed development.

The cable percussion boreholes (referenced BH01 to BH03) were positioned across the proposed development area, targeting the crest and toe positions of existing slopes, and drilled to a maximum depth of approximately 12.0m bgl. In-situ strength testing (SPT/CPTs) was carried out in the cable percussion boreholes.

The purpose cable percussion boreholes was to prove the deeper ground conditions and allow an assessment of the most appropriate foundation type for the proposed development.

Shallow and deep gas/groundwater monitoring standpipes were installed in the cable percussion boreholes. Following the installation of the standpipes, groundwater was sampled for laboratory chemical testing, and a programme of gas monitoring was commenced.

The rotary open hole boreholes (referenced PH01 to PH12) were positioned across the proposed development area and drilled to a maximum depth of 37.0m bgl. The purpose of the rotary open hole boreholes was to investigate the deeper ground conditions and to assess the presence, or otherwise, of any shallow coal seams and/or any shallow unrecorded underground mine workings beneath the site.

4.1 FIELDWORKS (CONTINUED)

Representative soil samples were taken from the supplemental exploratory holes for laboratory geotechnical testing and placed in the appropriate sample containers deemed suitable for the analysis required.

The fieldworks were supervised by a qualified Geotechnical Engineer from Intégral Géotechnique (Wales) Limited who also logged the trial pits, windowless sample boreholes and cable percussion boreholes, and prepared their detailed engineering logs.

Note that the strata descriptions relating to the rotary probeholes (drilled using open hole methods) are based on the lead driller's description of the flushed arisings (drill cutting returns).

The approximate locations all exploratory holes (from both the 2023 site investigation and the recent 2024 supplemental site investigation) are shown in Figure 2.

Copies of the exploratory hole logs are presented in Appendices A, B, C and D. The results of the previous 2023 falling head infiltration testing are presented in Appendix E.

4.1.3 Additional Soil Sampling (June 2024)

Following demolition of the buildings and breaking out of the floor slabs and areas of hardstanding across the Phase 1 development area a series of soil samples were taken from across the exposed formations. These samples are referred to as S3 to S8, the locations of which are shown in Figure 2a.

Visual contamination checks were also undertaken across the exposed post-demolition formations.

Several additional soil samples were also obtained from the areas of former coke ovens (in the south of the site) and the area where part of a historical copper works is indicated to have encroached upon the far eastern area of the site. These samples are referred to as S1, S2, S9 and S10, the locations of which are shown in Figure 2a.

The site works were carried out by a qualified asbestos awareness trained Geotechnical Engineer from Intégral Géotechnique (Wales) Limited.

4.1 FIELDWORKS (CONTINUED)

4.1.4 Additional Soil Sampling (March 2025)

Following demolition of the buildings and breaking out of the floor slabs and areas of hardstanding across the Phase 2 development (Western) area a series of soil samples were taken from across the exposed formations. These samples are referred to as S11 to S14 inclusive, the locations of which are shown in Figure 2a.

Visual contamination checks were also undertaken across the exposed post-demolition formations.

The site works were carried out by a qualified asbestos awareness trained Geotechnical Engineer from Intégral Géotechnique (Wales) Limited.

4.2 FIELD OBSERVATIONS

Made ground was encountered across the site . The made ground contains anthropogenic material such as colliery spoil, slag material (including fused slag), concrete, brick, ash, clinker etc.

It should be noted that a number of exploratory holes encountered hard dig / drilling conditions as a result of encountering large buried boulders of suspected fused slag.

No visual or olfactory evidence of any gross contamination was observed.

4.3 LABORATORY CHEMICAL TESTING

As part of the initial 2023 site investigation works, a number of representative soil samples were taken from windowless sample boreholes (and hand dug trial pits) across the site, stored at the appropriate temperature and dispatched to the laboratories of i2 Analytical for laboratory chemical testing within 24 hours.

The samples were tested for a range of contaminants that reflects the historical use of the site, the findings of the desk study and the preliminary conceptual site model/conceptual exposure model.

A list of the chemical testing carried out is given below:

Beryllium	Cadmium
Total Chromium	Hexavalent Chromium (VI)

4.3 LABORATORY CHEMICAL TESTING (CONTINUED)

Copper	Lead
Mercury	Nickel
Vanadium	Zinc
Arsenic	Boron
Selenium	Elemental Sulphur
Total Cyanide	Total Sulphate
Sulphide	Water Soluble Sulphate
pH	Monohydric Phenol
Polyaromatic Hydrocarbons (PAH)	Asbestos screen

In addition to the above, the post demolition representative soil samples and the soils samples obtained from the area of the former coke ovens and copper works were also tested for petroleum hydrocarbons (EPH/VPH) and volatile organic compounds (VOCs).

The soil samples obtained from the vicinity of an existing electrical substation was also tested for polychlorinated biphenyls (PCBs).

The results of the chemical testing of soils are presented in Appendix F.

Upon completion of the supplemental 2024 cable percussion drilling works, a programme of groundwater sampling and testing was commenced. Groundwater was sampled from each of the deep standpipe installations. The samples were dispatched to the laboratories of i2 Analytical and tested for the same elements/compounds as the soils (with the exception of asbestos), with the addition of petroleum hydrocarbons, volatile organic compounds (VOCs) and semi volatile organic compounds (SVOCs).

The results of the chemical testing of groundwater are presented in Appendix G.

4.4 LABORATORY GEOTECHNICAL TESTING

Representative samples of the made ground were dispatched to the UKAS accredited laboratory of GSTL.

A list of the geotechnical testing carried out is given below:

- Moisture Content
- Atterberg Limits
- Optimum Compaction (2.5kg rammer)
- Consolidation Drained Peak Shear Strength

4.4 LABORATORY GEOTECHNICAL TESTING

- Slag Expansion

The result of the geotechnical testing is presented in Appendix H.

4.5 IN-SITU GAS AND GROUNDWATER LEVEL MONITORING

Gas and groundwater monitoring standpipes were installed in each of the cable percussion boreholes (BH01 to BH03). Two standpipes were installed in each borehole (i.e., a shallow standpipe, and a deep standpipe).

A summary of the standpipe installations is provided below in Table 2.

Table 2: Summary of Standpipe Installations

Standpipe Reference	Base Depth (m)	Response Zone (m)
BH01 (shallow)	3.0	1.0 to 3.0
BH01 (deep)	10.1	8.5 to 10.1
BH02 (shallow)	3.0	1.0 to 3.0
BH02 (deep)	12.0	4.0 to 12.0
BH03 (shallow)	3.0	1.0 to 3.0
BH03 (deep)	6.2	4.0 to 6.2

A programme of ground gas and groundwater level monitoring was commenced on 24 April 2024 and completed on 10 July 2024.

During each monitoring visit, the groundwater levels were dipped and the concentration levels of methane, carbon dioxide and oxygen were measured in the standpipes using a GA5000 Landfill Gas Analyser. In addition, gas flow rate and the atmospheric pressure at the time of the field measurements were also recorded.

Gas monitoring has been carried out over a range of atmospheric pressures to include at least one reading in low and/or falling pressure, in accordance with the recommendations made in CIRIA Report C665.

The results of the gas and groundwater level monitoring are presented in Appendix I.

5.0 GROUND CONDITIONS

The ground conditions encountered beneath the site comprised a considerable thickness of made ground over superficial deposits, over the South Wales Middle Coal Measures.

5.1 TOPSOIL / DISTURBED TOPSOIL

A veneer of topsoil was encountered at the majority of the exploratory locations undertaken across the site. The topsoil generally comprised of very soft to soft brown sandy locally organic clay with roots and rootlets.

The topsoil was often disturbed and contained fragments of ash, clinker, timber and concrete etc.

The topsoil/disturbed topsoil was encountered at thicknesses of typically 0.1m/0.3m.

5.2 MADE GROUND

Made ground was encountered at each exploratory location and was either encountered directly beneath the topsoil/disturbed topsoil or alternatively from ground level.

The base of the made ground was not proven within the trial pits or windowless sample boreholes.

Within cable percussion borehole BH01 (located at the toe of the slope in the southern area of the site), the base of the made ground was recorded at a depth of approximately 8.0m bgl.

Within BH02 located at the crest of the slope in the eastern area of the site, the base of the made ground was not proven, with the borehole terminating at a depth of approximately 12.0m bgl on a buried obstruction / suspected boulder.

Within borehole, BH03 located at the crest of the slope in the western area of the site, the base of the made ground was not proven, with the borehole terminating at a depth of approximately 6.2m bgl on a buried obstruction / suspected boulder.

Within the rotary open hole boreholes, the base of the made ground was typically recorded at depths ranging between approximately 7.3m and 13.8m bgl. However, it should be noted that when using an open hole rotary technique, it is difficult to distinguish between the made ground or any, reworked ground to the underlying superficial deposits.

5.2 MADE GROUND (CONTINUED)

Although variability was noted within the made ground, the deposits are predominantly granular in nature varying in density between loose, locally very loose, loose to medium dense, medium dense and locally dense. The deposits are typically described as dark brown to black silty sandy clayey gravel or locally gravelly sand.

The gravel constituent typically comprised of ash, clinker, coke, coal, shale, slag (vesicular and fused), sandstone etc.

The made ground was noted to contain a variable cobble and boulder content. Where encountered the boulders typically comprised fused slag.

Although the made ground deposits are predominantly granular, some layers of cohesive materials (i.e., silt and clay) are also present.

It should be noted that during the excavation of the trial pits, instability was often encountered and varied from minor spalling to collapse and overbreak of trial pit sides.

Fused slag was encountered within some exploratory locations. The fused slag was difficult to drill and/or excavate through and where encountered the boreholes and trial pits often refused.

In-situ SPT testing undertaken within the windowless sample boreholes and cable percussion boreholes indicate highly variable uncorrected SPT N values ranging between 0 and >50. It should be noted that artificially high SPT N values have often been recorded due to the presence of obstructions, boulder cobbles, fused slag etc. within the made ground deposits.

5.3 SUPERFICIAL DEPOSITS

The made ground is underlain by superficial deposits.

It should be noted that samples of the superficial deposits were only obtained from cable percussion borehole BH01.

Within BH01, the superficial deposits were encountered at a depth of approximately 8.0m bgl and proven to extend down to a depth of 10.1m bgl. The superficial deposits encountered within BH01, where recorded as very dense brown grey very sandy gravel and cobbles of sandstone.

5.3 SUPERFICIAL DEPOSITS (CONTINUED)

In-situ SPT testing undertaken within the borehole, indicate SPT 'N' values of >50.

The rotary open hole boreholes recorded the base of the superficial deposits at depths of between approximately 16m and 20m bgl.

According to the driller's description for the rotary boreholes, the superficial deposits consist of a combination of silt, clay, sands and gravels. The results of the rotary open hole boreholes are further discussed in Section 5.2, below.

5.4 BEDROCK STRATA

A total of 12 No. rotary open hole boreholes were drilled across the proposed development area to a maximum depth of 37.0m bgl.

The rotary open hole boreholes were drilled to profile the depth of bedrock and investigate the presence of any shallow coal seams and/or any associated shallow unrecorded shallow mine workings.

As previously stated, it should be noted that when using an open hole rotary technique, it is difficult to distinguish between made ground, reworked ground, superficial deposits and weathered bedrock.

The rotary open boreholes generally encountered rockhead at depths of between approximately 16.0m and 20.0m bgl.

According to the driller's description, the encountered bedrock typically comprised mudstone with some siltstone and locally bands of sandstone.

Intact coal seams were encountered within all of rotary boreholes, at the following depths:

- RC01 between 16.4m and 17.3m (0.9m thick)
- RC02 between 24m and 25.5m (1.5m thick)
- RC03 between 19.2m and 19.5m (0.3m thick) and between 34.3m and 35.8m (1.5m thick)
- RC04 between 32m and 32.4m (0.4m thick) and between 33.4m and 33.9m (0.5m thick)
- RC05 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)

5.4 BEDROCK STRATA (CONTINUED)

- RC06 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)
- RC07 between 21m and 21.5m (0.5m thick) and between 23.5m and 25m (1.5m thick)
- RC08 between 22.5m and 23.5m (1m thick, with mudstone bands) and between 26.6 and 27m (0.4m thick)
- RC09 between 22.1m and 22.9m (0.8m thick)
- RC10 between 33.8m and 34.6m (0.8m thick)
- RC11 between 29m and 30.5m (1.5m thick)
- RC12 between 18m and 18.9m (0.9m thick), between 20m and 21.5m (1.5m thick) and between 31.1m and 31.3m (0.2m thick)

All coal seams were encountered as intact, and no soft drill, loss of flush or void/mine workings were encountered in the rotary open hole boreholes.

5.5 GROUNDWATER

During the 2023 initial site investigation, groundwater was not encountered within windowless sample boreholes.

During the recent supplementary site investigation, groundwater was encountered within the following locations, as summarised in Table 3.

Table 3: Summary of Groundwater Depths During Intrusive Investigation

Exploratory Location	Depth to Groundwater Strike (m bgl)	Comment	Strata
BH01	9.0	Strike	Superficial Deposits
RC01	10.2	Strike	Superficial Deposits
RC02	15.5	Strike	Superficial Deposits
RC03	15.3	Strike	Superficial Deposits
RC04	16.2	Strike	Superficial Deposits
RC05	11.7	Strike	Superficial Deposits
RC06	15.0	Strike	Superficial Deposits
RC07	15.1	Strike	Superficial Deposits
RC09	16.1	Strike	Superficial Deposits
RC10	15.0	Strike	Superficial Deposits
RC11	21.5	Strike	Bedrock
RC12	10.5	Strike	Bedrock

5.5 GROUNDWATER (CONTINUED)

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

Groundwater levels were also measured during visits to site to sample groundwater and monitor ground gas. The shallowest groundwater level during the site visits is provided in the summary below in Table 4. The depth to groundwater has been converted to a groundwater level with respect to ordnance datum.

Table 4: Summary of Groundwater Levels During Monitoring Visits

Borehole	Depth to Groundwater (mbgl)	Approximate Ground Level (mAOD)	Approximate Groundwater Level (mAOD)
BH01 (deep install)	8	53.7	45.7
BH02 (deep install)	Dry	n/a	n/a
BH03 (deep install)	Dry	n/a	n/a

5.6 GEOTECHNICAL TEST RESULTS

The results of the geotechnical testing on samples of the made ground are presented in Appendix H and a summary is provided below.

The results of the swelling potential on samples of the slag indicates a swelling potential of between 0.15% and 0.16%. The result indicate a negligible potential swelling potential.

The results of the Atterberg Limit testing indicates that the made ground is non-plastic.

Optimum compaction tests were undertaken on bulk disturbed samples of the made ground. The results indicate optimum moisture content values ranging between 8.3% and 11%. The corresponding maximum dry density values ranged between 1.77 to 1.87 Mg/m^3. Natural moisture content values ranging between 18% and 22% were recorded, indicating the made ground materials are currently over-wet for optimum compaction. The results are summarised below in Table 5.

5.6 GEOTECHNICAL TEST RESULTS (CONTINUED)

Table 5: Summary of Optimum Compaction Testing

Sample Reference	Depth (m bgl)	Initial Moisture Content (%)	Optimum Moisture Content (%)	Max Dry Density (Mg/m^3)
TP02	1.5	18	11	1.80
TP04	1	18	11	1.77
TP04	3	18	8.3	1.86
TP06	1	21	9.1	1.87
TP08	2.2	21	11	1.83
TP11	1.5	22	8.5	1.88

Drained shear strength tests were undertaken on remoulded bulk disturbed samples of the made ground. The results yielded effective friction angles ranging between 44 and 47.5 degrees, and effective cohesion values ranging between 2 and 17 kPa. The results are summarised below in Table 6.

Table 6: Summary of Drained Shear Strength Testing

Sample Reference	Depth (m bgl)	Effective Friction Angle (ϕ)	Effective Cohesion (kPa)
TP02	1.50	44	2
TP08	2.20	45	17
TP11	1.50	47.5	17

It should be noted that due to the disturbed nature of the as recovered soil samples, and the requirement to compact the material in order to undertake the tests, is considered that the results of the laboratory shear strength testing are unrepresentative, artificially high. The results do not correlate closely with physical observations of the in-situ material and the results of the in-situ SPT testing.

5.7 SOIL INFILTRATION TEST RESULTS

During the 2013 initial site investigation, falling head soil infiltration testing was undertaken within three of the windowless sample boreholes (WS03, WS05 and WS09).

The windowless sample boreholes were filled with clean water and the water level was monitored over a period of time.

Within windowless sample borehole WS03 and WS09, the infiltration stalled at a depth of 1.0m and 1.72m respectively and therefore no infiltration could be calculated for either location.

5.7 SOIL INFILTRATION TEST RESULTS (CONTINUED)

Within windowless sample borehole WS05, an infiltration rate of 4.74×10^{-4}m/s was calculated.

It should be noted that each falling head test was undertaken within the made ground deposits as natural soils deposits were not encountered within the depth of the windowless sample boreholes.

It should be noted that the results are specific to the tested locations and depths.

6.0 CONTAMINATION

6.1 AVERAGING AREAS

In order to assess the laboratory test results reliably and in context, the data have been grouped into an averaging area. An averaging area (or area of interest) is that area of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions. This may be an area of historical industrial usage, a soil type, or a specific proposed end use.

In the case of this analysis, the averaging area has been determined according to the proposed residential end use.

6.2 SOIL CONTAMINATION

The Suitable 4 Use Levels (S4ULs) published by LQM have been adopted as critical concentrations against which soil contaminant concentrations can be compared. In the absence of additional published S4ULs, the Category 4 Screening Levels (C4SLs) derived by DEFRA and Soil Screening Values (SSVs) derived by Atkins ATRISK^{soil} for a residential with home grown produce end use have been adopted, where considered appropriate.

Since the results of the testing indicate total organic carbon content (TOC) in the range of 2.4% to 7.1%, the results have been compared to the respective guidelines, where applicable, for 2.5% soil organic matter content.

With regards to polychlorinated biphenyls (PCBs), the current RIVM intervention values for PCBs (sum 7) based on a residential scenario of 0.39mg/kg has been considered appropriate.

The soil test results for the topsoil/disturbed topsoil and made ground (including the post demolition sampling) have been summarised separately and are shown in Appendix J and K respectively.

6.2.1 Topsoil/Disturbed Topsoil

During the 2023 initial site investigation a total of five samples of the topsoil/disturbed topsoil were tested for contamination.

The results of the laboratory testing indicate that most of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds. However, the initial screening indicates exceedances of arsenic, beryllium, lead and mercury.

6.2 SOIL CONTAMINATION (CONTINUED)

Arsenic was detected at elevated concentrations in two samples (from WS02 and WS03) at concentrations of 46mg/kg and 65mg/kg respectively, elevated above the adopted threshold of 37mg/kg.

Beryllium was detected at an elevated concentration within one sample from WS05 at an elevated concentration of 1.8mg/kg, marginally elevated above the adopted threshold of 1.7mg/kg.

Lead was detected at an elevated concentration within one sample from WS02 at an elevated concentration of 310mg/kg, elevated above the adopted threshold of 200mg/kg.

Mercury was detected at an elevated concentration within one sample from WS03 at an elevated concentration of 1.5mg/kg, elevated above the adopted threshold of 1.2kg/mg.

Asbestos was not detected within the screened samples.

6.2.2 Made Ground (Initial 2023 Testing)

During the initial 2023 site investigation, a total of nine samples of made ground were obtained from across the site and tested for contamination.

The results of the laboratory testing indicate that most of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds. However, the initial screening indicates exceedances of arsenic, copper and lead.

Arsenic was detected at an elevated concentrations within eight of the samples at concentrations of between 47mg/kg and 420mg/kg, elevated above the adopted threshold of 37mg/kg.

Copper was detected at an elevated concentration within one sample from WS09 at a concentration of 2,900mg/kg, elevated above the adopted threshold of 2,400mg/kg.

Lead was detected at elevated concentrations within four of the samples at concentrations of between 280mg/kg and 900mg/kg, elevated above the adopted threshold of 200mg/kg.

Asbestos fibres, consisting of loose chrysolite fibres were detected in one sample from WS09. The asbestos fibres were detected at <0.001% asbestos by weight.

6.2 SOIL CONTAMINATION (CONTINUED)

6.2.3 Made Ground (Supplemental 2024 Testing)

During the supplemental 2024 site investigation, ten additional samples of made ground were obtained from across the site and tested for contamination.

The results of the supplemental laboratory testing indicate that most of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds. However, the initial screening indicates exceedances of arsenic, beryllium, copper and lead.

Arsenic was detected at elevated concentrations within five of the samples at concentrations of between 51mg/kg and 370mg/kg, elevated above the adopted threshold of 37mg/kg.

Beryllium was detected at an elevated concentration within one sample from S10 at a concentration of 2.8mg/kg, elevated above the adopted threshold of 1.7mg/kg.

Copper was detected at an elevated concentration within one sample from S2 at a concentration of 3300mg/kg, elevated above the adopted threshold of 2400mg/kg.

Lead was detected at elevated concentrations within four samples at concentrations of between 230m/kg and 330mg/kg, elevated above the adopted threshold of 200mg/kg.

Asbestos fibres were not encountered within any of the screened soil samples.

Soil samples S1, S2, S9 and S10 were also tested for petroleum hydrocarbons and volatile organic compounds (VOCs). Samples S1 and S2 were obtained from the northeastern area of the site at or near the location of the historical copper works and soil sample S9 and S10 were obtained from the southeast at the location of the historic coke ovens.

The results of the laboratory testing indicate that the analysed petroleum hydrocarbon bands are either detected at concentrations below the appropriate thresholds or below the laboratory limits of detection.

The results of the VOC testing indicates that the analysed compounds are all below the laboratory limits of detection.

6.2 SOIL CONTAMINATION (CONTINUED)

Soil sample S3, located near/within the vicinity of the existing small substation was further tested for PCBs. However, it should be noted that the small substation is to retained onsite.

The results of the laboratory testing for PCB 7 congeners indicate that the concentrations of the analysed PCB congeners are below the laboratory limit of detection and therefore the concentrations are below the appropriate residential threshold.

6.2.4 Made Ground (Supplemental 2025 Testing)

During the supplemental 2025 site investigation, four additional samples of made ground were obtained from across the western (Phase 2) site area and tested for contamination.

The results of the supplemental laboratory testing indicate that most of the analysed chemical elements or compounds are present at concentrations below the appropriate thresholds. However, the initial screening indicates exceedances of arsenic and lead. trichlorofluoromethane (CFC-11) was also detected above the laboratory limit of detection. Additionally, asbestos was also detected within one sample.

Arsenic was detected at elevated concentrations within three of the four tested samples (S11, S12 and S14) at concentrations of between 50mg/kg and 95mg/kg, elevated above the adopted threshold of 37mg/kg.

Lead was detected at elevated concentrations within two samples (S12 and S13) at concentrations of 590m/kg and 740mg/kg, elevated above the adopted threshold of 200mg/kg.

Asbestos was also detected within sample S14 at 0.3m depth. Amosite and Chrysotile (loose fibres and fibrous debris) were detected at a quantification value of 0.002% weight by sample mass.

In addition to the above contaminants, trichlorofluoromethane (CFC-11) was detected in soil sample S14 at a concentration of 240 µg/kg, which is above the laboratory limit of detection.

While there are currently no published generic assessment criteria or threshold values for this compound, a site-specific screening value (SSSV) of 2860µg/kg has been derived based on a residential end-use scenario with homegrown produce.

6.2 SOIL CONTAMINATION (CONTINUED)

The measured concentration of 240µg/kg falls well below the calculated SSSV of 2860µg/kg, and as such, the presence of trichlorofluoromethane is not considered to pose a significant risk to future site users.

The results of the CLEA modelling and outline of the parameters used are presented in Appendix P.

6.2.5 In-situ Natural Ground

No visual or olfactory evidence of contamination of the in-situ natural ground was identified during the drilling of the cable percussion boreholes and rotary open hole boreholes. At the time of writing this report no samples of natural ground had been tested. It is considered likely that concentrations of determinants within the natural ground are likely to be naturally occurring and as such, the natural ground poses no significant threat to human health or the environment.

6.3 GROUNDWATER CONTAMINATION

As part of a 'Tier 1' screening exercise, the results groundwater analysis has been compared against the Annual Average Environmental Quality Standards (AA-EQS) for freshwaters in the first instance. Where no AA-EQS values are available, the results have been compared against the Maximum Allowable Concentration Environmental Quality Standards (MAC-EQS) for freshwaters. Where no EQS values are available, the results have been compared against the UK and WHO drinking water standards, in hierarchical order.

It should be noted that it was not possible to obtain groundwater samples from BH02 and BH03 as the wells installed within these boreholes were recorded as dry.

The groundwater sample from BH01 was obtained from the groundwater within the superficial deposits.

During the initial and recent supplementary investigation, there was no evidence of a persistent shallow / perched groundwater body within the made ground.

A summary of the groundwater test results and comparison with the screening criteria values is presented in Appendix L.

6.3 GROUNDWATER CONTAMINATION (CONTINUED)

The majority of the results were below the laboratory detection limits, or the relevant published guideline values. However, some exceedances of copper and nickel have been recorded.

In Round 1 of the testing the following exceedances were detected:

- Copper was recorded at a concentration of 5.3ug/l, elevated above the AA-EQS threshold of 1ug/l. It should be noted that the concentration is significantly below the UKDWS of 2,000ug/l.
- Nickel was recorded at a concentration of 6.2ug/l, elevated above the AA-EQS threshold of 4ug/l. The concentration of nickel was below the MAC-EQS of 34ug/l and the UKDWS of 20ug/l.

In Round 2 of the testing the following exceedances were detected:

- Copper was recorded at a concentration of 7.6ug/l, elevated above the AA-EQS threshold of 1ug/l. It should be noted that the concentration is significantly below the UKDWS of 2,000ug/l.
- Nickel was recorded at a concentration of 6.2ug/l, elevated above the AA-EQS threshold of 4ug/l. The concentration of nickel was below the MAC-EQS of 34ug/l and the UKDWS of 20ug/l.

In Round 3 of the testing the following exceedance were detected:

- Copper was recorded at a concentration of 7ug/l, elevated above the AA-EQS threshold of 1ug/l. It should be noted that the concentration is significantly below the UKDWS of 2,000ug/l.
- Nickel was recorded at a concentration of 6.5ug/l, elevated above the AA-EQS threshold of 4ug/l. The concentration of nickel was below the MAC-EQS of 34ug/l and the UKDWS of 20ug/l.

All organic contaminants (PAHs and petroleum hydrocarbons) and SVOCs/VOCs were recorded at concentrations below the laboratory detectable limits during each monitoring round.

With regards to copper and nickel in groundwater, ‘Predicted No-Effect Concentrations’ PNECs have been calculated utilising the Water Framework Directive M-BAT Tool and measured values of pH, DOC and calcium. The results are presented in Appendix M.

6.3 GROUNDWATER CONTAMINATION (CONTINUED)

Based on the three rounds of groundwater testing undertaken, PNEC values of between 1.46ug/l and 10.46ug/l have been calculated for copper. Only copper concentrations detected within the first and third round of testing remain elevated above their respective PNECs.

Based on the three rounds of groundwater monitoring undertaken, PNEC values of between 13.39ug/l and 16.04ug/l have been calculated for nickel. The nickel concentrations recorded within each round of testing are below their respective PNECs.

6.4 GROUND GASES

Ground gas was monitored on a fortnightly basis using a GA5000 Gas Analyser. The results of the gas monitoring programme are included in Appendix I. A summary of the results is given in the following Table 7.

Table 7: Summary of Ground Gas Results

Borehole	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Oxygen Concentration (%)	Gas Flow Rate (l/hr)
BH01	<0.5	0.3	19.5	<0.3
BH02	<0.5	1.4	19.2	<0.3
BH03	<0.5	0.2	19.3	<0.3

The results show a maximum methane concentration of <0.5% and a maximum carbon dioxide concentration of 1.4%. A maximum gas flow rate of <0.3l/hr was measured during the gas monitoring programme.

In addition to the above, carbon monoxide, hydrogen sulphide and volatile organic compound concentrations are also measured. Results indicated the general absence of carbon monoxide, hydrogen sulphide and volatile organic compounds.

7.0 REVISED CONCEPTUAL EXPOSURE MODEL

The preliminary conceptual exposure model has been reviewed and revised to reflect the findings of the site investigation and the results of the laboratory testing of soils, groundwater and gas monitoring. Pathways identified as a relevant pollutant linkage require appropriate risk assessment or mitigation measures (see Section 8).

Table 8: Revised Conceptual Exposure Model

Source		Receptor	Pathway	Preliminary Active Pathway? (see Sect. 5.7)	Relevant Pollutant Linkage	Justification/ Mitigation
Origin	Contaminant					
Topsoil/Disturbed Topsoil and Made Ground of unknown origin and historical land uses	Metals, semi-metals, non-metals, PAH, asbestos and locally petroleum hydrocarbons, VOCs and PCBs.	Resident – human health	Dermal Contact with made ground/dust	✓	✓	Elevated concentrations of arsenic, beryllium, lead and mercury within the topsoil/disturbed topsoil and elevated concentrations of arsenic, copper, beryllium, lead and asbestos within the made ground – risk assess.
			Ingestion of soil and/or soil attached to home-grown produce	✓	✓	
			Ingestion of home-grown produce	✓	✓	
			Inhalation of dust	✓	✓	
			Inhalation of vapours – indoor/outdoor	✓	X	No sufficiently volatile contaminants identified.
	Metals, semi-metals, inorganics, PAH	Groundwater quality	Leaching from made ground	✓	✓	Elevated concentrations identified within the topsoil/disturbed topsoil and made ground – risk assess.

7.0 REVISED CONCEPTUAL EXPOSURE MODEL (CONTINUED)

Source		Receptor	Pathway	Preliminary Active Pathway?	Relevant Pollutant Linkage	Justification/ Mitigation
Origin	Contaminant					
Topsoil/Disturbed Topsoil and Made Ground of unknown origin and historical land uses	Metals, semi-metals, inorganics, PAH, TPH, SVOCs/VOCs	Surface water quality	Transportation within groundwater	✓	✓	Elevated concentrations of copper within the groundwater - risk assess
Hot spots/areas in the vicinity of the electrical substation	Polychlorinated Biphenyls (PCBs)	Resident – human health	Dermal Contact with made ground/dust	✓	X	The small electrical substation is to retained and no elevated concentrations of PCBs detected within the vicinity of the substation.
			Ingestion of soil and/or soil attached to home-grown produce	✓	X	
			Ingestion of home-grown produce	✓	X	
			Inhalation of dust	✓	X	
	Polychlorinated Biphenyls (PCBs)	Groundwater quality	Leaching from made ground	✓	X	
	Polychlorinated Biphenyls (PCBs)	Surface water quality	Transportation within groundwater	✓	X	
Made Ground of unknown origin	pH and water soluble sulphate	Building Materials Durability	Direct contact	✓	✓	Building materials will be in contact with made ground – risk assess

7.0 REVISED CONCEPTUAL EXPOSURE MODEL (CONTINUED)

Source		Receptor	Pathway	Preliminary Active Pathway?	Relevant Pollutant Linkage	Justification/ Mitigation
Origin	Contaminant					
Ground Gas – organic, gas producing materials	Methane, carbon dioxide	Human health	Accumulation of gases in confined spaces, and/or migration off site, leading to asphyxiation, or risk of explosion	✓	✓	Potential gas producing materials present. Ground gas monitoring programme undertaken – risk assess

8.0 RISK ASSESSMENT

8.1 METHODOLOGY

The risk of pollution, health effects or environmental harm occurring as a result of ground contamination is dependent upon three principal factors:

- The scale of the contamination sources;
- The presence of sensitive “receptors”, eg Humans: health of the general public, site occupiers, redevelopment workers. Environment: flora, fauna, etc;
- The existence of migration pathways by which contaminants can reach the sensitive receptors.

This section assesses each of these factors in order to evaluate the overall level of risk and potential harm to receptors. The receptor may be human, a water resource, an eco-system or construction materials. Pathways connecting a perceived hazard to a receptor are referred to as exposure pathways.

The sources of contamination and the links connecting the hazards to the sensitive receptors will represent the basis for the risk assessment.

8.2 SOURCE-PATHWAY-RECEPTOR MODEL

The preliminary conceptual site model was based on the findings of the desk study. This was later reviewed and refined according to the findings of the site investigation, allowing for the ground conditions encountered and the results of laboratory testing of soil and groundwater. Any pathways considered to be inactive were removed from the model and all remaining potentially active pathways require risk assessment.

The pathways shown as potentially active in the Revised Conceptual Site Model in Section 9.0 above have been assessed below.

8.3 HUMAN HEALTH RISK ASSESSMENT

8.3.1 Site in its Present Condition

The site does not pose any risks to casual visitors or trespassers.

8.3 HUMAN HEALTH RISK ASSESSMENT (CONTINUED)

8.3.2 Future Site Users

The contamination test results record elevated concentration levels of arsenic, beryllium, lead and mercury within the in the topsoil/disturbed topsoil, and elevated concentrations of arsenic, copper, beryllium and lead within the made ground. Asbestos was also detected within the made ground.

Given the elevated concentrations within the topsoil/disturbed topsoil and made ground, along with the presence of asbestos within the made ground, it is considered that a potential risk to human health may exist via the following relevant pollutant linkages:

- Dermal contact
- Ingestion of soil or soil derived dust
- Ingestion of soil attached to homegrown produce
- Ingestion of homegrown produce
- Inhalation of soil bourn dust.

The inhalation of vapours pathways (indoor and outdoor air) are not considered to be active since the majority of contaminants of concern identified are not sufficiently volatile. Additionally, trichlorofluoromethane was detected below the adopted site specific screening value.

It is necessary to protect future site end users from the identified contamination within the made ground. This can be achieved by breaking the above listed relevant pollutant linkages thereby removing the potential risk.

In order to protect future site end users, it is considered the following remedial measures will be required:

- It is recommended that a capping layer, of a minimum thickness of 600mm, of inert imported subsoil and topsoil is placed above a high visibility geotextile membrane/anti-mixing layer in all private gardens and areas of soft landscaping. This would break all the above listed relevant pollutant linkages and removing the potential risk to future end users.

8.3 HUMAN HEALTH RISK ASSESSMENT (CONTINUED)

8.3.3 Construction Workers

With future site development works involving the excavation and removal of the topsoil/disturbed topsoil and the made ground, there would be a risk to workers from contaminants in the soils. Appropriate measures are therefore recommended for works involving the topsoil/disturbed topsoil and made ground materials which are known to be present beneath the site.

The following practical measures are required while excavating/re-using asbestos impacted made ground:

- Excavations will need to be regularly dampened down to prevent any dust that may contain asbestos becoming airborne
- Any excavated materials should be quarantined and regularly dampened down to prevent any dust that may contain asbestos becoming airborne
- Appropriate PPE to be worn by all workers and appropriate RPE when required
- Asbestos/dust/air monitoring
- All works to be carried out in accordance with the requirements of the Control of Asbestos Regulations 2012

Additionally, a system should be established by which any 'unusual' materials that may be encountered are reported rapidly to the site management, so that the appropriate action may be taken, following specialist advice if necessary. An unusual material may be identified on site by colour, odour or physical nature.

Given the nature and extent of the made ground encountered on site, routine checks should be made for the presence of ACM and handpicking of any occurrences. Any visual ACM should be handpicked by an appropriate qualified asbestos awareness trained operative. All picked ACMs will need to double bagged and disposed off-site at a suitable licensed facility as hazardous waste.

Normal good hygiene practices should be adequate to protect the health and safety of redevelopment workers, and should include:

- Minimum handling of materials
- Washing of hands prior to all meal breaks, which should be taken in a designated clean area
- The use of standard protective clothing such as boots and overalls and gloves, where considered relevant.

8.3 HUMAN HEALTH RISK ASSESSMENT (CONTINUED)

All excavations should be regularly checked for safe atmospheres.

In dry weather, inhalation of dust and gases should be avoided preferably by the use of dust suppression techniques to minimise fugitive emissions and minimisation of exposed materials at any particular time.

Reference should be made to the Health and Safety Executive document “Protection of Workers and the General Public during the development of contaminated land” for detailed guidance on these matters.

8.4 RISKS TO VEGETATION

The concentrations of phytotoxic contaminants in the shallow made ground materials, indicate the potential for adverse effects to vegetation. Similarly, the physical nature of the existing made ground does not provide a suitable growing medium for vegetation.

To ensure viable landscape areas by preventing upward migration of contaminants into the overlying soils, and in order to promote plant growth, any landscaped areas will require the provision of a minimum 600mm thick capping layer of clean, imported inert subsoil and topsoil materials placed above a high visibility geotextile membrane/anti-mixing layer in order to maintain the integrity of the capping layer and prevent upward migration of contaminants.

8.5 CONTROLLED WATERS RISK ASSESSMENT

The findings of the site investigation do not indicate the presence of a shallow perched groundwater body within the made ground deposits beneath the site.

Based on the findings of the rotary drilling, the main groundwater body beneath the site lies withing the natural superficial deposits, as demonstrated by the groundwater monitoring results at the locations of the installed wells in BH01, BH02 and BH03.

During the supplemental site investigation, groundwater was identified within the superficial deposits during the drilling of the rotary open hole boreholes and cable percussion borehole BH01, at depths of between approximately 9.0m ad 16.1m bgl.

8.5 CONTROLLED WATERS RISK ASSESSMENT (CONTINUED)

Minimal contamination has been recorded within the groundwater beneath the site. The only contaminants to exceed the initially adopted 'tier 1' screening values were copper, and nickel.

Subsequent assessment has demonstrated that all of the nickel concentrations and the copper concentration (recorded during round 2 of the groundwater testing) fall below their respective site specific PNEC concentrations (calculated using the WFD M-BAT tool). As such, the recorded metal concentrations are not considered significant and are likely to be representative of normal background levels within the formerly industrialised area of South Wales.

All organic contaminants including PAHs, petroleum hydrocarbons, VOCs and SVOCs were recorded at concentrations below laboratory detectable limits or the adopted 'tier 1' screening values.

Based on the findings of the site investigation overall level of risk to controlled waters from site sourced contamination is considered to be low and no groundwater remedial measures are considered necessary at the site.

8.6 GROUND GAS RISK ASSESSMENT

The results of the gas monitoring programme show a maximum methane concentration of <0.5% and a maximum carbon dioxide concentration of 1.4%. A maximum gas flow rate of <0.3l/hr was measured during the gas monitoring programme.

In accordance with CIRIA Report C665 a Gas Screening Value (GSV) of <0.0042l/hour has been calculated. This GSV corresponds to gas Characteristic Situation 1.

Reference should also be made to BS8485:2015+A1:2019. In accordance with BS8485:2015:2019 and based on the results of the gas monitoring with the site being classified as Characteristic Situation 1 (CS1), for Development Types A and B (private and private with building management control, respectively), the minimum gas protection score required is zero and therefore no specific gas protection measures are required.

Basic radon protective measures are required within the site.

8.7 RISKS TO BUILDINGS AND MATERIALS DURABILITY

8.7.1 Concrete Classification

In accordance with BRE Digest SD1:2005 and adopting the assessment procedure specified therein for brownfield sites, the laboratory chemical test results indicate a characteristic value (taking the highest of the test results) for water soluble sulphate within the made ground of 160mg/l.

Using Table C2 of BRE Digest SD1:2005, this characteristic value corresponds to Design Sulphate Class DS-1.

The groundwater regime of the site has been assessed as 'mobile' and a characteristic pH value within the made ground of 6.9 has been determined (adopting the lowest of the test results). The Design Sulphate Class has been modified to give a site ACEC class of AC-1 for concrete structures constructed within the made ground.

8.7.2 Water Services

Water supply pipes will need to be protected from any contamination present within the ground. Measures to protect the pipes will include clean backfill to trenches and alternative material selection (such as barrier pipe). Reference should be made to UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, document No. 10/WM/03/21. The final design and selection of the pipe and associated backfill should be agreed with the appropriate Regulator prior to installation.

8.8 WASTE DISPOSAL

Excavated materials generated by the development may be considered as waste and subject to waste controls. Any re-use of excavated materials on-site should be undertaken in accordance with current waste and environmental legislation and which may require the production of an approved Materials Management Plan (MMP) prepared in accordance with the CL:AIRE Code of Practice.

It is recommended that a sustainable development strategy is adopted which reduces to a practicable minimum the generation of waste materials and the need for disposal to a licensed tip. Emphasis should be on recovery and re-use rather than disposal.

However, any waste or surplus materials that are generated will need to be classified in accordance with current EC regulations and Environment Agency guidance prior to disposal. It is the responsibility of the waste producer to classify the waste.

8.8 WASTE DISPOSAL (CONTINUED)

Based on the data obtained from the site investigation works, any waste materials comprising the existing made ground are likely to be classified as non-hazardous/hazardous waste.

Any asbestos containing materials (ACMs) will be classified as hazardous waste.

This classification is provisional and indicative of the likely waste classification based on the data obtained to date (including chemical composition, moisture content, etc.). It also assumes that the materials tested will be representative of future generated waste.

In order to minimise disposal, the materials generated should be segregated and examined, with appropriate testing as necessary, to enable the materials to be sorted or treated into lower classifications, with the resultant benefit of potentially generating re-use rather than disposal.

Once final waste sources and volumes are known, the waste stockpile to be disposed off-site will need to be classified in accordance with Environment Agency/Natural Resources Wales Waste Classification – Guidance on the Classification and Assessment of Waste Technical Guidance WM3 (2015). This is likely to require additional sampling and testing of the generated waste materials to provide an up to date current basis for classification.

Depending on the waste classification, waste acceptance criteria (WAC) testing may be required, in order to determine which class of landfill site the waste can be sent to.

It is recommended that the results of the waste classification and any WAC test results are sent to the intended licensed waste operator prior to disposal in order to confirm their classification and acceptance.

8.9 UNCERTAINTIES

It is important to recognise that there may be areas of contamination within the site that have not been found or that contaminants may be present at concentrations above those that have been found. It is also important to recognise that contamination may be localised and that no investigation, however comprehensive, is capable of finding such occurrences, other than by chance.

9.0 MINING RISK ASSESSMENT

9.1 SHALLOW UNRECORDED MINE WORKINGS

A desk study based coal mining risk assessment was previously undertaken by Intégral Géotechnique (Wales) Limited and the findings reported in the Coal Mining Risk Assessment Report ref. 14023/LP/22/CMRA dated July 2022. This Supplementary Site Investigation Report should be read in conjunction with the Coal Mining Risk Assessment referenced above.

In addition to the Coal Mining Risk Assessment report a Coal Authority Consultants Coal Mining Report is presented in Appendix N.

The Coal Mining Risk assessment and the Coal Authority Consultants Mining reports states that there are recorded workings in five coal seams at depths of between 47m and 190m. The shallowest workings at 47m are likely within the Lower Four Feet seam or locally known as the Lower or Middle Nine Foot Top Leaf. These recorded workings are at a depth that would not pose a shallow mining risk at the surface.

However, the Coal Authority stated that the site is located in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered, particularly prior to any site works or future development activity, as ground movement could still be a risk.

The potential for unrecorded shallow workings are likely to be within the Lower Four Feet seam and the underlying Bute seam and Yard seam.

The geological map conjectures that the Lower Four Feet seam outcrops across the southwest area of the site on a west to east orientation and dipping in an approximately northerly direction and would therefore underlie the site at shallow depth. The Generalised Vertical Section indicates that the Bute seam lies some 11m below the Lower Four Feet and the Yard seam lies approximately 45m below the Lower Four Feet seam and therefore these seams could be at shallow depths within the southwestern corner of the site.

It was therefore recommended that further intrusive investigation in the form of deep rotary boreholes would be required to determine the level of risk to the development and to define the risk based on site specific data.

9.1 SHALLOW UNRECORDED MINE WORKINGS (CONTINUED)

Accordingly, twelve rotary open hole boreholes were drilled within the development area to a maximum depth of 37m below existing ground level to investigate if there were any traces of shallower coal seams of any associated unrecorded shallow mine workings.

The rotary open boreholes generally encountered the top of bedrock at depths of between 16m and 20m below existing ground level.

According to the driller's description, the encountered bedrock was a mudstone with some siltstone and locally bands of sandstone.

Coal seams were encountered within the majority of boreholes at the following depths:

- RC01 between 16.4m and 17.3m (0.9m thick)
- RC02 between 24m and 25.5m (1.5m thick)
- RC03 between 19.2m and 19.5m (0.3m thick) and between 34.3m and 35.8m (1.5m thick)
- RC04 between 32m and 32.4m (0.4m thick) and between 33.4m and 33.9m (0.5m thick)
- RC05 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)
- RC06 between 29.7m and 30.4m (0.7m) and between 31.8m and 32.5m (0.7m thick)
- RC07 between 21m and 21.5m (0.5m thick) and between 23.5m and 25m (1.5m thick)
- RC08 between 22.5m and 23.5m (1m thick, with mudstone bands) and between 26.6 and 27m (0.4m thick)
- RC09 between 22.1m and 22.9m (0.8m thick)
- RC10 between 33.8m and 34.6m (0.8m thick)
- RC11 between 29m and 30.5m (1.5m thick)
- RC12 between 18m and 18.9m (0.9m thick), between 20m and 21.5m (1.5m thick) and between 31.1m and 31.3m (0.2m thick)

All coal seams were encountered as intact, and no soft drill, loss of flush or void/mine workings were encountered in the rotary open hole boreholes.

9.1 SHALLOW UNRECORDED MINE WORKINGS (CONTINUED)

In addition to the above, the boreholes have proven there is at least 15.1m/19m of rock cover above any underground coal seams and mine workings that may be present beneath the 35m/37m depths of the boreholes. Based on the commonly accepted 10:1 required rock cover to void ratio, this rock cover should be sufficient to prevent any void migration up to rock head, from any deeper recorded workings present beneath the depth of the boreholes.

Due to the proven rock cover thickness, encountering of intact coal seams only and no associated evidence of old mine workings in the depths of the boreholes, it is considered that there is a low risk of unrecorded shallow coal workings beneath the site with the potential to cause mine related ground subsidence at the site surface.

9.2 MINE ENTRIES

The Coal Authority report included within the Coal Mining Risk Assessment stated that no mine entries are recorded within the site.

The Coal Authority states that three mine entries were located within the 100m of the site boundary, but greater than 20m.

The mine entries, (two mine adits and a shaft) were located approximately 21m north, 25m north and 50m southeast of the site.

The closest mine entries, consisting of mine adits, located approximately 21m and 25m north of the site are not considered to affect the site, given the distance between the adits and site, greater than 20m and the orientation into the hillside in a northerly direction and would therefore not affect the site.

The mine shaft located approximately 50m southeast of the site would not affect the site due to the distance from the site.

The development site lies within a historical mining area and therefore there is a residual risk of unrecorded mine entries to be present on site. All site operatives should be made aware of this potential risk and a watching brief should be maintained during site works.

9.3 MINE GAS RISK ASSESSMENT

The Coal Authority states that with regards to mine gas, none has been recorded within 500m of the site boundary.

Due to the location of the site, within a coal mining reported area, a mine gas risk assessment should be undertaken.

A preliminary mine gas risk assessment has been carried out for the site, conducted in accordance with CL:AIRE document Good Practice for Risk Assessment for Coal Mine Gas Emission, dated Octoer 2021.

There are many sources of gas in mine workings including desorption of gas from coal and rocks, oxidation of coal, decomposition of old wood (such as pit props) and acidic mine drainage reacting with carbonate in the rocks around the seam or shaft. These gasses, if produced within the old workings, would need a viable pathway to the surface such as a shaft or fractured rock above the workings.

The desk study shows that the site is located within a high-risk development area. Shallow coal workings are recorded beath the site at 50m depth.

There is considered to be no viable pathways via mine entries with none recorded within the site. No mine entries are located within 20m of the site, however, two mine adits are located within 20m and 25m north of the site.

There are considered to be no viable pathways via fractured rock or fault zones. The bedrock is overlain by significant thickness of low permeability soils.

Based on the desk-based research, the potential risk from coal mine gas emissions at the development site is considered below:

Figure 13.1 Decision Support Tool for Mine Gas Risk Assessment, included with CL:AIRE document Good Practice for Risk Assessment for Coal Mine Gas Emissions, dated October 2021 includes a flow chart to aid the risk assessment process and decision making.

Stage 1 of the flow chart asks if the site is located within a Coal Authority defined Coal Mining Reporting Area. Since the site is located within a Coal Authority defined Coal Mining Reporting Area the flow chart then asks if all of the following are true:

- Mine entries >50m from site boundary,
- Workings >150m depth,

9.3 MINE GAS RISK ASSESSMENT (CONTINUED)

- No faults or other potential pathways connecting surface to deeper unflooded workings,
- Outside area of past or probable shallow workings on Coal Authority viewer.

Based on the information gained from the desk-based research, it is considered that the Stage 1 statements are not true due to the potential for shallow unrecorded workings, recorded workings at 50m depth and the presence of mine entries within 50m of the site boundary. Therefore, the flow chart requires the next stage to be considered.

The next stage of the flow chart then asks if all of the following statements are true:

- Workings between 30m and 150m but permanently flooded or covered by 10m+ of low permeability superficial deposits,
- Mine entries >50m from site boundary.

The supplementary site investigation did not encounter any shallow unrecorded mine workings within 35/37m depths of the rotary open hole boreholes. Recoded mine workings are known to be present at a depth of 50m. During the supplemental site investigation, groundwater was encountered within the superficial deposits and locally the bedrock and therefore any workings that may be present would be flooded.

With regards to the mine adits located 21m and 25m north of the site, these are not considered to be a viable pathway due to their orientation dipping away from the site. As stated in Note 5 for Figure 13.1 Decision Support Tool for Mine Gas Risk Assessment, ‘Adits require specific consideration of their direction in relation to the development. In cases the adit entry is close to the development (between 20m and 50m or less than 20m) but it dips in the opposite direction, it might not be considered a pathway for mine gas emissions and may be considered low risk’.

Based on the above, the site is considered to be at a low risk from mine gas.

As part of the supplemental site investigation, a programme of gas monitoring has been undertaken and the results as previously discussed, indicate a maximum methane concentration of <0.5% and a maximum carbon dioxide concentration of 1.4%. A maximum gas flow rate of <0.3l/hr was measured during the gas monitoring programme.

Based on the results of the gas monitoring programme, no ground gas protection measures are required.

10.0 SLOPE STABILITY ASSESSMENT

There are a number of slopes within the site boundary. The current development proposals, as shown in Spring Design Drawing Ref: 2575-525, dated January 2024 include several plots, retaining walls, and car parking areas positioned over the crests of these slopes (see Figure 3).

Based on a review of the proposed engineering layout and levels, several cross sections have been produced to ascertain the gradients of these slopes. The cross sections are referred to as: Section AA to Section FF (see Appendix O). The locations of the cross sections are shown in Figure 3.

Slope stability modelling has been undertaken to assess any slope potential stability risks to the proposed development along Section AA to Section FF.

The 'Slide2' modelling software, developed by RocScience Ltd, has been utilised for the assessment. Slide2 is a two-dimensional limit equilibrium slope stability modelling program used for evaluating the global Factor of Safety (FoS) or probability of failure in soil and rock slopes.

10.1 MODELLED CROSS SECTION GEOMETRIES

Based on a review of Spring Design Drawing Ref: 2575-525, dated January 2024, a summary of the development proposals and modelled slope geometries along Sections AA to FF is provided below in Table 9.

Other than a proposed cutting (to be supported by a retaining wall) at the location of Plots 40 to 43, it should be noted that the current development proposals do not include any significant slope reprofiling / regrading works. However, at several locations development is shown on or over slope crest positions.

Table 9: Summary of Slope Cross Sections

Cross Section Reference	Slope Height (m)	Existing Slope Gradient	Current Proposed Slope Gradient	Proposed Development Notes
Section AA	7m	1v:3h	1v:3h	Western corner of Plots 1 to 4 shown at and over slope crest
Section BB	11m	1v:2.5h	1v:2.5h	Plots 40 to 43 shown within a 2.2m deep cutting at the toe of the slope. Cutting at toe to be supported by a retaining wall

10.1 MODELLED CROSS SECTION GEOMETRIES (CONTINUED)

Table 9: Summary of Slope Cross Sections (Continued)

Cross Section Reference	Slope Height (m)	Existing Slope Gradient	Current Proposed Slope Gradient	Proposed Development Notes
Section CC	10m	1v:1.4h	1v:1.4h	Southern corner of Plot 15 shown at and over slope crest
Section DD	8m	1v:1.4h	1v:1.4h	Car parking areas shown at slope crest
Section EE	7m	1v:1.7h	1v:1.7h	Southern edge of Plot 32 shown at and over slope crest
Section FF	5m	1v:1.7h	1v:1.7h	Southern edge of Plot 33 shown close to slope crest. Proposed ground level raising (approx. 0.80m of fill shown at slope crest

10.2 MODEL INPUTS AND ASSUMPTIONS

As part of the modelling process, the following assumptions have been made:

- Two primary strata layers have been assumed as follows: (1) historical made ground – typically granular, (2) natural superficial soils – typically granular.
- A groundwater table has been included at the base of the made ground deposits (i.e., at the interface with the underlying natural superficial soils).
- Foundation loads of 30kPa have been applied to the crest of the slope along Section AA, Section CC, Section EE, and Section FF. The foundation loads have been applied in order to replicate average loads applied by typically raft foundations.
- As per the development proposals, a retaining structure has been included at the toe of the slope along Section AA. The wall itself has been assigned infinite strength soil parameters. This feature will need to be appropriately designed by a Structural Engineer. Considering the ground conditions at the toe of the slope at this location, for the purpose of the analysis, it has been assumed that the retaining structure will utilise piled foundations.

The soil properties used in the analysis are summarised in Table 10 below:

10.2 MODEL INPUTS AND ASSUMPTIONS (CONTINUED)

Table 10: Summary of Soil Properties used for Slope Stability Analysis			
Soil type	Unit Weight (kN/m3)	Friction Angle (ϕ)	Cohesion (kPa)
Made Ground	18	35*	2
Superficial Soils	19	38*	1

**Based on BS EN 1997-2:2007 typical peak effective angles of friction based on density*

The stability analysis for each cross section has been undertaken to reflect the long-term conditions within the slope.

A circular failure mechanism has been assumed.

10.3 MODEL RESULTS

Slide2 has been used to evaluate the Factors of Safety (FoS) of potential slope failure surfaces along Section AA, Section BB, Section CC, Section DD, Section EE and Section FF.

A FoS of 1.0 indicates that a slope is at equilibrium (i.e., the frictional forces acting to resist instability are equal to the forces acting to promote instability).

Where the FoS falls below 1.0, a slope would be considered to be unstable.

It should be noted that when modelling the long-term stability during the design of permanent slopes that are supporting development, a minimum FoS of 1.5 is typically required.

The outputs of the slope stability analysis are presented in Appendix O.

The following minimum FOS values has been calculated:

- Section AA Minimum FOS – 2.504
- Section BB Minimum FOS – 2.174
- Section CC Minimum FOS – 1.279
- Section DD Minimum FOS – 1.459
- Section EE Minimum FOS – 1.513
- Section FF Minimum FOS – 1.571

10.3 MODEL RESULTS (CONTINUED)

The calculated FoS values range between 1.279 and 2.504, with the lowest value derived at Section CC.

Acceptable FoS values have been calculated at Section AA, Section BB, Section DD, Section EE, and Section FF.

An unacceptable FoS value has been calculated at Section CC. The unacceptable FoS at Section CC is reflective of the height and over-steep nature of the slope at this location.

10.4 CONCLUSIONS AND RECOMMENDATIONS

The modelling results have demonstrated that slopes across the majority of the site have an acceptable FoS to justify long-term stability following development.

However, further consideration is required in the area of Section CC, as shown in Figure 3 and Figure 4.

To achieve an adequate global FoS against failure, the current development proposals will need to be revised in the area of Section CC.

The following solutions could be considered:

- Slackening the slope to a maximum gradient of 1v:1.7h. Note that if development levels are to remain as currently proposed, this solution will result in a revised slope crest position, which could impact the development layout in the area of Plot 15.

- Introducing retaining structures and slacking the slope behind retaining structures to a gradient of 1v:1.7h.

Any proposed retaining structures will need to be designed by a suitably qualified Structural Engineer.

Drainage should be designed and constructed to prevent surface water being able to run down slope faces and in order to ensure no build-up of hydrostatic pressures behind any proposed retaining structures.

All proposed cut/regraded slopes should be hydroseeded in order to promote vegetation growth.

10.4 CONCLUSIONS AND RECOMMENDATIONS (CONTINUED)

In areas outside of required cut earthworks, the existing vegetation, trees (and associated roots) should be retained and managed as they will have a stabilising effect on the slope materials. Vegetation on slopes protects against erosion and shallow sliding. Roots reinforce or bind the soil and provide cohesion that improves stability against shallow sliding.

11.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

11.1 DETAILS OF PROPOSED DEVELOPMENT

The proposed development will comprise the construction of a number of low-rise residential properties with private gardens and areas of soft landscaping as illustrated in Spring Design Drawing Ref: 2575-525, dated January 2024.

The development will also include associated infrastructure such as access roads and car parking areas.

An extract of the proposed development plan is shown in Figure 3.

11.2 SITE PREPARATION

11.2.1 Services and Demolition

Prior to works commencing on site, any services within the site area should be identified and either disconnected/removed, diverted or protected. Early discussions should be held with the service operators regarding any required diversionary works or any required protection measures / easements. Any diversionary works should be carried out under the supervision of, and to the specification of the appropriate Statutory Authorities. The resulting excavations should be backfilled with suitable acceptable granular fill material.

Prior to demolition of the existing buildings / structures, strategies should be developed to ensure the safe demolition and re-use of materials.

All buildings/structures to be demolished/dismantled should be subject to a 'Demolition Asbestos Survey', soft strip, and disposal of asbestos containing materials to a licensed tip

11.2.2 Vegetation and Site Strip

It is recommended that a survey for invasive species plants is undertaken across the site. Any invasive plant species, if identified, should be subject to an eradication programme.

There are a number of semi-mature, mature trees and hedges along the site boundary and within the site. Allowances should be made for the removal of any associated roots that may become exposed in any proposed nearby earthworks and foundation excavations. Any such works should be conducted in accordance with the code of practice recommended by the National House Building Council (NHBC).

11.2 SITE PREPARATION (CONTINUED)

All protection orders relating to existing vegetation/ecology should be adhered to during the development of the site.

All existing topsoil/disturbed should be stripped from beneath proposed development areas. Based on the results of the soil contamination testing, this material will be unsuitable for re-use in proposed garden areas and will be unsuitable for re-use as structural fill. As such, this material should be disposed off-site.

11.2.3 Unexpected Occurrences

Given the nature of the made ground encountered across the site, unidentified 'hotspots' of contamination could be present. Strategies and site management procedures should be put in place for dealing with unexpected contamination, waste handling and control of workers health and safety. Allowances should be made for any such materials, if encountered, to be removed from site and disposed at a suitably licensed tip.

Allowances should be made for potentially encountering and dealing with possible springs and land drains.

11.2.4 Site Reclamation (Upper Plateau Area)

Existing areas of hardstanding (including surface tarmac and concrete) should be broken out and the materials set aside for appropriate re-use or off-site disposal.

Once the existing buildings have been demolished and the existing floor slabs / areas of hardstanding have been removed, the exposed formations should be inspected and tested for a range of contaminants (in accordance with the recommendations outlined in Section 8.3).

All remnant buried obstructions such as foundations, structures, redundant drainage / services ducts / infrastructure / basements etc. should be fully broken out and removed.

To achieve a formation cleared of underground obstructions it is advised to excavate the upper plateau (as shown in Figure 4) to a depth of 2.0m below the contours of the underside of proposed foundations or until undisturbed natural ground is encountered (if this is less than 2.0m below underside of proposed foundations). The excavated material should be sorted and processed, in accordance with an agreed Earthworks Specification. Any oversized materials should be crushed to a suitable grade and stockpiled on site for future re-use as granular fill material. Any unacceptable materials, such as timber, metal, rag, plastic etc removed. The acceptable materials should be stockpiled on site for compliance testing and future re-use.

11.2 SITE PREPARATION (CONTINUED)

Note that careful consideration should be given to the proximity of the existing pavement along Heol Crwys and potential excavation stability issues that may arise and potentially impact the pavement.

Any soft cohesive or organic materials at sub-formation level will require excavation and replacement with granular fill materials.

The reduced levels should be brought up to the required levels with the processed made ground in controlled and compacted layers in accordance with Department of Transport (DTp) Specification for Highway Works.

During the reclamation earthworks it will be necessary to implement suitable land drainage and surface water management control measures. Allowances should be made for encountering old land drains.

Any soft spots within prepared formations should be excavated and replaced with inert structural fill. Engineered fill should be of granular nature, rolled and compacted over benched formations, and placed in accordance with Department of Transport Specification for Highways Works.

Detailed material re-use strategies should be produced prior to the commencement of works to maximise the re-use of materials

The required site preparatory earthworks should be properly specified (in a Geotechnical Earthworks Specification), monitored and validated by a suitably qualified Geotechnical Engineer.

Validation testing, chemical and physical (typically plate load tests and dynamic probing) should be carried out across the completed prepared plateau in order to ensure its performance.

A validation/verification report will be required upon completion of the site works in order to satisfy the requirements of the local planning authority, Natural Resources Wales and the building control authority, as appropriate. This may be phased as appropriate to the program of development.

11.2 SITE PREPARATION (CONTINUED)

Note that earthworks will be seasonally dependant and will rely on control of water content in the structural soils. It is recommended that a series of supplementary optimum compaction tests and PSD tests are carried out ahead of the earthworks in order to inform the compaction works.

It is recommended that the reuse of excavated materials is undertaken in accordance with the CL:AIRE DoW Code of Practice.

11.2.5 Cut and Fill

If any fill is to be placed onto an existing sloping area, then the original ground should be adequately cut and benched, in order to prevent the possibility of slippage at the interface between the new fill and original ground. All works should be carried out in accordance with the Department of Transport (DTp) Specification for Highway Works.

Any cut and/or fill slopes should be no steeper than 1v in 2h. Cut off drains should be provided at the top and French drains at the bottom of any cut and/or fill slopes. In areas of cut and/or fill, the slopes should be topsoiled and seeded with grass, in order to minimise any future maintenance problems caused by surface water run-offs.

Allowances should be made for encountering perched groundwater and/or issues during any excavations. Allowances should be made for some surface and groundwater management during excavations to ensure the protection of materials.

It should be noted that a historical map dated 1973, included within the Desk Study Report Ref. 14023/LP/22/DS dated March 2022, indicates a water course and issues were located in the southern area of the site within lower plateau area of site off Heol Jiwbili (encompassing proposed Plots 40 to 43), see Figure 2.

11.2.6 Certification

The required site preparatory earthworks should be properly specified, monitored and validated by a qualified Geotechnical Engineer. A certification report should be prepared to confirm the acceptability of the prepared ground for the proposed development. Field and laboratory verification/validation tests will be required for such a certification. Allowances should therefore be made for site monitoring by a competent and suitably qualified geotechnical engineer, and for the required sampling and field and laboratory chemical and geotechnical testing.

11.2 SITE PREPARATION (CONTINUED)

11.2.7 Pollution Protection and Management

During the site clearance and subsequent operations, airborne nuisance caused by dust from the site must be controlled on account of the health and safety of site operatives and the general public who are occupying properties adjacent to the site.

A number of historical drains/channels run through the site. These should be diverted from beneath the proposed development. New temporary drainage grips and silt pumps will be required during earthworks in order to control near surface formations and protect the adjacent water courses to the north and east of the site from uncontrolled run-off.

11.3 FOUNDATIONS AND FLOOR SLABS

Based on the ground conditions observed during the site investigation, it is considered that a combination of, reinforced concrete raft foundations (bearing on re-engineered fill), and/or drilled pile foundations could be utilised for the proposed development.

A Foundation Zone Plan detailing the foundation recommendations applicable across the site is presented in Figure 4.

11.3.1 Foundation Zone A (Plots 1 to 39)

Foundation Zone A comprises the upper plateau area of the site, situated off Heol Crwys (encompassing Plots 1 to 39).

<u>Option 1 – Raft Foundations Bearing onto Re-Engineered Fill</u>

If it is proposed to undertake and excavation and re-compaction earthworks exercise across the upper plateau (as detailed above in Section 11.2.4), then following the successful validation of the works, and subject to the successful completion of the recommended slope engineering / reprofiling works in the area of Section CC (as shown in Figure 3), the proposed buildings and structures across Foundation Zone A could utilise reinforced concrete raft foundations, bearing onto the validated re-engineered fill.

Subject to confirmatory plate load testing, for a reinforced concrete raft, an allowable bearing capacity of 50kN/m^2 could be achieved on re-engineered fill. At this intensity of loading, the total settlement should not exceed 30mm and any angular distortions caused by differential movements should be less than 1:750.

Rafts should be designed to span a 3.0m soft spot and 1.5m cantilever at build corners.

11.3 FOUNDATIONS AND FLOOR SLABS (CONTINUED)

All formations should be proof rolled with any soft spots removed.

To minimise the potential for differential movements, it is recommended that beneath the raft foundations there should be a suitably thick layer of well compacted imported granular fill throughout the plan area of the building. Department of Transport Type 1 Sub-base, or similar approved, could be used and should be compacted in layers in accordance with current DTp Specification for Highway Works.

Laboratory Atterberg Limit testing on representative samples of the made ground indicated that the materials are non-shrinkable.

Thickening of the raft is likely to be required beneath the load bearing walls/columns.

Basic radon protective measures are required for the site.

Within influencing distances of slope crests and any proposed retaining walls, foundations should be deepened to ensure no potential adverse loads are transmitted through these features.

Option 2 – Piled Foundations

Alternatively, if a turn and re-compact earthworks exercise is not considered practicable or feasible (e.g., due to the proximity to the existing highway and pavement along Heol Crwys), then the proposed buildings could be founded using piled foundations.

Due to the presence of fused slag and large boulders within the made ground and/or superficial deposits, the proximity to the adjacent Heol Crwys and the proximity to live buried services, subject to the advice from a specialist Piling Contractor, it is recommended that drilled piled foundations (with a suitably designed rock socket within competent bedrock strata) are used.

During the site investigation, the depths to the bedrock strata beneath the upper plateau area was found to vary between approximately 16.0m (at PH01) and 20.0m bgl (at PH08).

The advice of a specialist Piling Contractor should be sought regarding the most appropriate piling technique, specific design and load bearing capacity of the piles.

It will be the responsibility of appointed specialist Piling Contractor to confirm their proposed piling technique and the detailed pile design (based on all the available SI data and site constraints).

11.3 FOUNDATIONS AND FLOOR SLABS (CONTINUED)

Allowances should be made for a suitable period of pile testing and for construction and testing of piling mats.

Floor slabs should be designed and constructed as suspended.

Basic radon protective measures are required.

11.3.2 Foundation Zone B (Plots 40 to 43)

Foundation Zone B comprises the lower plateau area of site, situated off Heol Jiwbili (encompassing proposed Plots 40 to 43), see Figure 4.

The development proposals in this area include a cut into the toe of an existing slope (which will be supported by a retaining wall) in order to create a level development plateau.

The utilisation of raft foundations on re-engineered fill is not advised in this area of the site as the required turn-and-recompact earthworks would necessitate a significant increase in the required cut depth at the toe of the slope which could result in temporary stability issues.

As such, it is advised that Plots 40 to 43 utilise piled foundations.

During the site investigation, the depth to the bedrock strata beneath the lower plateau area was recorded at approximately 9.8m bgl (at PH12).

The advice of a specialist Piling Contractor should be sought regarding the specific design and load bearing capacity of the piles.

Allowances should be made for a suitable period of pile testing and for construction and testing of piling mats.

Floor slabs should be designed and constructed as suspended.

Basic radon protective measures are required.

11.4 RETAINING WALLS

Where it is proposed to retain existing ground or re-engineered made ground by means for retaining walls, then for preliminary design purposes the following shear strength parameters may be used for the design of the retaining walls, as summarised in Table 11, below.

11.4 RETAINING WALLS (CONTINUED)

Table 11: Summary of Shear Strength Parameters for Design of Retaining Walls		
Soil type	Friction Angle (ϕ)	Cohesion (kPa)
Exiting Made Ground	35	2
Re-engineered Made Ground	38	2

Drainage measures should be incorporated into the design and construction of the retaining walls, in order to ensure that there is no build-up of any hydrostatic pressure behind the walls. Temporary support may be required during construction of any retaining walls.

Th proposed retaining walls structures within the lower plateau area should be founded using drilled piles.

Discussion should be undertaken with a structural engineer in regards to retaining wall design.

11.5 EXCAVATIONS AND FORMATIONS

Most excavations (to the depths of the trial pits) should be possible with normal soil excavating machinery.

However, allowances should be made for the use of pneumatic breaker attachments, or similar tools, to deal with potential buried obstructions and/or large cobbles and boulders of fused slag.

Below the depth of the trial pits hard dig conditions and rock break may be required.

Based on the site investigation to date, excavations are unlikely to encounter significant groundwater inflows. However, potential concentrated inflows from pockets of perched water or land drains should be anticipated. Any groundwater inflows and rainfall infiltrations should be dealt with by conventional pumping techniques.

Allowances should be made for the instability of excavation sides.

The sides of excavations deeper than 1.0m should be fully supported by trench boxes or temporarily battered at gradients of typically 30°.

11.5 EXCAVATIONS AND FORMATIONS (CONTINUED)

The exposed formations are likely to be prone to deterioration as a result of prolonged exposure to weathering. It is recommended that measures are put in place to control surface water run-off and deterioration of the exposed formations.

11.6 ACCESS ROADS AND CAR PARKING AREAS

For access roads and car parking formations within the existing made ground a CBR value of <2% should be assumed for design purposes. Within re-engineered fill, CBR values of 5% should be achievable and could be used for design purposes.

After proof rolling the formations, any 'soft and hard spots' should be removed and replaced with well compacted imported granular materials. Department of Transport (DTp) Type 1 sub-base, or similar approved, could be used and should be compacted in layers in accordance with the current DTp Specification for Highway Works.

Formations should be regarded as frost susceptible.

It should be noted that CBR tests should be carried out in order to confirm the above assumptions. Depending on the outcome of such field tests, the above assumptions may need to be revised.

11.6 DRAINAGE

During the 2023 site investigation, falling head soil infiltration testing were undertaken within three of the windowless sample boreholes (WS03, WS05 and WS09).

Within windowless sample borehole WS03 and WS09, the infiltration stalled at a depth of 1.0m and 1.72m respectively and therefore no infiltration could be calculated for either location.

Within windowless sample borehole WS05, an infiltration rate of 4.74×10^{-4}m/s was calculated.

It should be noted that each falling head test was undertaken within the made ground deposits as natural soil deposits were not encountered within the depth of the windowless sample boreholes.

It should also be noted that the results are specific to the tested locations and depths.

11.6 DRAINAGE (CONTINUED)

It is considered that the site is not suited for the use of soakaway drainage due to:

- The variable nature and thickness of the made ground encountered beneath the entire site.
- The potential for leaching of contaminants from the made ground at drainage/soakaway locations and migration of contaminants to the underlying groundwater.
- The likely negligible permeability of the underlying glacial till deposits.

The potential for leachate generation from the made ground at soakaway draining locations could result in a potential risk to groundwater quality.

Drainage runs are likely to be situated within the made ground and/or fill materials. Care should be taken to ensure that all drainage and water services are constructed properly and to a high standard using steep gradients/falls and with flexible joints to prevent backfalls occurring and possible misalignment and breakage to the drainage system.

Special care should be taken at the entry detail of external services into the proposed buildings, in order to deal the any potential differential movement. At these locations, flexible joints should be used.

It is recommended that a drainage engineer is consulted for the detailed design with regard to actual falls adopted and provision of adequate rocker details to drainage runs and at the junction with structures, in order to accommodate for differential settlement and meet the technical requirements for sewers for adoption.

The above measures will not prevent long term total and differential settlements occurring, however, they should make the future maintenance of these underground services more tolerable.

It is recommended that channels of clean inert materials are constructed within the body of the made ground in order that deeper primary infrastructure service corridors can be safely used for the construction and maintenance of deeper buried service such as drainage.

APPENDIX A

TRIAL PIT LOGS (2023 AND 2024)

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP01** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278190.52mE - 278190.52mN	**Dimensions** 2.60m × 0.70m
Date Excavated: 18/03/2024	Level: 51.30mAOD	Depth : 1.00m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.10	51.20		MADE GROUND: Grass over soft brown slightly silty slightly gravelly slightly organic CLAY with common roots and rootlets. Gravel is fine to coarse angular to sub-rounded of sandstone, ash and clinker. [Disturbed Topsoil]
						MADE GROUND: Highly variable (dense) grey and black silty clayey very sandy GRAVEL with moderate cobble content of angular to rounded concrete, brick and fused slag. Gravel is fine to coarse angular to sub-rounded of sandstone, brick, concrete, ash, vesicular slag. Inclusions of timber and plastic. ... frequent gravel and cobble sized inclusions of grey fissured and friable silty gravelly CLAY.
1.00	B		1.00	50.30		End of Trialpit at 1.00 m

1
2
3
4
5

Remarks:

1. Refusal of excavation equipment at 1.0m depth on fused slag material.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP02** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278190.52mE - 192508.70mN	**Dimensions** 2.40m
Date Excavated: 18/03/2024	Level: 51.80mAOD	Depth : 3.00m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Grass over soft brown slightly silty slightly gravelly organic CLAY with common rootlets. Gravel is fine to coarse angular to sub-rounded of sandstone and rare vitreous slag. [Disturbed Topsoil]
			0.20	51.60		MADE GROUND: (Medium dense) grey, red and black silty very sandy very ashy GRAVEL with low cobble content of sub-angular and sub-rounded sandstone, brick and fused slag. Gravel is fine to coarse angular to sub-rounded of rare sandstone and predominantly fine ash, clinker and vesicular, vitreous and metallic slag.
			0.50	51.30		MADE GROUND: Highly variable (dense) to very dense black silty ashy sandy GRAVEL with moderate cobble content of sub-angular brick, fused slag and sandstone. Gravel is fine to coarse angular of sandstone, shale, coal, vesicular, vitreous, fused and metallic slag, fine ash and clinker. ... occasional gravel and cobble sized inclusions of sandy ashy gravelly CLAY throughout.
1.00	B					
1.50	B					
						... boulder sized fused slag obstruction along southern and west pit wall encountered at 2.2m depth.
			3.00	48.80		End of Trialpit at 3.00 m

Remarks:
1. Trial pit terminated at 3.0m depth due to refusal on fused slag boulder.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP03** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavatoor	Coordinates: 278292.58mE - 192528.66mN	**Dimensions** 2.70m
Date Excavated: 18/03/2024	Level: 50.90mAOD	Depth : 3.90m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20	50.70		MADE GROUND: Grass over loose black gravelly ashy SAND with occasional rootlets. Gravel is fine to coarse angular to sub-rounded of sandstone, ash and clinker. [Disturbed Topsoil]
1.50	B					MADE GROUND: (Firm locally very soft) brown mottled orange and local partings of grey sandy very gravelly slightly clayey SILT with low cobble content of sub-rounded sandstone. Gravel is fine to coarse sub-rounded and rounded of sandstone and rare ash, shale and vitreous clay. [Reworked Natural Soils]
						... parting of orange sandy gravel of fine to coarse angular brick encountered between 3.6m and 3.7m depth.
			3.90	47.00		End of Trialpit at 3.90 m

1 2 3 4 5

Remarks:
1. Trial pit terminated at 3.9m. Maximum excavation depth achieved.

Groundwater: 1. Minor seepage encountered at 0.9m depth.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP04** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278285.33mE - 192562.34mN	**Dimensions** 2.40m
Date Excavated: 18/03/2024	Level: 53.30mAOD	Depth : 3.00m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Soft brown slightly silty organic rich CLAY with frequent rootlets. [Disturbed Topsoil]
			0.15	53.15		MADE GROUND: Variable (Medium dense) grey and black silty sandy clayey GRAVEL. Gravel is fine to coarse angular to sub-rounded ash, clinker and shale. Inclusions of timber.
			0.40	52.90		MADE GROUND: (Medium dense) grey locally yellow ashy sandy GRAVEL. Gravel is fine to coarse angular of shale, ash, clinker, coke and vitreous, metallic and vesicular slag.
1.00	B					
			2.20	51.10		MADE GROUND: (Medium dense) becoming dense black and grey ashy sandy GRAVEL with moderate cobble and boulder content of angular to rounded sandstone, brick and vesicular slag. Gravel is fine to coarse angular platy mudstone, shale, coal, vesicular and vitreous slag and coke.
						... becoming dense below 2.5m depth.
3.00	B		3.00	50.30		End of Trialpit at 3.00 m

Remarks:
1. Trial pit terminated at 3.0m depth due to slow progress of excavation within dense slag material.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP05** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278326.09mE - 192580.16mN	**Dimensions** 2.40m
Date Excavated: 19/03/2024	Level: 53.50mAOD	Depth : 2.30m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Grass over soft brown slightly silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-angular to sub-rounded of sandstone. [Disturbed Topsoil]
			0.30	53.20		MADE GROUND: (Medium dense) black and grey silty sandy clayey GRAVEL with moderate cobble content of angular to sub-rounded brick, sandstone and vesicular slag. Gravel is fine to coarse angular to rounded of sandstone, ash, shale, vesicular and vitreous slag, coke and clinker.
			0.90	52.60		MADE GROUND: (Medium dense to dense) black sandy ashy GRAVEL with high cobble and boulder content of angular to sub-rounded brick, sandstone, and predominantly vesicular slag. Gravel is fine to coarse angular and sub-angular ash, shale, brick and predominantly fused, metallic, vitreous and vesicular slag.
1.00	B					
1.50	B					
			2.00	51.50		MADE GROUND: (Loose to medium dense) black sandy ashy GRAVEL and COBBLES with moderate boulder content of sandstone and vesicular slag. Gravel is fine to coarse angular to sub-rounded of sandstone, brick, rare shale and predominantly vesicular, metallic and fused slag.
			2.30	51.20		*... metal plate obstructions recorded at 2.2m depth.* End of Trialpit at 2.30 m

1 2 3 4 5

Remarks:
1. Trial pit terminated at 2.3m depth due to frequent spalling of pit wall sides.

Groundwater: 1. No groundwater encountered.

Stability: 1. Unstable below 0.5m with spalling and overbreak of pit wall sides.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP06** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 8 Tonne Tracked Excavator	Coordinates: 278359.57mE - 192594.24mN	**Dimensions** 2.60m
Date Excavated: 19/03/2024	Level: 53.70mAOD	Depth : 3.00m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Soft brown silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-rounded sandstone. [Disturbed Topsoil]
			0.30	53.40		MADE GROUND: (Medium dense) grey and black sandy ashy slightly clayey GRAVEL with low to moderate cobble content and low boulder content of angular to sub-rounded sandstone, brick and concrete. Gravel is fine to coarse angular to sub-rounded sandstone, ash, clinker, brick and vesicular, vitreous, metallic and fused slag.
1.00	B					
			1.50	52.20		MADE GROUND: (Medium dense) red and black sandy GRAVEL with high cobble content of sandstone, and predominantly vesicular, vitreous, metallic and fused slag. Gravel is fine to coarse angular to sub-rounded of ash, clinker, and predominantly, vitreous, vesicular, metallic and fused slag.
			2.20	51.50		MADE GROUND: (Dense) red and orange and black gravelly SAND with high cobble content of sandstone, and predominantly vesicular and fused slag. Gravel is fine to coarse angular to sub-rounded of clinker and predominantly ash and vesicular and metallic slag.
2.50	B					
			3.00	50.70		End of Trialpit at 3.00 m

1 2 3 4 5

Remarks:
1. Trial pit terminated at 3.0m depth due to slow progress of excavation within dense slag and ash deposits.

Groundwater: 1. No groundwater encountered.

Stability: 1. Unstable below 0.5m with spalling and overbreak of pit wall sides.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP07** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 7 Tonne Tracked Excavator	Coordinates: 278360.68mE - 192554.67mN	**Dimensions** 2.80m
Date Excavated: 19/03/2024	Level: 53.80mAOD	Depth : 3.50m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Vegetation over soft grey silty slightly gravelly CLAY. Gravel is fine to coarse angular mudstone and rounded sandstone. [Disturbed Topsoil]
			0.20	53.60		MADE GROUND: (Loose) grey sandy slightly ashy clayey GRAVEL with low cobble content of sub-angular brick and sub-rounded sandstone and brick. Gravel is fine to coarse angular to sub-rounded of rare ash, mudstone shale, coal and vesicular slag.
1.00	B		0.90	52.90		MADE GROUND: (Medium dense) grey and reddish grey ashy very slightly clayey very sandy GRAVEL with moderate cobble content and low boulder content of brick, sandstone, and vesicular slag. Gravel is fine to coarse angular to sub-rounded brick, vesicular slag, ash and clinker.
			1.70	52.10		MADE GROUND: (Loose) red and black ashy sandy GRAVEL with high cobble content of fused vesicular slag. Gravel is fine to coarse angular to sub-rounded of fine ash, clinker and predominantly vesicular and vitreous slag.
3.50	B		3.50	50.30		End of Trialpit at 3.50 m

1 2 3 4 5

Remarks:
1. Trial pit excavated on crest of slope.
2. Trial pit terminated at 3.5m. Maximum excavation depth achieved.

Groundwater: 1. No groundwater encountered.

Stability: 1. Unstable below 1.7m with spalling and overbreak of pit wall sides.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP08** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 6 Tonne Tracked Excavator	Coordinates: 278351.13mE - 278351.13mN	**Dimensions** 3.20m
Date Excavated: 19/03/2024	Level: 53.70mAOD	Depth : 3.20m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Vegetation over soft brown silty very slightly gravelly organic rich CLAY. Gravel is fine to coarse angular mudstone and rounded sandstone. [Disturbed Topsoil]
			0.20	53.50		MADE GROUND: (Loose to medium dense) grey silty slightly sandy clayey GRAVEL. Gravel is fine to coarse angular to sub-rounded of sandstone, shale, coal and vesicular slag.
1.00	B					
			2.10	51.60		MADE GROUND: (Medium dense) orange brown and black silty sandy ashy GRAVEL with high cobble content of vesicular and fused slag, brick and sandstone. Gravel is fine to coarse angular and sub-angular brick, ash, sandstone and predominantly vesicular slag.
2.20	B					
			3.20	50.50		End of Trialpit at 3.20 m

1 2 3 4 5

Remarks:
1. Trial pit excavated on crest of slope.
2. Trial pit terminated at 3.2m due to slow progress of excavation within dense slag and ash deposits.

Groundwater: 1. No groundwater encountered,

Stability: 1. Unstable below 2.1m with spalling and overbreak of pit wall sides.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP09** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 9 Tonne Tracked Excavator	Coordinates: 278386.54mE - 192534.33mN	**Dimensions** 2.50m
Date Excavated: 19/03/2024	Level: 47.40mAOD	Depth : 2.00m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Soft brown silty slightly gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse sub-angular and sub-rounded of sandstone and rare clinker. [Disturbed Topsoil]
			0.20	47.20		MADE GROUND: (Medium dense) grey and black silty sandy GRAVEL with high cobble and boulder content of sub-angular vitreous and vesicular slag and brick. Gravel is fine to coarse angular to sub-rounded of sandstone, fine ash, clinker, brick, and predominantly vesicular slag.
1.00	B					
			1.10	46.30		MADE GROUND: (Very loose) grey and black sandy GRAVEL and COBBLES. Gravel and cobbles are fine to coarse angular to sub-rounded blocky of vitreous and vesicular, fused slag, sandstone and brick.
			2.00	45.40		End of Trialpit at 2.00 m

1 2 3 4 5

Remarks:
1. Trial pit terminated at 2.0m depth due to frequent spalling of pit wall sides.

Groundwater: 1, No groundwater encountered,

Stability: 1. Unstable during excavtation from surface with frequent collapse of pit wall sides.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

AGS

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP10** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278328.82mE - 192525.05mN	**Dimensions** 2.80m
Date Excavated: 20/03/2024	Level: 45.50mAOD	Depth : 3.20m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Vegetation over soft dark brown silty very slightly gravelly organic CLAY with frequent roots and rootlets. Gravel is fine to coarse rounded sandstone and sub-angular and sub-rounded fine ash and clinker. [Disturbed Topsoil]
			0.20	45.30		MADE GROUND: (Loose to medium dense) slightly silty very gravelly slightly ashy SAND with moderate cobble and low boulder content of sub-rounded and rounded sandstone and vesicular slag. Gravel is fine to coarse sub-angular to rounded of sandstone and predominantly vesicular slag with some fine ash, clinker and brick.
			0.80	44.70		MADE GROUND: (Dense) sandy gravelly COBBLES and BOULDERS of sub-rounded and rounded vesicular slag. Gravel is fine to coarse sub-rounded and rounded of fine ash, clinker, sandstone and predominantly vesicular slag.
1.00	B					
			2.00	43.50		MADE GROUND: (Soft to firm) grey gravelly friable CLAY with low cobble content of rounded vesicular slag. Gravel is fine to coarse sub-angular to rounded coal, shale, clinker and vesicular slag.
2.50	B					
			3.20	42.30		End of Trialpit at 3.20 m

1 2 3 4 5

Remarks:
1. Trial pit terminated at 3.2m. Maximum excavation depth achieved.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP11** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 192525.05mE - 192505.04mN	**Dimensions** 3.00m
Date Excavated: 20/03/2024	Level: 45.30mAOD	Depth : 1.60m; 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.20	45.10		MADE GROUND: Vegetation over soft brown slightly silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-rounded furnace lining block work and vesicular slag. [Disturbed Topsoil]
						MADE GROUND: Variable (Dense) grey very sandy clayey GRAVEL with high cobble and boulder content of sub-angular to rounded furnace lining block work and vesicular slag and rare concrete. Gravel is fine to coarse sub-angular and sub-rounded of sandstone, brick, shale, slag with rare coal.
1.60	B		1.60	43.70		End of Trialpit at 1.60 m

1
2
3
4
5

Remarks:
1. Refusal of excavation equipment on slag boulder.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP12** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 278347.10mE - 192516.11mN	**Dimensions** 2.40m × 0.70m
Date Excavated: 20/03/2024	Level: 45.50mAOD	Depth : 1.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						MADE GROUND: Vegetation over soft brown slightly silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-rounded furnace lining block work and vesicular slag. [Disturbed Topsoil]
			0.20	45.30		MADE GROUND: Variable (Dense) grey and black silty sandy GRAVEL with high cobble and boulder content of sub-rounded and rounded sandstone, furnace lining brickwork and vesicular slag. Gravel is fine to coarse sub-angular and sub-rounded of sandstone, vesicular slag, brick, ash and clinker. ... slow progress of excavation through large boulders (1.0m x 0.5m x 0.6m)
			1.70	43.80		End of Trialpit at 1.70 m

1
2
3
4
5

Remarks:
1. Refusal of excavation equipment at 1.7m depth on unknown boulder.

Groundwater: 1. No encountered encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**TP13** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: 5 Tonne Tracked Excavator	Coordinates: 192516.11mE - 192527.03mN	**Dimensions** 3.00m
Date Excavated: 20/03/2024	Level: 49.50mAOD	Depth : 3.20m, 0.70m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
			0.10	49.40		MADE GROUND: Grass over soft brown slightly silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-angular to rounded of sandstone and rare slag. [Disturbed Topsoil]
						MADE GROUND: (Loose to medium dense) grey and red sandy ashy GRAVEL with high coble and low boulder content of angular to sub-rounded vesicular and vitreous slag and brick. Inclusion of intact brickwork (1.0m x 0.3m x 0.7m). Gravel is fine to coarse angular to sub-rounded of shale, brick, sandstone and vesicular slag.
1.00	B		1.00	48.50		MADE GROUND: (Loose to medium dense) grey sandy slightly ashy GRAVEL and COBBLES of sandstone, and fused slag. Gravel is fine to coarse angular to rounded of sandstone, fine ash, brick, and vesicular slag.
			2.20	47.30		MADE GROUND: (Loose to medium dense) grey and black sandy ashy GRAVEL with high cobble and low boulder content of rare brick and sandstone and predominantly vesicular slag. Gravel is fine to coarse sub-angular to rounded ash, clinker and coal and predominantly vesicular slag and rare coke.
2.50	B					
			3.20	46.30		End of Trialpit at 3.20 m

1 2 3 4 5

Remarks:
1. Refusal of excavation equipment at 3.2m depth on slag boulders.

Groundwater: 1. No groundwater encountered.

Stability: 1. Generally stable in the short term with local instability associated with cobble and boulder removal.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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Project Name:	Project No.:	Trial Pit No.:
Heol Y Crwys	**14023**	**HD01** Sheet 1 of 1

Location:	Client:	Logged By:	Scale
Cwmavon	Tai Tarian	FG	1:25

Equipment: Hand Excavated Trial Pit	Coordinates:	**Dimensions** 0.50m × 0.50m
Date Excavated: 19/09/2023	Level:	Depth : 0.60m

Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
						TOPSOIL: Grass over very soft brown slightly silty slightly gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse sub-angular of mudstone.
			0.30			MADE GROUND: Loose grey slightly silty sandy GRAVEL with moderate cobble and boulder content of sub-rounded sandstone. Gravel is fine to coarse sub-angular of brick, rare ash, vesicular slag, mudstone and sandstone.
0.40	ES					
			0.60			End of Trialpit at 0.60 m

1
2
3
4
5

Remarks:

1. Hand excavated trial pit refused at 0.6m depth on boulder obstruction. Repeat excavation attempts undertaken with same result.

Groundwater: 1. No groundwater encountered.

Stability: Generally stable in the short term.

Key:
D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
W - Water sample

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APPENDIX B

WINDOWLESS SAMPLE BOREHOLE LOGS (2023 AND 2024)

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS101** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278164.37mE 192474.74mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 51.00mAOD	Scale 1:25
Diameter of Boring: 96+86+76+101mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
					0.15	50.85		MADE GROUND: Grass over soft dark brown slightly silty very slightly gravelly CLAY with occasional rootlets. Gravel is fine to coarse angular of sandstone, fine ash and coal. [Disturbed Topsoil]	
								MADE GROUND: Soft dark brown and black silty gravelly CLAY. Gravel is fine to coarse angular to sub-rounded of sandstone, fine ash and clinker.	
		1.00	C	N=17 (3,3/4,4,4,5)					1
					1.10	49.90		MADE GROUND: Medium dense dark brown and black silty sandy clayey GRAVEL. Gravel is fine to coarse angular of sandstone, fine ash and clinker.	
					1.60	49.40		MADE GROUND: Very loose black sandy ashy GRAVEL. Gravel is fine to coarse angular to sub-rounded of ash, clinker and rare coal and coke.	
		2.00	C	N=0 (1,0/0,0,0,0)	2.00	49.00		Very poor recovery between 2.0m and 3.0m depth. (<10%) … Recovered as gravelly sandy CLAY. Gravel is fine to coarse angular of sandstone, coal, coke and shale. [MADE GROUND]	2
		3.00	C	N=20 (2,3/10,6,2,2)	3.00	48.00		Poor recovery between 3.0m and 4.0m depth. (<50%) … Recovered as dark brown and black silty sandy locally clayey GRAVEL. Gravel is fine to coarse angular of sandstone, fine ash and rare clinker. [MADE GROUND]	3
		4.00	C	70 (2,6/70 for 190mm)	4.00	47.00		End of Borehole at 4.00 m	4
									5

Remarks:

1). Refusal of windowless sampler at 4.0m bgl on unknown obstruction.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS102** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192474.74mE 192509.78mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 52.10mAOD	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.15	51.95		MADE GROUND: Soft brown sandy CLAY with occasional rootlets. [Disturbed Topsoil]
					0.90	51.20		MADE GROUND: Soft black sandy slightly ashy gravelly CLAY. Gravel is fine to coarse angular of sandstone, shale, coke, clinker, ash and rare vitreous and vesicular slag.
		1.00	C	80 (10,14/80 for 115mm)	1.00	51.10		MADE GROUND: Loose black sandy ashy GRAVEL. Gravel is fine to coarse angular of sandstone, ash, clinker and vesicular slag.
								End of Borehole at 1.00 m

1 2 3 4 5

Remarks:

1). Refusal of windowless sample at 1.0m bgl on unknown obstruction.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS103** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278278.36mE 192533.80mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 52.90mAOD	Scale 1:25
Diameter of Boring: 86+101+76+65+96mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
					0.20	52.70		MADE GROUND: Grass over soft dark brown slightly silty gravelly CLAY with common roots and rootlets. Gravel is fine to coarse angular of sandstone, rare ash and clinker. [Disturbed Topsoil]	
					0.60	52.30		MADE GROUND: Very soft and greyish brown gravelly clayey SILT with low cobble content of sub-angular sandstone. Gravel is fine to coarse angular and sub-angular of sandstone, brick, fine ash and rare clinker.	
		1.00	C	N=0 (0,0/0,0,0,0)				MADE GROUND: Loose black ashy slightly gravelly locally clayey SAND. Gravel is fine to coarse angular of ash, clinker, shale and coal.	1
		2.00	C	N=0 (1,0/0,0,0,0)					2
					2.10	50.80		MADE GROUND: Very soft brown mottled red and orange slightly gravelly clayey locally sandy SILT. Gravel is fine to coarse sub-rounded of sandstone, and fine ash.	
		3.00	C	N=0 (1,0/0,0,0,0)	3.00	49.90		Poor recovery between 3.0m and 4.0m depth. (<50%) … Recovered as dark brown and black gravelly sandy CLAY. Gravel is fine to coarse angular of sandstone, coal, coke and shale. [MADE GROUND].	3
		4.00	C	N=1 (1,0/1,0,0,0)	4.00	48.90		MADE GROUND: Very soft brown mottled red and orange slightly gravelly clayey locally sandy SILT. Gravel is fine to coarse sub-rounded of sandstone, and fine ash.	4
		5.00	C	N=3 (1,1/1,1,0,1)	5.00	47.90			5

Remarks:

1). Windowless sampler terminated at 5.0m below existing ground level. Continued with SPT rod to 5.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS103** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278278.36mE 192533.80mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 52.90mAOD	Scale 1:25
Diameter of Boring: 86+101+76+65+96mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.50	C	N=22 (1,1/1,6,7,8)				End of Borehole at 5.00 m

6
7
8
9
10

Remarks:

1). Windowless sampler terminated at 5.0m below existing ground level. Continued with SPT rod to 5.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS104** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278334.47mE 192540.85mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 53.70mAOD	Scale 1:25
Diameter of Boring: 96+101+65+76+86mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
								MADE GROUND: Soft dark brown and brown silty gravelly CLAY. Gravel is fine to coarse sub-angular and sub-rounded of sandstone and fine ash.	
					0.50	53.20		MADE GROUND: Loose reddish black sandy clayey GRAVEL. Gravel is fine to coarse angular of ash, clinker, coal and sandstone.	
		1.00	C	N=6 (1,2/1,2,1,2)					1
		2.00	C	N=4 (1,1/1,1,1,1)					2
					2.10	51.60		MADE GROUD: Very soft to soft to firm becoming very soft becoming firm grey and yellowish grey very gravelly silty CLAY. Gravel is fine to coarse angular of shale, mudstone, and rare vesicular slag.	
		3.00	C	N=12 (1,3/3,3,3,3)					3
		4.00	C	N=0 (0,0/0,0,0,0)					4
		5.00	C	N=3 (0,0/0,0,0,3)	5.00	48.70			5

Remarks:

1). Windowless sampler terminated at 5.0m below existing ground level. Continued with SPT rod to 5.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS104** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278334.47mE 192540.85mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 53.70mAOD	Scale 1:25
Diameter of Boring: 96+101+65+76+86mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
								End of Borehole at 5.00 m
		5.50	C	N=9 (2,2/3,2,2,2)				

6
7
8
9
10

Remarks:

1). Windowless sampler terminated at 5.0m below existing ground level. Continued with SPT rod to 5.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS105** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278342.60mE 192503.23mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 43.10mAOD	Scale 1:25
Diameter of Boring: 101+96+86mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
					0.20	42.90		MADE GROUND: Soft brown very slightly gravelly silty CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-angular and sub-rounded brick. [Disturbed Topsoil]	
								MADE GROUND: Very loose to loose grey, black and brown ashy sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded of sandstone, ash, coke and clinker.	
		1.00	C	N=4 (1,2/1,2,1,0)	1.00	42.10		Poor recovery between 1.0m and 2.0m depth. (<50%) … Recovered as grey very gravelly CLAY. Gravel is fine to coarse angular to sub-rounded of vesicular and vitreous slag, ash and clinker. [MADE GROUND]	1
		2.00	C	N=28 (3,6/7,5,4,12)	2.00	41.10		MADE GROUND: Stiff black very sandy slightly gravelly CLAY. Gravel is fine to coarse angular of ash, clinker, and rare coal.	2
		3.00	C	N=17 (1,2/2,2,10,3)	3.00	40.10		End of Borehole at 3.00 m	3
		3.50		N=4 (1,0/1,1,1,1)					
		4.00	C	N=3 (1,1/1,1,0,1)					4
		4.50	C	N=31 (1,1/0,10,10,11)					
		5.00	C	N=9 (5,2/3,3,2,1)					5

Remarks:

1). Refusal of windowless sampler at 3.0m bgl on unknown obstruction. SPT rod continued to 6.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS105** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278342.60mE 192503.23mN	Hole Type: WLS
Equipment: DART 352	Diameter of Casing:	Level: 43.10mAOD	Scale 1:25
Diameter of Boring: 101+96+86mm	Depth of Casing:	Dates 19/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		5.50	C	N=8 (2,1/2,1,2,3)				
		6.00	C	N=23 (3,4/4,4,7,8)				
		6.50	C	N=39 (8,10/8,8,12,11)				

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Remarks:

1). Refusal of windowless sampler at 3.0m bgl on unknown obstruction. SPT rod continued to 6.5m depth.
2). No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS01** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 76+65+87+101+54mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
								TOPSOIL/DISTURBED TOPSPOIL: Grass over very soft brown sandy gravelly organic CLAY with common roots and rootlets. Gravel is fine to coarse angular of mudstone. Inclusions of timber.	
					0.20			MADE GROUND: Very loose black silty ashy sandy GRAVEL with low cobble content of angular and sub-angular mudstone. Gravel is fine to coarse angular and sub-angular of mudstone, fine ash and clinker.	
		0.30	ES						
					0.90			MADE GROUND: Very loose orange and red sandy GRAVEL. Gravel is fine to coarse angular of concrete and brick.	1
		1.00	C	N=1 (1,0/0,0,0,1)					
					1.10			MADE GROUND: Very loose sandy ashy locally silty GRAVEL. Gravel is fine to coarse angular of mudstone, burnt shale, fine ash and clinker, brick and coal.	
		2.00	C	N=1 (0,0/0,0,0,1)					2
		3.00	C	N=0 (0,0/0,0,0,0)					3
		4.00	C	N=0 (0,0/0,0,0,0)	4.00			MADE GROUND: Very loose blackish brown sandy clayey GRAVEL. Gravel is fine to coarse angular of fine ash, burnt shale, coke and coal.	4
					4.90			Stiff brown sandy slightly gravelly CLAY. Gravel is fine to coarse	
		5.00	C	50 (2,3/50 for 190mm)	5.00				5

Remarks:

1. Windowless sample from GL to 5.0m bgl.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS01** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 76+65+87+101+54mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
								angular of sandstone. [Possible Made Ground] End of Borehole at 5.00 m

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Remarks:

1. Windowless sample from GL to 5.0m bgl.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS02** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.10	ES		0.20			TOPSOIL: Grass over very soft brown silty very slightly gravelly CLAY with occasional roots and rootlets. Gravel is fine to coarse angular of mudstone.
					0.60			MADE GROUND: Loose black locally yellow slightly clayey silty sandy GRAVEL. Gravel is fine to coarse angular of mudstone, fine ash, clinker and coal.
		1.00 1.00	D C	51 (2,7/51 for 190mm)	1.00			MADE GROUND: Medium dense becoming dense black locally grey and brown sandy GRAVEL. Gravel is fine to coarse angular to sub-rounded of fine ash, clinker and vesicular slag.
								End of Borehole at 1.00 m

Remarks:

1. Windowless sample from GL to 1.0m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS03** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.10	ES					TOPSOIL/DISTURBED TOPSOIL: Grass over very soft to soft brown slightly silty very slightly gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse angular of mudstone and rare coal.
					0.30			MADE GROUND: Soft brownish black slighlty silty slightly sandy ashy very gravelly CLAY. Gravel is fine to coarse angular of mudstone, fine ash, clinker and coal.
		0.50	ES					
					0.80			MADE GROUND: Loose to medium dense, medium dense black locally red slightly sandy GRAVEL. Gravel is fine to coarse angular of fine ash, burnt shale, coke, clinker and vesicular slag.
		1.00	C	N=19 (1,3/4,5,5,5)				
		2.00	C	50 (2,3/50 for 180mm)	2.00			End of Borehole at 2.00 m

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Remarks:

1. Windowles sample from GL to 2.0m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.
3. Falling head percolation testing undertaken within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS04** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL: Grass over Very soft brown slightly sandy slightly gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse sub-angular of mudstone and sandstone.
		0.30	ES		0.70			MADE GROUND: Loose becoming medium dense black sandy slightly clayey GRAVEL. Gravel is fine to coarse angular of mudstone, burnt shale, fine ash, clinker and brick.
		1.00	C	50 (25 for 85mm/50 for 30mm)	1.00			MADE GROUND: Medium dense black sandy GRAVEL. Gravel is fine to coarse angular of mudstone, coal, burnt shale, coke and vitreous slag.
								End of Borehole at 1.00 m

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Remarks:

1. Windowless sample from GL to 1.0m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS05** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.10	ES		0.10			TOPSOIL/DISTURBED TOPSOIL: Grass over very soft brown slightly sandy gravelly CLAY. Gravel is fine to coarse sub-angular of concrete and mudstone.
		0.50	ES					MADE GROUND: Very poor recovery below 0.1m (<5%) - Recovered as loose brown and grey clayey gravel of angular fine ash and concrete.
		1.00 1.00	D C	N=50 (3,4/50 for 265mm)	1.00			End of Borehole at 1.00 m

Remarks:

1. Windowless sample from GL to 1.0m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS05A** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 18/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			TOPSOIL/DISTURBED TOPSOIL: Grass over soft brown sandy gravelly CLAY. Gravel is fine to coarse angular of mudstone, brick and fine ash.
								MADE GROUND: Loose black silty sandy clayey GRAVEL. Gravel is fine to coarse angular of mudstone, burnt shale, fine ash, clinker and coal.
		1.00	C	50 (4,6/50 for 190mm)	1.00			End of Borehole at 1.00 m

Remarks:

1. Windowless sample from GL to 1.0m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.
3. Falling head percolation testing undertaken within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS06** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 76+101+54+87+65mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
								TOPSOIL: Grass over very soft brown slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-angular mudstone.	
					0.30			MADE GROUND: Loose black and grey slightly sandy clayey ashy GRAVEL. Gravel is fine to coarse sub-angular of burnt shale, fine ash, clinker and mudstone.	
		0.40	ES						
		1.00	C	N=8 (1,1/2,2,2,2)					1
		2.00	C	N=10 (3,5/4,4,1,1)	2.00			MADE GROUND: Loose becoming very loose to loose black and orange slightly clayey ashy GRAVEL. Gravel is fine to coarse angular of fine ash, coke, and are clinker.	2
		3.00	C	N=2 (1,2/1,1,0,0)					3
		4.00	C	N=6 (1,1/1,1,2,2)					4
					4.40			MADE GROUND: Soft to firm brown mottled orange slightly gravelly slightly ashy CLAY. Gravel is fine to coarse sub-angular of ash, mudstone and coal.	
		5.00	C	N=11 (1,2/2,2,3,4)	5.00			End of Borehole at 5.00 m	5

Remarks:

1. Windowless sample from GL to 5.0m bgl.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS07** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 65+101+54+87+76mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		0.10	ES					TOPSOIL: Grass over very soft brown slightly silty slightly gravelly organic CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-angular of mudstone.	
					0.20			MADE GROUND: Loose black silty ashy sandy GRAVEL. Gravel is fine to coarse sub-angular of ash, coke and mudstone.	
					0.50			MADE GROUND: Loose becoming medium dense black silty ashy sandy GRAVEL. Gravel is fine to coarse sub-angular of ash, coal, clinker, burnt shale and rare vesicular slag.	
		0.60	ES						
		1.00	C	N=12 (2,2/3,3,3,3)					1
		2.00	C	N=13 (2,3/3,3,3,4)					2
		3.00	C	N=30 (1,1/2,8,10,10)					3
		4.00	C	N=3 (1,0/0,1,1,1)	4.00			MADE GROUND: Poor recovery below 4.0m depth (<40%) - Recovered as soft, soft to firm black sandy ashy clayey GRAVEL. Gravel is fine to coarse ash angular fine ash, clinker, vesicular slag and rare coal.	4
		5.00	C	N=11 (4,0/3,2,4,2)	5.00			End of Borehole at 5.00 m	5

Remarks:

1. Windowles sample from GL to 5.0m bgl.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS08** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.10	ES					MADE GROUND: Grass over very soft bown slightly silty slightly gravelly CLAY with common roots and rootlets. Gravel is fine to coarse angular and sub-angular mudstone and concrete.
					0.40			End of Borehole at 0.40 m

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4
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Remarks:

1. Windowless sample from GL to 0.4m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS08A** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 555	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.40			MADE GROUND: Grass over very soft bown slightly silty slightly gravelly CLAY with common roots and rootlets. Gravel is fine to coarse angular and sub-angular mudstone and concrete.
								End of Borehole at 0.40 m

1
2
3
4
5

Remarks:

1. Windowless sample from GL to 0.4m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS08B** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 556	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 101mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.40			MADE GROUND: Grass over very soft bown slightly silty slightly gravelly CLAY with common roots and rootlets. Gravel is fine to coarse angular and sub-angular mudstone and concrete.
								End of Borehole at 0.40 m

1
2
3
4
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Remarks:

1. Windowless sample from GL to 0.4m bgl. Borehole terminated due to refusal.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS09** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 76+54+101+65+87mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
								TOPSOIL: Grass over very soft brown silty gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse sub-angular of mudstone.	
					0.30			MADE GROUND: Soft greyish black slightly sandy gravelly clayey SILT. Gravel is fine to coarse angular and sub-angular of mudstone, brick, ash, coal and clinker.	
		0.40	ES						
					0.70			MADE GROUND: Loose black sandy ashy slightly clayey GRAVEL. Gravel is fine to coarse angular to sub-rounded of mudstone, burnt shale, ash, coal, clinker, brick and vesicular slag.	
		0.80	ES						
		1.00	C	N=9 (2,2/2,2,2,3)	1.00			MADE GROUND: Poor recovery between 1m - 2m depth (<10%) - Recovered as very loose black and red ashy GRAVEL. Gravel is fine to coarse angular of mudstone, coal and vesicular slag.	1
		2.00	C	N=1 (2,0/0,0,0,1)	2.00			MADE GROUND: Very poor recovery between 1m - 2m depth (<5%) - Recovered as very loose black and red ashy GRAVEL. Gravel is fine to coarse angular of mudstone, coal and vesicular slag.	2
		3.00	C	N=5 (1,1/0,0,2,3)	3.00			End of Borehole at 3.00 m	3
		4.00	C	N=10 (5,5/3,3,2,2)					4
		5.00	C	N=17 (3,4/5,4,4,4)					5

Remarks:

1. Windowless sample from GL to 3.0m bgl. SPT 's to 5.0m
2. Groundwater not encountered.
3. Falling head percolation testing undertaken within borehole.
4. Borehole collapsed from 3.0m to 1.0m depth. Continued with SPT rod only.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **WS10** Sheet 1 of 1
Location: Cwmavon	Client: Tai Tarian	Coordinates:	Hole Type: WLS
Equipment: DART 554	Diameter of Casing:	Level:	Scale 1:25
Diameter of Boring: 87+101+54+65+76mm	Depth of Casing:	Dates 19/09/2023 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		0.20	ES					TOPSOIL/DISTURBED TOPSOIL:: Grass over soft brown and orangish brown slightly silty slightly gravelly organic rich CLAY with common roots and rootlets. Gravel is fine to coarse sub-angular mudstone.	
		0.50	ES		0.40			MADE GROUND: Loose grey ashy GRAVEL. Gravel is fine to coarse angular of mudstone, brick and concrete.	
		1.00	C	N=15 (5,5/5,4,3,3)	0.70			MADE GROUND: Loose to medium dense grey and red ashy GRAVEL. Gravel is fine to coarse angular to sub-rounded of clinker, coke and vesicular slag.	1
		1.50	D						
		2.00	C	N=5 (1,0/1,2,1,1)	1.70			MADE GROUND: Loose becoming very loose black ashy GRAVEL. Gravel is fine and medium of clinker and coal.	2
		3.00	C	N=3 (1,1/0,0,1,2)					3
					3.50			MADE GROUND: Loose black ashy GRAVEL. Gravel is fine and medium of clinker and coal.	
		4.00	C	N=7 (1,0/0,1,2,4)	3.80			MADE GROUND: Loose becoming very loose black ashy GRAVEL. Gravel is fine and medium of clinker and coal.	4
		5.00	C	N=4 (1,2/0,0,0,4)	5.00			End of Borehole at 5.00 m	5

Remarks:

1. Windowless sample from GL to 5.0m bgl.
2. Groundwater not encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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APPENDIX C

CABLE PERCUSSION BOREHOLE LOGS

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **BH01** Sheet 1 of 3
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278343.79mE 192505.52mN	Hole Type: CP
Equipment: DANDO 2000	Diameter of Casing: 115mm	Level: 43.50mAOD	Scale 1:25
Diameter of Boring: 115mm	Depth of Casing: 2.10m	Dates 27/03/2024 -	Logged By: FG

Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
0.00 - 1.00	B		0.20	43.30	MADE GROUND: Vegetation over soft brown slightly silty slightly gravelly organic rich CLAY with frequent roots and rootlets. Gravel is fine to coarse sub-rounded furnace lining blockwork and vesicular slag. [Disturbed Topsoil]
					MADE GROUND: Medium dense black dark brown locally very sandy slightly silty locally silty locally slightly clayey GRAVEL with a high cobble and boulder (0.3m x 0.15m x 0.15m) content of sub-angular furnace lining blockwork, vesicular sometimes metallic slag. Gravel is fine to coarse angular to sub-rounded of mudstone, sandstone, shale, brick, vesicular and metallic slag. Localised inclusions of timber.
1.00	C	N=23 (6,6/6,5,5,7)			1
1.00 - 2.00	B				
2.00	C	N=24 (3,5/6,6,6,6)			2
2.00 - 3.00	B				
3.00	C	N=11 (5,5/2,2,4,3)			3
3.00 - 4.00	B				... *Chisel employed between 3.0m and 3.5m depth for 150 minutes.*
					... *Chisel employed between 3.5m and 4.0m depth for 150 minutes.*
4.00	C	N=27 (3,3/5,7,7,8)	4.00	39.50	4
4.00 - 5.00	B				MADE GROUND: Stiff black dark grey slightly gravelly silty CLAY. Gravel is fine to coarse sub-angular or brick and vesicular and vitreous slag.
5.00	D				5

Water Strikes: 2.90

Remarks:

1. Cable percussion borehole drilled to 10.10m below existing ground level.
2. Groundwater strike encountered @ 3.00m bgl, rising to 2.90m bgl after 20 minutes.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**BH01**
		Sheet 2 of 3

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278343.79mE 192505.52mN	CP
Equipment: DANDO 2000	Diameter of Casing: 115mm	Level: 43.50mAOD	Scale 1:25
Diameter of Boring: 115mm	Depth of Casing: 2.10m	Dates 27/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		5.00 5.00 - 6.00	C B	N=11 (2,2/1,2,4,4)					
		6.00 6.00 - 7.00	C B	50 (6,8/50 for 162mm)	6.00	37.50		MADE GROUND: Very dense dark brown dark grey sandy silty very clayey GRAVEL with a low coble and boulder (0.25m x 0.15m x 0.15m) content of sub-angular brick and vesicular slag. Gravel is fine to coarse sub-angular of brick fragment and slag.	6
		7.00 7.00 - 8.00	C B	N=55 (7,7/55 for 276mm)					7
		8.00 - 9.00	B		8.00	35.50		Very dense brown and grey very sandy GRAVEL and COBBLES of sub-rounded to rounded sandstone. Gravel is fine to coarse sub-rounded and rounded of sandstone. *... Chisel employed between 8.4m and 8.6m depth for 30 minutes.*	8
	9.00	9.00 9.00 - 10.00	C B	50 (25 for 75mm/50 for 75mm)				*... Chisel employed between 9.8m and 10.0m depth for 60 minutes.*	9
									10

Remarks:

1. Cable percussion borehole drilled to 10.10m below existing ground level.
2. Groundwater strike encountered @ 3.00m bgl, rising to 2.90m bgl after 20 minutes.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **BH01** Sheet 3 of 3
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278343.79mE 192505.52mN	Hole Type: CP
Equipment: DANDO 2000	Diameter of Casing: 115mm	Level: 43.50mAOD	Scale 1:25
Diameter of Boring: 115mm	Depth of Casing: 2.10m	Dates 27/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		10.00	C	50 (25 for 30mm/50 for 20mm)	10.10	33.40		End of Borehole at 10.10 m

11
12
13
14
15

Remarks:

1. Cable percussion borehole drilled to 10.10m below existing ground level.
2. Groundwater strike encountered @ 3.00m bgl, rising to 2.90m bgl after 20 minutes.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**BH02** Sheet 1 of 3

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278348.56mE 192540.64mN	CP

Equipment:	Diameter of Casing:	Level:	Scale
DANDO 2000	115mm	53.70mAOD	1:25

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	8.90m	28/03/2024 -	FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		0.00 - 0.40	B					TOPSOIL: Vegetation over soft brown silty gravelly organic rich CLAY. Gravel is fine to coarse angular of mudstone and rounded of sandstone.	
		0.40 - 1.00	B		0.40	53.30		MADE GROUND: Highly variable dense becoming medium dense dark brown dark grey sandy silty very clayey ashy GRAVEL with low cobble and boulder (0.25m x 0.15m x 0.15m) content of sub-angular brick and vesicular slag. Gravel is fine to coarse sub-angular of shale, brick and slag. Inclusions of timber.	
		1.00 1.00 - 2.00	C B	N=34 (4,7/8,7,9,10)					1
		2.00 2.00 - 3.00	C B	N=12 (3,4/4,3,3,2)				*...Becoming medium dense from 2.00m bgl.*	2
		3.00 3.00 - 4.00	C B	N=7 (3,1/2,2,1,2)	3.00	50.70		MADE GROUND: Loose becoming medium dense black dark brown locally very sandy slightly silty locally silty locally slightly clayey ashy GRAVEL with a low cobble and boulder (0.3m x 0.15m x 0.15m) content of sub-angular vesicular slag. Gravel is fine to coarse sub-angular and angular of mudstone, glass, vesicular slag and brick. Localised inclusions of timber and ashy.	3
		4.00 4.00 - 5.00	C B	N=24 (4,7/5,5,7,7)				*...Becoming medium dense below 4.0m bgl.* *... Chisel employed between 4.0m and 4.5m depth for 30 minutes.*	4
		5.00	C	N=14 (3,4/4,4,3,3)					5

Remarks:

1. Cable percussion borehole drilled to 12.0m below existing ground level.
2. No water strike observed due to borehole being drilled with water.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**BH02** Sheet 2 of 3

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278348.56mE 192540.64mN	CP

Equipment:	Diameter of Casing:	Level:	Scale
DANDO 2000	115mm	53.70mAOD	1:25

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	8.90m	28/03/2024 -	FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		5.00 - 6.00	B						
		6.00	C	N=8 (10,9/3,2,2,1)	6.00	47.70		MADE GROUND: Loose locally very loose to loose black dark brown locally very sandy slightly silty locally silty locally slightly clayey ashy GRAVEL with a low cobble and boulder (0.3m x 0.15m x 0.15m) content of sub-angular vesicular slag. Gravel is fine to coarse sub-angular and angular of mudstone, glass, vesicular slag and brick.	6
		6.00 - 7.00	B						
		7.00	C	N=4 (2,2/1,1,1,1)				*... Chisel employed between 7.0m and 7.3m depth for 60 minutes.*	7
		7.00 - 8.00	B						
		8.00	C	N=8 (3,3/2,2,2,2)				*... Chisel employed between 8.0m and 8.3m depth for 210 minutes.*	8
					8.30	45.40		MADE GROUND: Loose black dark brown locally very sandy slightly silty locally silty locally slightly clayey GRAVEL with a low cobble and boulder (0.3m x 0.15m x 0.15m) content of sub-angular vesicular slag and ironstone. Gravel is fine to coarse sub-angular and angular of mudstone, vesicular slag and brick. Localised inclusions of timber.	
		9.00	C	50 (0 for 0mm/50 for 75mm)					9
		9.00 - 10.00	B						
		10.00	C	N=5 (3,1/2,1,1,1)					10

Remarks:

1. Cable percussion borehole drilled to 12.0m below existing ground level.
2. No water strike observed due to borehole being drilled with water.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**BH02** Sheet 3 of 3

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278348.56mE 192540.64mN	CP

Equipment:	Diameter of Casing:	Level:	Scale
DANDO 2000	115mm	53.70mAOD	1:25

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	8.90m	28/03/2024 -	FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description	
		10.00 - 11.00	B						
		11.00 11.00 - 12.00	C	N=6 (4,4/2,1,1,2)					11
		12.00	C	N=14 (2,2/4,4,4,2)	12.00	41.70		End of Borehole at 12.00 m	12
									13
									14
									15

Remarks:

1. Cable percussion borehole drilled to 12.0m below existing ground level.
2. No water strike observed due to borehole being drilled with water.
3. Installation of ground gas and water monitoring standpipes within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**BH03** Sheet 1 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278216.64mE 192509.74mN	CP

Equipment:	Diameter of Casing:	Level:	Scale
DANDO 2000	115mm	51.90mAOD	1:25

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	6.20m	27/03/2024 -	FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		0.00 - 0.40	B					MADE GROUND: Grass over soft brown slightly silty slightly gravelly organic rich CLAY with common rootlets. Gravel is fine to coarse angular to sub-rounded of sandstone and rare vitreous slag. [Disturbed Topsoil]
		0.40 - 1.00	B		0.40	51.50		MADE GROUND: Medium dense grey, red and black silty very sandy very ashy GRAVEL with low cobble content of sub-angular and sub-rounded sandstone, brick and fused slag. Gravel is fine to coarse angular to sub-rounded of rare sandstone and predominantly fine ash, clinker and vesicular, vitreous and metallic slag.
					0.80	51.10		MADE GROUND: Very dense black dark grey slightly sandy ashy GRAVEL with a low cobble and boulder (0.3m x 0.15m x 0.1m) content of sub-angular vesicular slag, vitreous, fused metallic slag. Gravel is fine to coarse sub-angular of vitreous, vesicular, fused metallic slag.
		1.00	C	N=26 (3,3/6,10,5,5)				
		1.00 - 2.00	B					
		2.00	C	N=27 (7,5/4,9,8,6)				
		2.00 - 3.00	B					
		3.00	C	N=30 (7,6/5,7,9,9)				
		3.00 - 4.00	B					
								... Chisel employed between 3.5m and 4.0m depth for 60 minutes.
		4.00	C	50 (25 for 75mm/50 for 75mm)	4.00	47.90		MADE GROUND: Medium dense black dark grey slightly sandy GRAVEL. Gravel is fine to coarse angular and sub-angular of vesicular and vitreous slag.
		4.00 - 5.00	B					*... Chisel employed between 4.0m and 4.5m depth for 60 minutes.*
								... Chisel employed between 4.5m and 5.0m depth for 60 minutes.

Remarks:

1. Cable percussion borehole drilled to 6.20m below existing ground level upon refusal on metallic obstruction.
2. No groundwater encountered.
3. Installation of ground gas and water monitoring standpipe within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **BH03** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278216.64mE 192509.74mN	Hole Type: CP
Equipment: DANDO 2000	Diameter of Casing: 115mm	Level: 51.90mAOD	Scale 1:25
Diameter of Boring: 115mm	Depth of Casing: 6.20m	Dates 27/03/2024 -	Logged By: FG

Well	Water Strikes	Samples & In situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		5.00	C	50 (25 for 75mm/50 for 30mm)				*... Chisel employed between 5.0m and 5.5m depth for 90 minutes.*
		5.00 - 5.50	B					
					6.20	45.70		End of Borehole at 6.20 m

6
7
8
9
10

Remarks:

1. Cable percussion borehole drilled to 6.20m below existing ground level upon refusal on metallic obstruction.
2. No groundwater encountered.
3. Installation of ground gas and water monitoring standpipe within borehole.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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APPENDIX D

ROTARY OPEN HOLE BOREHOLE LOGS

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH01** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278151.11mE 192496.47mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 52.00mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 14.70m	Dates 20/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - variable fill (Driller's Description).
							7.30	44.70			CLAY (Driller's Description).
	10.20						9.80	42.20			SAND and GRAVEL (Driller's Description).
							13.70	38.30			CLAY and GRAVEL (Driller's Description).
							16.00	36.00			MUDSTONE (Driller's Description).
							16.40	35.60			COAL (Driller's Description).
							17.30	34.70			MUDSTONE and SANDSTONE (Driller's Description).

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 10.20m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH01** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278151.11mE 192496.47mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 52.00mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 14.70m	Dates 20/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							35.00	17.00			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 10.20m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH02** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278207.09mE 192500.47mN	Hole Type: RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 51.30mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 18.00m	Dates 19/02/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description). - Hard drill conditions noted.
							12.00	39.30			Silty CLAY (Driller's Description).
	15.50						15.00	36.30			SAND and GRAVEL (Driller's Description).
							18.10	33.20			SILTSTONE (Driller's Description).

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH02** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278207.09mE 192500.47mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	51.30mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	18.00m	19/02/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							24.00	27.30			COAL (Driller's Description).
							25.50	25.80			MUDSTONE and SILTSTONE (Driller's Description).
							35.00	16.30			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH03** Sheet 1 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278209.70mE 192521.51mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	52.20mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	19.50m	20/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description).
							11.90	40.30			Silty CLAY (Driller's Description).
	15.30						14.70	37.50			SAND and GRAVEL (Driller's Description).
							19.00	33.20			MUDSTONE (Driller's Description).
							19.20	33.00			COAL (Driller's Description).
							19.50	32.70			SILTSTONE (Driller's Description).

Remarks:

1. Rotary open borehole drilled to 37.00m below existing ground level.

2. Groundwater strike encountered @15.30m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH03** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278209.70mE 192521.51mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	52.20mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	19.50m	20/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							34.30	17.90			COAL (Driller's Description).
							35.80	16.40			MUDSTONE (Driller's Description).
							37.00	15.20			End of Borehole at 37.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 37.00m below existing ground level.

2. Groundwater strike encountered @15.30m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH04** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192521.51mE 192511.08mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 52.10mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 20.70m	Dates 20/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description). - Hard drill conditions noted.
							13.80	38.30			SAND and GRAVEL (Driller's Description).
	16.20										
							18.10	34.00			CLAY and GRAVEL (Driller's Description).
							19.90	32.20			

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 16.20m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH04** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	192521.51mE 192511.08mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
PL-G	115mm	52.10mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	20.70m	20/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MUDSTONE and SANDSTONE (Driller's Description).
							32.00	20.10			COAL (Driller's Description).
							32.40	19.70			MUDSTONE (Driller's Description).
							33.40	18.70			COAL (Driller's Description).
							33.90	18.20			MUDSTONE (Driller's Description).
							35.00	17.10			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 16.20m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH05** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278246.16mE 192539.74mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 53.10mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 20.70m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable fill (Driller's Description)
	11.70						11.30	41.80			CLAY (Driller's Description).
							15.00	38.10			SAND and GRAVEL (Driller's Description).
							19.30	33.80			MUDSTONE and SANDSTONE (Driller's Description).

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 11.70m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Intégral Géotechnique	Project Name: **Heol Y Crwys**	Project No.: **14023**	Borehole No.: **PH05** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278246.16mE 192539.74mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 53.10mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 20.70m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

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Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							29.70	23.40			COAL (Driller's Description).
							30.40	22.70			MUDSTONE (Driller's Description).
							31.80	21.30			COAL (Driller's Description).
							32.50	20.60			MUDSTONE (Driller's Description).
							35.00	18.10			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 11.70m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH06** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192539.74mE 192530.87mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing:	Level: 52.50mAOD	Scale 1:100
Diameter of Boring:	Depth of Casing:	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											Reworked Fill materials. (Driller's Description)
							11.30	41.20			CLAY. (Driller's Description)
	15.00						15.00	37.50			SAND and GRAVEL. (Driller's Description)
							19.30	33.20			Interbedded MUDSTONE and SANDSTONE. (Driller's Description)

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH06** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	192539.74mE 192530.87mN	RO
Equipment: PL-G	Diameter of Casing:	Level: 52.50mAOD	Scale 1:100
Diameter of Boring:	Depth of Casing:	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							29.70	22.80			COAL. (Driller's Description)
							30.40	22.10			MUDSTONE. (Driller's Description)
							31.80	20.70			COAL. (Driller's Description)
							32.50	20.00			MUDSTONE. (Driller's Description)
							35.00	17.50			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @ 15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Intégral Géotechnique	Project Name: **Heol Y Crwys**	Project No.: **14023**	Borehole No.: **PH07** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192530.87mE 192559.15mN	Hole Type: RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 53.30mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 18.00m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

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Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description). - Hard drill conditions noted.
							9.70	43.60			SAND and GRAVEL. (Driller's Description)
	15.10										
							18.00	35.30			MUDSTONE. (Driller's Description)

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @15.10m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH07** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	192530.87mE 192559.15mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	53.30mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	18.00m	21/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							21.00	32.30			COAL. (Driller's Description)
							21.50	31.80			MUDSTONE. (Driller's Description)
							23.50	29.80			COAL. (Driller's Description)
							25.00	28.30			SILTSTONE. (Driller's Description)
							35.00	18.30			End of Borehole at 35.00 m

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @15.10m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH08** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192559.15mE 192551.64mN	Hole Type: RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 53.60mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 19.50m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description). - Hard drill conditions noted.
							12.00	41.60			Silty CLAY with sand and gravel bands. (Driller's Description)
							19.50	34.10			MUDSTONE. (Driller's Description)

Remarks:

1. Rotary open borehole drilled to 35.00m bgl.
2. No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH08**
		Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	192559.15mE 192551.64mN	RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 53.60mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 19.50m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							22.50	31.10			COAL with subordinate mudstone bands. (Driller's Description)
							23.50	30.10			MUDSTONE. (Driller's Description)
							26.60	27.00			COAL. (Driller's Description)
							27.00	26.60			Interbedded SILTSTONE and MUDSTONE. (Driller's Description)
							35.00	18.60			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m bgl.
2. No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH09**
		Sheet 1 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	192551.64mE 192548.19mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	54.00mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	21.00m	21/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description).
							12.90	41.10			Silty CLAY with sand and gravel bands. (Driller's Description)
	16.10										
							20.00	34.00			

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @16.10m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH09** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192551.64mE 192548.19mN	Hole Type: RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 54.00mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 21.00m	Dates 21/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MUDSTONE. (Driller's Description)
							22.10	31.90			COAL (Driller's Description)
							22.90	31.10			MUDSTONE (Driller's Description)
							35.00	19.00			End of Borehole at 35.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @16.10m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH10** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192548.19mE 192576.36mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 53.60mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 19.70m	Dates 22/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable fill materials. (Driller's Description)
							10.70	42.90			CLAY. (Driller's Description)
							14.00	39.60			SAND and GRAVEL. (Driller's Description)
	15.00										
							18.30	35.30			Interbedded MUDSTONE and SANDSTONE. (Driller's Description)

Remarks:

1. Rotary open borehole drilled to 36.00m below existing ground level.
2. Groundwater strike encountered @ 15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

AGS

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH10** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 192548.19mE 192576.36mN	Hole Type: RO
Equipment: PL-G	Diameter of Casing: 115mm	Level: 53.60mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 19.70m	Dates 22/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
							33.80	19.80			COAL. (Driller's Description)
							34.60	19.00			MUDSTONE. (Driller's Description)
							36.00	17.60			End of Borehole at 36.00 m

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

Remarks:

1. Rotary open borehole drilled to 36.00m below existing ground level.
2. Groundwater strike encountered @ 15.00m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH11** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278358.44mE 192574.89mN	Hole Type: RO
Equipment: KLEMM KR802-2	Diameter of Casing: 115mm	Level: 53.80mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 19.00m	Dates 22/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description) - Hard drill conditions noted.
							9.30	44.50			SAND and GRAVEL with silty clay bands. (Driller's Description)
							19.00	34.80			MUDSTONE. (Driller's Description)

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @21.50m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name:	Project No.:	Borehole No.:
Heol Y Crwys	**14023**	**PH11** Sheet 2 of 2

Location:	Client:	Coordinates:	Hole Type:
Cwmavon	Tai Tarian	278358.44mE 192574.89mN	RO

Equipment:	Diameter of Casing:	Level:	Scale
KLEMM KR802-2	115mm	53.80mAOD	1:100

Diameter of Boring:	Depth of Casing:	Dates	Logged By:
115mm	19.00m	22/03/2024 -	Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
	21.50										
							29.00	24.80			COAL. (Driller's Description)
							30.50	23.30			SILTSTONE. (Driller's Description)
							35.00	18.80			End of Borehole at 35.00 m

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.
2. Groundwater strike encountered @21.50m bgl.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH12** Sheet 1 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278346.19mE 192504.03mN	Hole Type: RO
Equipment:	Diameter of Casing: 115mm	Level: 43.40mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 10.50m	Dates 23/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											MADE GROUND - Variable slag fill material. (Driller's Description). - Hard drill conditions noted.
							8.00	35.40			SAND and GRAVEL. (Driller's Description)
	10.50						9.80	33.60			SANDSTONE. (Driller's Description)
							18.00	25.40			COAL. (Driller's Description)
							18.90	24.50			MUDSTONE. (Driller's Description)
							20.00	23.40			

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.

2. No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

AGS

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Project Name: **Heol Y Crwys**		Project No.: **14023**	Borehole No.: **PH12** Sheet 2 of 2
Location: Cwmavon	Client: Tai Tarian	Coordinates: 278346.19mE 192504.03mN	Hole Type: RO
Equipment:	Diameter of Casing: 115mm	Level: 43.40mAOD	Scale 1:100
Diameter of Boring: 115mm	Depth of Casing: 10.50m	Dates 23/03/2024 -	Logged By: Lead Drillers Field Description

Well	Water Strikes	Rotary Coring Depth (m)	TCR	SCR	RQD	FI	Depth (m)	Level (m AOD)	N Value	Legend	Stratum Description
											COAL. (Driller's Description)
							21.50	21.90			SILTSTONE. (Driller's Description)
							31.10	12.30			COAL. (Driller's Description)
							31.30	12.10			MUDSTONE. (Driller's Description)
							35.00	8.40			End of Borehole at 35.00 m

Remarks:

1. Rotary open borehole drilled to 35.00m below existing ground level.

2. No groundwater encountered.

Key:

D - Small disturbed sample
B - Bulk disturbed sample
ES - Environmental soil sample
SPT - Standard Penetration Test (split spoon)
CPT - Standard Penetration Test (solid cone)
W - Water sample
U - Undisturbed sample
TCR - Total Core Recovery
SCR - Solid Core Recovery
RQD - Rock Quality Designation

AGS

APPENDIX E

FALLING HEAD TEST RESULTS (2023)

PERMEABILITY TEST DATA

PROJECT	**Heol Y Cryws, Cwmavon**	**JOB No.**	**14023**

TYPE	FALLING HEAD		
DATE	18.09.2023	**TIME**	11:30 hrs
BOREHOLE NUMBER	WS03	**TEST No.**	1
Depth of borehole at start of test (mBGL) h_i			2.00 m
Depth of borehole at end of test (mBGL) h_e			2.00 m
Borehole diameter (m) D			0.102 m
Piezometer diameter (m) d			m
Filter Backfill			No
Soil in casing (m) L			0.00 m
L/D Ratio			19.6
Hole in Soil below base of casing (m) L			2.00 m
Depth of casing (mBGL) h_c			0.00 m
Height of casing above ground level h_{uc}			0.00 m
Ground water level (mBGL) H_G			2.00 m
Water level at start of test below top of casing h_o			0.00 m
		$H_{G\ TEST}$	2.00 m

Elapsed Time t (mins)	**t (s)**	**Depth of water below top of casing h (m)**	**Head of Water $H = (H_G - h)$ (m)**	**Ratio H/H_0**
0	0	0.00	2.0	1.00
1	60	0.19	1.8	0.91
3	180	0.40	1.6	0.80
5	300	0.55	1.5	0.73
6	360	0.63	1.4	0.69
8	480	0.68	1.3	0.66
10	600	0.72	1.3	0.64
16	960	0.76	1.2	0.62
22	1320	0.80	1.2	0.60
36	2160	0.85	1.2	0.58
50	3000	0.90	1.1	0.55
120	7200	0.96	1.0	0.52
154	9240	0.98	1.0	0.51
181	10860	1.00	1.0	0.50
200	12000	1.00	1.0	0.50

TEST SECTION

Length L = **2.00** m

Area A = **0.6491** m^2

INTAKE FACTOR

Refer to BS 5930 Figure 7

Type **Special**

F = **D*2.32*π*(L/D)**

F = **3.90**

TIME LAG

T = Time from start of test when h = 0.37 h_o

See graph opposite

T = **N/A** s

PERMEABILITY

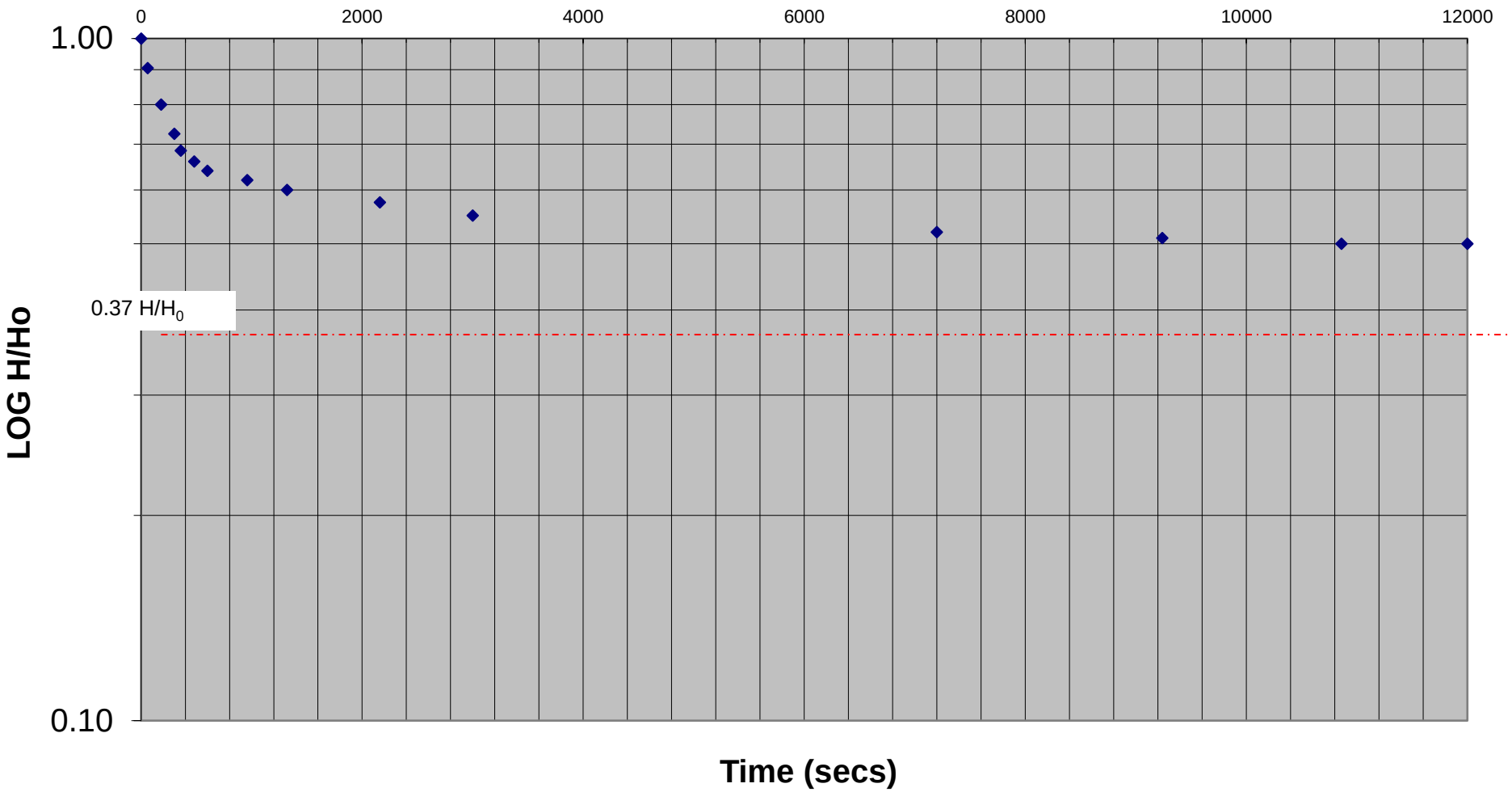
K = A / (F * T)

K = **#VALUE!** m/s

COMMENTS

Infiltration stalled after 200 minutes. Insufficient infiltration to derive permeability value.
Test undertaken primarily within granular made ground deposits.

Borehole WS03



PERMEABILITY TEST DATA

PROJECT	**Heol Y Crwys, Cwmavon**	**JOB No.**	**14023**

TYPE	FALLING HEAD		
DATE		**TIME**	09:05 hrs
BOREHOLE NUMBER	WS09	**TEST No.**	1
Depth of borehole at start of test (mBGL) h_i			5.00 m
Depth of borehole at end of test (mBGL) h_e			5.00 m
Borehole diameter (m) D			0.102 m
Piezometer diameter (m) d			m
Filter Backfill			No
Soil in casing (m) L			0.00 m
L/D Ratio			49.0
Hole in Soil below base of casing (m) L			5.00 m
Depth of casing (mBGL) h_c			0.00 m
Height of casing above ground level h_{uc}			0.00 m
Ground water level (mBGL) H_G			5.00 m
Water level at start of test below top of casing h_o			0.00 m
		$H_{G\ TEST}$	5.00 m

Elapsed Time t (mins)	**t (s)**	**Depth of water below top of casing h (m)**	**Head of Water $H = (H_G - h)$ (m)**	**Ratio H/H_0**
0	0	0.00	5.0	1.00
1	60	0.50	4.5	0.90
2	120	0.79	4.2	0.84
3	180	0.99	4.0	0.80
4	240	1.20	3.8	0.76
6	360	1.43	3.6	0.71
10	600	1.56	3.4	0.69
16	960	1.60	3.4	0.68
22	1320	1.64	3.4	0.67
36	2160	1.70	3.3	0.66
48	2880	1.72	3.3	0.66
72	4320	1.72	3.3	0.66

TEST SECTION

Length L = **5.00** m

Area A = **1.6104** m^2

INTAKE FACTOR

Refer to BS 5930 Figure 7

Type **Special**

F = **D*2.32*Π*(L/D)**

F = **7.82**

TIME LAG

T = Time from start of test when h = 0.37 h_o

See graph opposite

T = **N/A** s

PERMEABILITY

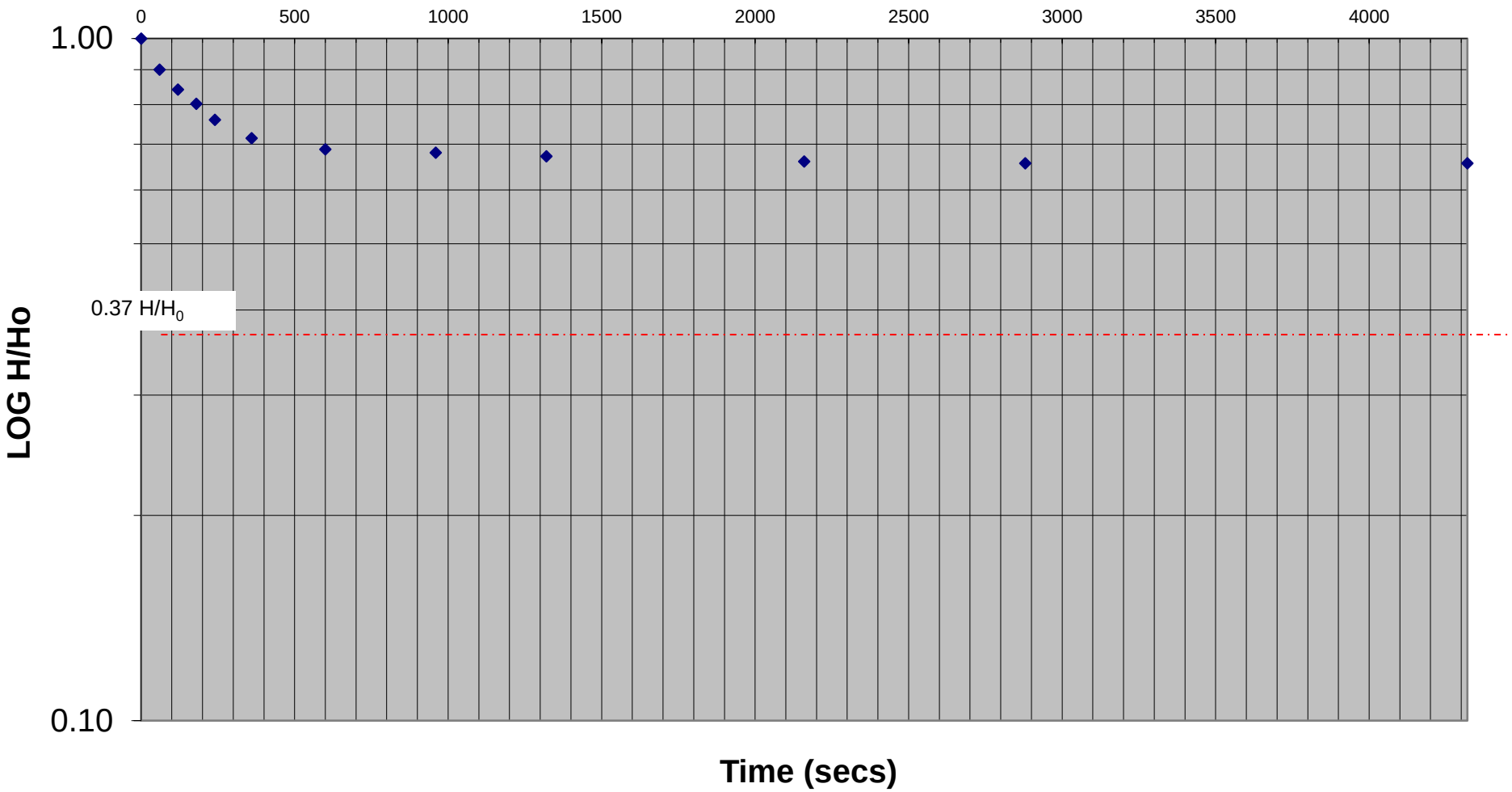
K = A / (F * T)

K = **#VALUE!** m/s

COMMENTS

Infiltration stalled after 48 minutes. Insufficient infiltration to derive permeability value.
Test undertaken primarily within granular made ground deposits.

Borehole WS09



PERMEABILITY TEST DATA

PROJECT	**Heol Y Crwys, Cwmavon**	**JOB No.**	**14023**

TYPE	FALLING HEAD		
DATE		**TIME**	13:45 hrs
BOREHOLE NUMBER	WS05A	**TEST No.**	1
Depth of borehole at start of test (mBGL) h_i			1.00 m
Depth of borehole at end of test (mBGL) h_e			1.00 m
Borehole diameter (m) D			0.102 m
Piezometer diameter (m) d			m
Filter Backfill			No
Soil in casing (m) L			0.00 m
L/D Ratio			9.8
Hole in Soil below base of casing (m) L			1.00 m
Depth of casing (mBGL) h_c			0.00 m
Height of casing above ground level h_{uc}			0.00 m
Ground water level (mBGL) H_G			1.00 m
Water level at start of test below top of casing h_o			0.00 m
		$H_{G\ TEST}$	1.00 m

Elapsed Time t (mins)	**t (s)**	**Depth of water below top of casing h (m)**	**Head of Water $H = (H_G - h)$ (m)**	**Ratio H/H_0**
0	0	0.00	1.0	1.00
1	60	0.43	0.6	0.57
2	120	0.56	0.4	0.44
3	180	0.58	0.4	0.42
4	240	0.59	0.4	0.41
6	360	0.68	0.3	0.32
7	420	0.71	0.3	0.29
10	600	0.72	0.3	0.28
15	900	0.72	0.3	0.28

TEST SECTION

Length L = **1.00** m

Area A = **0.3286** m^2

INTAKE FACTOR

Refer to BS 5930 Figure 7

Type **Special**

F = **D*2.32*Π*(L/D)**

F = **2.39**

TIME LAG

T = Time from start of test when h = 0.37 h_o

See graph opposite

T = **290** s

PERMEABILITY

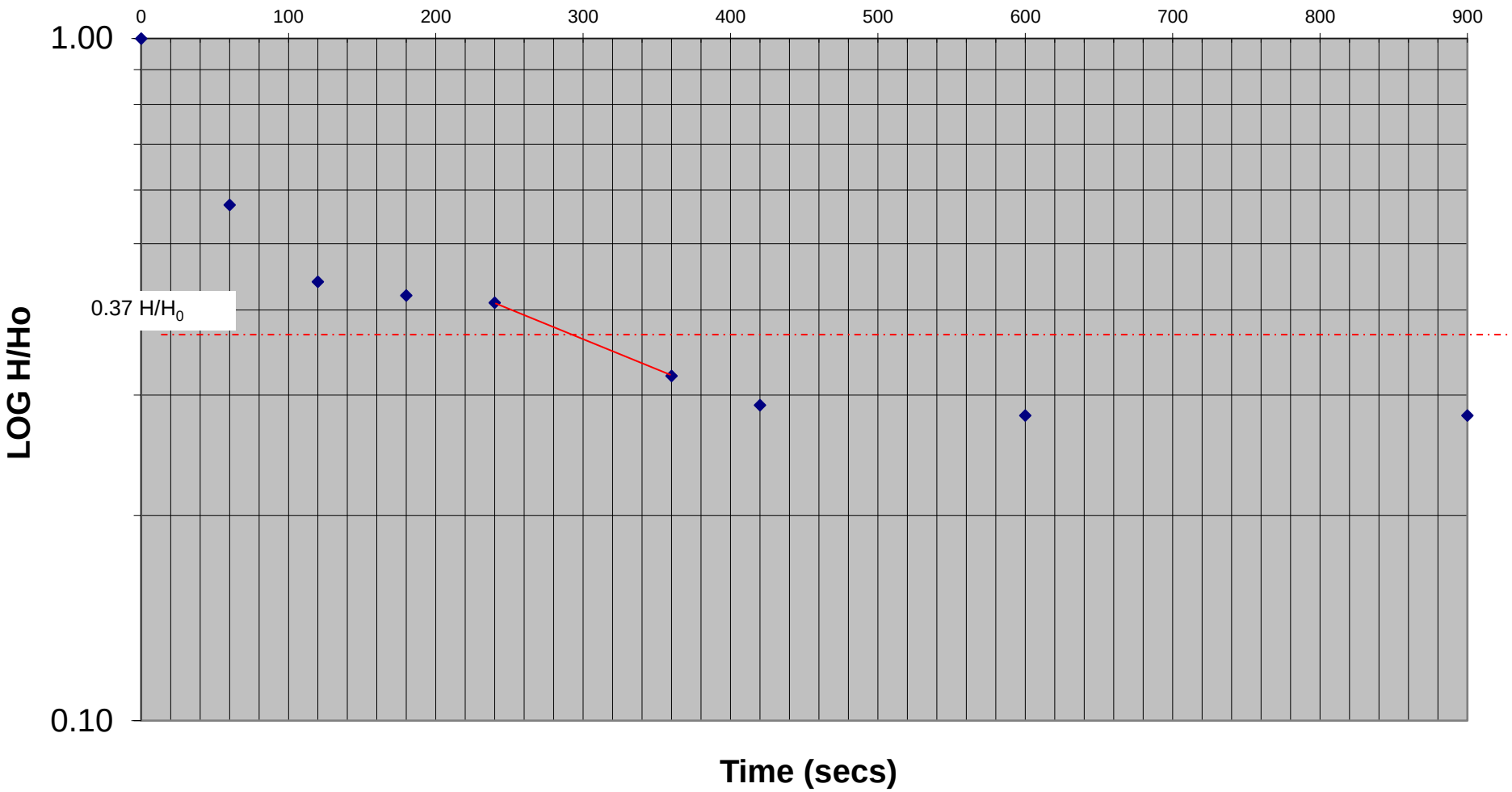
K = A / (F * T)

K = **4.74E-04** m/s

COMMENTS

Test undertaken within variable made ground deposits. Permeability value to be used with caution.

Borehole WS05



APPENDIX F

LABORATORY CHEMICAL TEST RESULTS (SOILS)

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Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-57754

Replaces Analytical Report Number: 23-57754, issue no. 1
Additional analysis undertaken.
Asbestos quantification added for positive samples as per client's request

Project / Site name:	Heol Crwys, Cwmavon	**Samples received on:**	21/09/2023
Your job number:	14023	**Samples instructed on/ Analysis started on:**	21/09/2023
Your order number:	14023 FG	**Analysis completed by:**	09/10/2023
Report Issue Number:	2	**Report issued on:**	17/10/2023
Samples Analysed:	14 soil samples		

Signed:

Dominika Warjan
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

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

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819083	2819084	2819085	2819086	2819087
Sample Reference				WS01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.10	0.10	0.30	0.10
Date Sampled				18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
Time Taken				0900	1000	1100	1215	1315
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	27	24	17	18
Total mass of sample received	kg	0.001	NONE	0.3	0.4	0.3	0.3	0.4
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	6.2	5.4	7.1	8
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1400	670	740	440	1200
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.127	0.0117	0.0073	0.0165	0.0301
Sulphide	mg/kg	1	MCERTS	11	< 1.0	< 1.0	2.6	82
Total Sulphur	mg/kg	50	MCERTS	1100	630	520	630	1400
Organic Matter	%	0.1	MCERTS	-	-	-	14	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	4.3	5.7	4.1	-	7.1
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-	8.4	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	12.8	15.1	10.9	25.8	15.6

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.21	0.09	< 0.05	1.8	0.16
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.06	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.06	0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.84	0.47	0.17	0.64	0.32
Anthracene	mg/kg	0.05	MCERTS	0.09	0.08	< 0.05	0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.2	1	0.42	0.36	0.26
Pyrene	mg/kg	0.05	MCERTS	1	0.83	0.33	0.27	0.19
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.71	0.73	0.3	0.31	0.2
Chrysene	mg/kg	0.05	MCERTS	0.9	1	0.43	0.5	0.22
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1	1.4	0.44	0.34	0.28
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.36	0.35	0.17	0.09	0.09
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.63	0.86	0.29	0.17	0.17
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.38	0.6	0.19	0.11	0.11
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.15	0.22	0.06	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.38	0.56	0.2	0.11	0.15

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	8.02	8.37	3	4.77	2.15

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819083	2819084	2819085	2819086	2819087
Sample Reference				WS01	WS02	WS03	WS04	WS05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.10	0.10	0.30	0.10
Date Sampled				18/09/2023	18/09/2023	18/09/2023	18/09/2023	18/09/2023
Time Taken				0900	1000	1100	1215	1315
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	51	46	65	66	26
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1	0.93	0.65	1.1	1.8
Boron (water soluble)	mg/kg	0.2	MCERTS	0.5	1.1	0.7	0.4	0.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	U/S**	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	21	20	13	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	310	180	100	400	130
Lead (aqua regia extractable)	mg/kg	1	MCERTS	900	310	130	130	46
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	1.5	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	31	25	20	34	11
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	34	32	35	33	45
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	290	350	250	130	110

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819088	2819089	2819090	2819091	2819092
Sample Reference				WS05	WS06	WS07	WS07	WS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.40	0.10	0.60	0.10
Date Sampled				18/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Time Taken				1330	0900	1000	1015	1115
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	11	26	8.3	23
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.4	0.3	0.3
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.9	7.7	5.8	7.4	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	1500	11000	950	4000	460
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0244	0.0313	0.0121	0.0163	0.0091
Sulphide	mg/kg	1	MCERTS	32	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphur	mg/kg	50	MCERTS	1500	4900	600	1900	400
Organic Matter	%	0.1	MCERTS	-	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	6.4	3.1	4.6	5.2	3.1
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-	-	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	17.5	17.5	11.4	19.4	7.2

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.29	0.83	0.05	1.2	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.1	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.07	0.22	< 0.05	0.09	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.68	1.2	0.13	1.4	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	1.2	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.4	0.06	0.14	0.05	< 0.05
Pyrene	mg/kg	0.05	MCERTS	0.3	0.07	0.11	0.1	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.35	< 0.05	0.08	0.06	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.53	0.32	0.09	0.39	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.45	0.11	0.11	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.1	0.13	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.25	< 0.05	0.08	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.15	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.08	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.18	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	3.83	4.18	< 0.80	3.32	< 0.80

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819088	2819089	2819090	2819091	2819092
Sample Reference				WS05	WS06	WS07	WS07	WS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.40	0.10	0.60	0.10
Date Sampled				18/09/2023	19/09/2023	19/09/2023	19/09/2023	19/09/2023
Time Taken				1330	0900	1000	1015	1115
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	63	110	29	47	25
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.7	0.35	0.83	0.64	0.79
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.2	0.6	0.3	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	8.9	26	18	25
Copper (aqua regia extractable)	mg/kg	1	MCERTS	400	66	76	57	81
Lead (aqua regia extractable)	mg/kg	1	MCERTS	98	55	67	48	58
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.9	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	42	9	23	22	21
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	51	18	35	26	38
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	210	27	120	73	100

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819093	2819094	2819095	2819096
Sample Reference				WS09	WS09	WS10	HD01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.80	0.20	0.40
Date Sampled				19/09/2023	19/09/2023	19/09/2023	19/09/2023
Time Taken				1215	1230	1330	1515
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	17	20	11
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.3

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	< 0.001	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	-	< 0.001	-	-
Asbestos Analyst ID	N/A	N/A	N/A	MJN	MJN	MJN	MJN

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	7.9	7.5	6.9
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	470	2000	230	4200
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0209	0.0296	0.0108	0.0743
Sulphide	mg/kg	1	MCERTS	4.4	4.6	< 1.0	3.4
Total Sulphur	mg/kg	50	MCERTS	510	1800	380	2800
Organic Matter	%	0.1	MCERTS	-	-	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.9	6	2.4	2.7
Total Organic Carbon (TOC) – Manual	%	0.1	MCERTS	-	-	-	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	9.3	19	6.4	12.6

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.19	0.57	0.06	0.41
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.06	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.08	0.15	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.64	1.6	0.44	0.53
Anthracene	mg/kg	0.05	MCERTS	0.07	0.1	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.93	1.3	0.53	0.18
Pyrene	mg/kg	0.05	MCERTS	0.71	0.9	0.41	0.15
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.64	1.2	0.24	0.12
Chrysene	mg/kg	0.05	MCERTS	0.9	1.2	0.39	0.27
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.87	1.4	0.43	0.19
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.35	1.7	0.11	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.57	0.56	0.26	0.09
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.33	0.38	0.16	0.07
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.11	0.06	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.33	0.37	0.15	0.06

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	6.78	11.5	3.18	2.07

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				2819093	2819094	2819095	2819096
Sample Reference				WS09	WS09	WS10	HD01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.80	0.20	0.40
Date Sampled				19/09/2023	19/09/2023	19/09/2023	19/09/2023
Time Taken				1215	1230	1330	1515
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	98	420	35	110
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.1	1	0.7	0.76
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.3	0.5	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27	15	24	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	850	2900	91	1200
Lead (aqua regia extractable)	mg/kg	1	MCERTS	280	400	96	420
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	34	50	19	39
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	72	38	37	82
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	380	3100	210	490

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

UKAS TESTING 4041

Analytical Environmental Science

Analytical Report Number: 23-57754
Project / Site name: Heol Crwys, Cwmavon
Your Order No: 14023 FG

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2819094	WS09	0.80	162	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 23-57754
Project / Site name: Heol Crwys, Cwmavon

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2819083	WS01	None Supplied	0.4	Brown clay and sand with clinker
2819084	WS02	None Supplied	0.1	Brown loam and clay with vegetation.
2819085	WS03	None Supplied	0.1	Brown clay and loam with vegetation.
2819086	WS04	None Supplied	0.3	Brown clay and sand with clinker
2819087	WS05	None Supplied	0.1	Brown clay and loam with vegetation and clinker
2819088	WS05	None Supplied	0.5	Grey sand with clinker
2819089	WS06	None Supplied	0.4	Brown clay and sand.
2819090	WS07	None Supplied	0.1	Brown clay with vegetation.
2819091	WS07	None Supplied	0.6	Brown clay and sand with gravel.
2819092	WS08	None Supplied	0.1	Brown clay with vegetation.
2819093	WS09	None Supplied	0.4	Brown clay and sand with gravel.
2819094	WS09	None Supplied	0.8	Grey clay and sand with clinker
2819095	WS10	None Supplied	0.2	Brown clay.
2819096	HD01	None Supplied	0.4	Brown clay and sand.

Analytical Report Number : 23-57754
Project / Site name: Heol Crwys, Cwmavon

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L023-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards. Refer to CoA for analyte specific accreditation.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L023-PL	D	MCERTS

Analytical Report Number : 23-57754
Project / Site name: Heol Crwys, Cwmavon

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

**U/S - Unsuitable for analysis due to high colour intensity.

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Analytical Report Number : 24-027996

Project / Site name:	Heol Y Cryws, Cwmavon	**Samples received on:**	28.06.2024
Your job number:	14023	**Samples instructed on/ Analysis started on:**	01.07.2024
Your order number:	14023 FG	**Analysis completed by:**	08.07.2024
Report Issue Number:	1	**Report issued on:**	09.07.2024
Samples Analysed:	8 soil samples		

Signed:

Rafał Szczepańczyk
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242737	242738	242739	242740	242741
Sample Reference				S1	S2	S3	S4	S6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.25	0.30	0.10	0.20
Date Sampled				26/06/2024	26/06/2024	26/06/2024	26/06/2024	26/06/2024
Time Taken				1300	1305	1315	1330	1355
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	47.6	< 0.1
Moisture Content	%	0.01	NONE	22	16	14	4.6	9.3
Total mass of sample received	kg	0.1	NONE	0.5	0.5	0.5	0.5	0.5
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	EC	EC	EC	EC	EC
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	6.7	8.4	-	9.3	6.6
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	730	1200	-	2800	4800
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	23	120	-	460	2400
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0113	0.0579	-	0.228	1.22
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	11.3	57.9	-	228	1220
Sulphide	mg/kg	1	MCERTS	< 1.0	14	-	18	2.7
Total Sulphur	mg/kg	50	MCERTS	440	1400	-	1600	2400
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	2.4	4.6	-	2.1	4.7
Loss on Ignition @ 450°C	%	0.2	MCERTS	8.1	16	-	8.6	24
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.33	0.87	-	0.46	0.75
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.05	-	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.29	0.44	-	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.2	0.45	-	0.07	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	2.3	2.5	-	0.91	1.4
Anthracene	mg/kg	0.05	MCERTS	0.63	0.56	-	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	3	2.8	-	0.5	< 0.05
Pyrene	mg/kg	0.05	MCERTS	2.7	2.2	-	0.51	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.6	1.5	-	0.37	< 0.05
Chrysene	mg/kg	0.05	MCERTS	1.6	1.9	-	0.59	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.8	1.8	-	0.62	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.92	0.83	-	0.26	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.7	1.2	-	0.45	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.83	0.57	-	0.27	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.18	0.21	-	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.89	0.63	-	0.28	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	18.8	18.4	-	5.28	2.12

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242737	242738	242739	242740	242741
Sample Reference				S1	S2	S3	S4	S6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.25	0.30	0.10	0.20
Date Sampled				26/06/2024	26/06/2024	26/06/2024	26/06/2024	26/06/2024
Time Taken				1300	1305	1315	1330	1355
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	55	370	-	23	87
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.3 #	1.2 #	-	0.35 #	0.88 #
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	0.5	-	0.3	1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.9	< 0.2	-	0.5	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	-	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	29	19	-	6.9	9.7
Copper (aqua regia extractable)	mg/kg	1	MCERTS	100	3300	-	39	110
Lead (aqua regia extractable)	mg/kg	1	MCERTS	230	290	-	27	53
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.7	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	28	35	-	7.9	23
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	35	47	-	11	26
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	790 #	240 #	-	65 #	69 #
Petroleum Hydrocarbons								
TPHCWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	-	-	-
TPHCWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	< 0.020	< 0.020	-	-	-
TPHCWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	< 0.050	< 0.050	-	-	-
TPHCWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	< 1.0	1.2	-	-	-
TPHCWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	4.1	-	-	-
TPHCWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	< 8.0	21	-	-	-
TPHCWG - Aliphatic >EC16 - EC35 EH_CU_1D_AL	mg/kg	10	MCERTS	< 10	250	-	-	-
TPHCWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	9	230	-	-	-
TPHCWG - Aliphatic >EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	21	72	-	-	-
TPHCWG - Aliphatic >EC5 - EC35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	250	-	-	-
TPHCWG - Aliphatic >EC5 - EC44 EH_CU+HS_1D_AL	mg/kg	10	NONE	30	320	-	-	-
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	-	-	-
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	< 0.010	< 0.010	-	-	-
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	< 0.050	< 0.050	-	-	-
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	< 1.0	1.2	-	-	-
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	6.1	-	-	-
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	18	-	-	-
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	12	55	-	-	-
TPHCWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	< 10	13	-	-	-
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	18	24	-	-	-
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	12	81	-	-	-
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	30	100	-	-	-
TPH Total >EC5 - EC44 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	60	430	-	-	-

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242737	242738	242739	242740	242741
Sample Reference				S1	S2	S3	S4	S6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.25	0.30	0.10	0.20
Date Sampled				26/06/2024	26/06/2024	26/06/2024	26/06/2024	26/06/2024
Time Taken				1300	1305	1315	1330	1355
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	5	ISO 17025	< 5.0 ##	< 5.0 ##	-	-	-
Chloroethane	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
Bromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Vinyl Chloride	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
Trichlorofluoromethane	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,1-Dichloroethene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
Trans 1,2-dichloroethylene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,1-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
2,2-Dichloropropane	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
Chloroform	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,2-Dichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,1-Dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-	-
Carbontetrachloride	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,2-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Trichloroethene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Dibromomethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Bromodichloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-	-
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,3-Dichloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Dibromochloromethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Tetrachloroethene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,2-Dibromoethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Chlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-	-
p & m-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-	-
Styrene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Bromoform	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	-	-	-
Isopropylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
Bromobenzene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
n-Propylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
2-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
4-Chlorotoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
tert-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
sec-Butylbenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,3-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
p-Isopropyltoluene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,4-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,2-Dichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242737	242738	242739	242740	242741
Sample Reference				S1	S2	S3	S4	S6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.25	0.30	0.10	0.20
Date Sampled				26/06/2024	26/06/2024	26/06/2024	26/06/2024	26/06/2024
Time Taken				1300	1305	1315	1330	1355
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Butylbenzene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-
Hexachlorobutadiene	µg/kg	5	NONE	< 5.0	< 5.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	< 5.0	< 5.0	-	-	-

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
Total PCBs	mg/kg	0.007	MCERTS	-	-	< 0.007	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242742	242743	242744
Sample Reference				S8	S9	S10
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.10
Date Sampled				26/06/2024	26/06/2024	26/06/2024
Time Taken				1420	1425	1430
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	62.2
Moisture Content	%	0.01	NONE	12	13	9.2
Total mass of sample received	kg	0.1	NONE	0.5	0.5	0.5

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	EC	EC	SSZ

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	8.1	7	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	mg/kg	50	MCERTS	3900	3000	1200
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	54	51	180
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.027	0.0253	0.0877
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	27	25.3	87.7
Sulphide	mg/kg	1	MCERTS	< 1.0	3	630
Total Sulphur	mg/kg	50	MCERTS	1900	2200	2600
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	7.1	3	3.1
Loss on Ignition @ 450°C	%	0.2	MCERTS	40	11	5.9

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	3.4	0.45	0.11
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.23	0.09	0.06
Phenanthrene	mg/kg	0.05	MCERTS	4.2	0.67	0.32
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.09
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.53	0.56
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.54	0.4
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.36	0.38
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.56	0.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.45	0.51
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.22	0.16
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.33	0.33
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.18	0.17
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.06
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.2	0.18

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	7.75	4.57	3.81

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242742	242743	242744
Sample Reference				S8	S9	S10
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.10
Date Sampled				26/06/2024	26/06/2024	26/06/2024
Time Taken				1420	1425	1430
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	51	130	29
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.56 #	1 #	2.8
Boron (water soluble)	mg/kg	0.2	MCERTS	< 0.2	0.2	< 0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	11	26	83
Copper (aqua regia extractable)	mg/kg	1	MCERTS	66	600	150
Lead (aqua regia extractable)	mg/kg	1	MCERTS	50	330	230
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	30	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	2.8	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	21	55	210
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	70 #	600 #	430
Petroleum Hydrocarbons						
TPHCWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.02	NONE	-	< 0.020	< 0.020
TPHCWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.02	NONE	-	< 0.020	< 0.020
TPHCWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.05	NONE	-	< 0.050	< 0.050
TPHCWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-	< 8.0	< 8.0
TPHCWG - Aliphatic >EC16 - EC35 EH_CU_1D_AL	mg/kg	10	MCERTS	-	< 10	< 10
TPHCWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-	< 8.0	< 8.0
TPHCWG - Aliphatic >EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	-	< 8.4	< 8.4
TPHCWG - Aliphatic >EC5 - EC35 EH_CU+HS_1D_AL	mg/kg	10	NONE	-	< 10	< 10
TPHCWG - Aliphatic >EC5 - EC44 EH_CU+HS_1D_AL	mg/kg	10	NONE	-	< 10	< 10
TPHCWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.01	NONE	-	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.01	NONE	-	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.05	NONE	-	< 0.050	< 0.050
TPHCWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-	< 10	< 10
TPHCWG - Aromatic >EC35 - EC40 EH_CU_1D_AR	mg/kg	10	NONE	-	< 10	< 10
TPHCWG - Aromatic >EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	-	< 8.4	< 8.4
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	-	< 10	< 10
TPHCWG - Aromatic >EC5 - EC44 EH_CU+HS_1D_AR	mg/kg	10	NONE	-	< 10	< 10
TPH Total >EC5 - EC44 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	< 10	< 10

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242742	242743	242744
Sample Reference				S8	S9	S10
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.10
Date Sampled				26/06/2024	26/06/2024	26/06/2024
Time Taken				1420	1425	1430
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
VOCs						
Chloromethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Chloroethane	µg/kg	5	NONE	-	< 5.0	< 5.0
Bromomethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Vinyl Chloride	µg/kg	5	NONE	-	< 5.0	< 5.0
Trichlorofluoromethane	µg/kg	5	NONE	-	< 5.0	< 5.0
1,1-Dichloroethene	µg/kg	5	NONE	-	< 5.0	< 5.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	5	NONE	-	< 5.0	< 5.0
Trans 1,2-dichloroethylene	µg/kg	5	NONE	-	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	< 5.0	< 5.0
1,1-Dichloroethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
2,2-Dichloropropane	µg/kg	5	NONE	-	< 5.0	< 5.0
Chloroform	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
1,1,1-Trichloroethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,2-Dichloroethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
1,1-Dichloropropene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Cis-1,2-dichloroethene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0
Carbontetrachloride	µg/kg	5	NONE	-	< 5.0	< 5.0
1,2-Dichloropropane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Trichloroethene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
Dibromomethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
Bromodichloromethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Cis-1,3-dichloropropene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Trans-1,3-dichloropropene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
Toluene	µg/kg	5	MCERTS	-	< 5.0	< 5.0
1,1,2-Trichloroethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0 ##
1,3-Dichloropropane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Dibromochloromethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Tetrachloroethene	µg/kg	5	NONE	-	< 5.0	< 5.0
1,2-Dibromoethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Chlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,1,1,2-Tetrachloroethane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	-	< 5.0	< 5.0
p & m-Xylene	µg/kg	5	MCERTS	-	< 5.0	< 5.0
Styrene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Bromoform	µg/kg	5	NONE	-	< 5.0	< 5.0
o-Xylene	µg/kg	5	MCERTS	-	< 5.0	< 5.0
Isopropylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane	µg/kg	5	NONE	-	< 5.0	< 5.0
Bromobenzene	µg/kg	5	NONE	-	< 5.0	< 5.0
n-Propylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
2-Chlorotoluene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
4-Chlorotoluene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,3,5-Trimethylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
tert-Butylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
sec-Butylbenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,3-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
p-Isopropyltoluene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,4-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,2-Dichlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0

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Analytical Report Number: 24-027996
Project / Site name: Heol Y Cryws, Cwmavon
Your Order No: 14023 FG

Lab Sample Number				242742	242743	242744
Sample Reference				S8	S9	S10
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.10
Date Sampled				26/06/2024	26/06/2024	26/06/2024
Time Taken				1420	1425	1430
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Butylbenzene	µg/kg	5	NONE	-	< 5.0	< 5.0
1,2-Dibromo-3-chloropropane	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
1,2,4-Trichlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0
Hexachlorobutadiene	µg/kg	5	NONE	-	< 5.0	< 5.0
1,2,3-Trichlorobenzene	µg/kg	5	ISO 17025	-	< 5.0	< 5.0

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	-

Total PCBs	mg/kg	0.007	MCERTS	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 24-027996
Project / Site name: Heol Y Cryws, Cwmavon

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
242737	S1	None Supplied	0.3	Brown loam and sand with gravel and vegetation
242738	S2	None Supplied	0.25	Brown sand with gravel and clinker
242739	S3	None Supplied	0.3	Brown clay and sand with gravel
242740	S4	None Supplied	0.1	Brown sand with gravel and stones
242741	S6	None Supplied	0.2	Brown sand with gravel
242742	S8	None Supplied	0.2	Brown sand with gravel
242743	S9	None Supplied	0.3	Brown loam and sand with gravel and vegetation
242744	S10	None Supplied	0.1	Brown loam and sand with gravel and stones

Analytical Report Number : 24-027996
Project / Site name: Heol Y Cryws, Cwmavon

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode	In-house method	L010	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES	In-house method	L038B	D	MCERTS
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS

Analytical Report Number : 24-027996
Project / Site name: Heol Y Cryws, Cwmavon

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

- Quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as deviating and should be interpreted with caution. The result is not accredited.
- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

Sample Deviation Report

Analytical Report Number : 24-027996
Project / Site name: Heol Y Cryws, Cwmavon

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
S1	N/A	S	242737	b	BTEX and/or Volatile organic compounds in soil	L073B	b
S1	N/A	S	242737	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
S10	N/A	S	242744	b	BTEX and/or Volatile organic compounds in soil	L073B	b
S10	N/A	S	242744	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
S2	N/A	S	242738	b	BTEX and/or Volatile organic compounds in soil	L073B	b
S2	N/A	S	242738	b	Monohydric phenols in soil	L080	b
S2	N/A	S	242738	b	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	b
S2	N/A	S	242738	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b
S4	N/A	S	242740	b	Monohydric phenols in soil	L080	b
S4	N/A	S	242740	b	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	b
S6	N/A	S	242741	b	Monohydric phenols in soil	L080	b
S6	N/A	S	242741	b	Speciated PAHs and/or Semi-volatile organic compounds in soil	L064B	b
S9	N/A	S	242743	b	BTEX and/or Volatile organic compounds in soil	L073B	b
S9	N/A	S	242743	b	Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	L076B/L088	b

APPENDIX G

LABORATORY CHEMICAL TEST RESULTS (GROUNDWATER)

UKAS TESTING
4041

Environmental Science

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Analytical Report Number : 24-016309

Project / Site name:	Heol Y Crwys	**Samples received on:**	26/04/2024
Your job number:	14023	**Samples instructed on/ Analysis started on:**	26/04/2024
Your order number:		**Analysis completed by:**	02/05/2024
Report Issue Number:	1	**Report issued on:**	02/05/2024
Samples Analysed:	1 water sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 24-016309
Project / Site name: Heol Y Crwys

Lab Sample Number				181488
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				24/04/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	7.2
Total Cyanide	µg/l	10	ISO 17025	< 10
Sulphate as SO_4	µg/l	45	ISO 17025	121000
Total Sulphur	µg/l	15	NONE	40000
Sulphide	µg/l	5	NONE	6.9
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	0.39
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	0.65
Hardness - Total	mgcaCO 3/l	1	ISO 17025	261

Total Phenols

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

Speciated PAHs

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

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.17
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.14
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	5.3
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	6.2
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.4
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	6.8

Boron (dissolved)	µg/l	10	ISO 17025	63
Calcium (dissolved)	mg/l	0.012	ISO 17025	81
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0

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4041

Analytical Report Number: 24-016309
Project / Site name: Heol Y Crwys

Lab Sample Number				181488
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				24/04/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

Petroleum Hydrocarbons

TPH - Aliphatic >C5 - C6 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C6 - C8 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C8 - C10 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C10 - C12 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C12 - C16 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C21 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C21 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C5 - C35 $_{HS+EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C35 - C44 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10

TPH - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC12 - EC16 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC16 - EC21 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC21 - EC35 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC35 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC40 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC40 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC44 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10

TPH (>C5 - C10) $_{HS_1D_TOTAL}$	µg/l	10	NONE	< 10
TPH (>C10 - C20) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH (>C20 - C44) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH Total >C5 - C44 $_{HS+EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0

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Analytical Report Number: 24-016309
Project / Site name: Heol Y Crwys

Lab Sample Number				181488
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				24/04/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Dibromomethane	µg/l	3	ISO 17025	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05

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Analytical Report Number: 24-016309
Project / Site name: Heol Y Crwys

Lab Sample Number				181488
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				24/04/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05
Azobenzene	µg/l	0.05	NONE	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05
Carbazole	µg/l	0.05	NONE	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05

3+4-Methylphenol	µg/l	0.1	NONE	< 0.10

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 24-016309
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW	In-house method based on USEPA Method 6020 & 200.8 for the determination of trace elements in water by ICP-MS	L012B	W	ISO 17025
Sulphide in water	Determination of sulphide in water by ion selective electrode	In-house method	L029	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Total organic carbon in water	Determination of total organic carbon in water by TOC/DOC NDIR analyser.Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices: SW, GW, PW, PrW (Al, Cu, Fe,Zn)	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW, LL	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil	L039B	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
Total petroleum hydrocarbons by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS	In-house method	L070B	W	NONE
BTEX and/or Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA 8260	L073B	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW	L080	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total petroleum hydrocarbons by GC-MS HS in water	Determination of total petroleum hydrocarbons in water by GC-MS HS	In-house method	L088	W	ISO 17025
pH at 20°C in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method	L099	W	ISO 17025

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Analytical Report Number : 24-016309
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds (including PAH) in leachate by extraction in dichloromethane followed by GC-MS	In-house method based on USEPA 8270	L102B	W	ISO 17025
Phenols in water by GC-MS	Determination of phenols in water by GC-MS	In-house method	L102B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

UKAS TESTING
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Environmental Science

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Analytical Report Number : 24-018757

Project / Site name:	Heol Y Crwys	**Samples received on:**	10/05/2024
Your job number:	14023	**Samples instructed on/ Analysis started on:**	10/05/2024
Your order number:		**Analysis completed by:**	17/05/2024
Report Issue Number:	1	**Report issued on:**	21/05/2024
Samples Analysed:	1 water sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 24-018757
Project / Site name: Heol Y Crwys

Lab Sample Number				194541
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				08/05/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	7.2
Total Cyanide	µg/l	10	ISO 17025	< 10
Sulphate as SO_4	µg/l	45	ISO 17025	163000
Total Sulphur	µg/l	15	NONE	54000
Sulphide	µg/l	5	NONE	< 5.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	2.51
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	12.9
Hardness - Total	mgCaCO3/l	1	ISO 17025	311

Total Phenols

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

Speciated PAHs

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

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.86
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.7
Copper (dissolved)	µg/l	0.5	ISO 17025	7.6
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	6.2
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.5
Zinc (dissolved)	µg/l	0.5	ISO 17025	9.3

Boron (dissolved)	µg/l	10	ISO 17025	60
Calcium (dissolved)	mg/l	0.012	ISO 17025	97
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0

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Analytical Report Number: 24-018757
Project / Site name: Heol Y Crwys

Lab Sample Number				194541
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				08/05/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

Petroleum Hydrocarbons

TPH - Aliphatic >C5 - C6 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C6 - C8 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C8 - C10 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C10 - C12 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C12 - C16 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C21 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C21 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C5 - C35 $_{HS+EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C35 - C44 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10

TPH - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC12 - EC16 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC16 - EC21 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC21 - EC35 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC35 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC40 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC40 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC44 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10

TPH (>C5 - C10) $_{HS_1D_TOTAL}$	µg/l	10	NONE	< 10
TPH (>C10 - C20) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH (>C20 - C44) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH Total >C5 - C44 $_{HS+EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10

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Analytical Report Number: 24-018757
Project / Site name: Heol Y Crwys

Lab Sample Number				194541
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				08/05/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
VOCs				
Chloromethane	µg/l	3	ISO 17025	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0
Dibromomethane	µg/l	3	ISO 17025	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0

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Analytical Report Number: 24-018757
Project / Site name: Heol Y Crwys

Lab Sample Number				194541
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				08/05/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05
Azobenzene	µg/l	0.05	NONE	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05
Carbazole	µg/l	0.05	NONE	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05

3+4-Methylphenol	µg/l	0.1	NONE	< 0.10

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Analytical Report Number: 24-018757
Project / Site name: Heol Y Crwys

Lab Sample Number				194541
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				08/05/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
PCBs by GC-MS				
PCB Congener 28	µg/l	0.02	NONE	< 0.02
PCB Congener 52	µg/l	0.02	NONE	< 0.02
PCB Congener 101	µg/l	0.02	NONE	< 0.02
PCB Congener 118	µg/l	0.02	NONE	< 0.02
PCB Congener 138	µg/l	0.02	NONE	< 0.02
PCB Congener 153	µg/l	0.02	NONE	< 0.02
PCB Congener 180	µg/l	0.02	NONE	< 0.02
Total ICES-7 PCBs	µg/l	0.14	NONE	< 0.14

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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Analytical Report Number : 24-018757
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW	In-house method based on USEPA Method 6020 & 200.8 for the determination of trace elements in water by ICP-MS	L012B	W	ISO 17025
PCB's By GC-MS in water	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L028B	W	NONE
Sulphide in water	Determination of sulphide in water by ion selective electrode	In-house method	L029	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Total organic carbon in water	Determination of total organic carbon in water by TOC/DOC NDIR analyser.Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices: SW, GW, PW, PrW (Al, Cu, Fe,Zn)	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW, LL	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil	L039B	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
Total petroleum hydrocarbons by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS	In-house method	L070B	W	NONE
BTEX and/or Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA 8260	L073B	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW	L080	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total petroleum hydrocarbons by GC-MS HS in water	Determination of total petroleum hydrocarbons in water by GC-MS HS	In-house method	L088	W	ISO 17025

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Analytical Report Number : 24-018757
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method	L099	W	ISO 17025
Speciated EPA-16 PAHs and/or Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds (including PAH) in leachate by extraction in dichloromethane followed by GC-MS	In-house method based on USEPA 8270	L102B	W	ISO 17025
Phenols in water by GC-MS	Determination of phenols in water by GC-MS	In-house method	L102B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

UKAS TESTING
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Environmental Science

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Analytical Report Number : 24-022996

Project / Site name:	Heol Y Crwys	**Samples received on:**	05/06/2024
Your job number:	14023-RJH	**Samples instructed on/ Analysis started on:**	05/06/2024
Your order number:		**Analysis completed by:**	10/06/2024
Report Issue Number:	1	**Report issued on:**	11/06/2024
Samples Analysed:	1 water sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 24-022996
Project / Site name: Heol Y Crwys

Lab Sample Number				216612
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				03/06/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

General Inorganics

pH (L099)	pH Units	N/A	ISO 17025	7
Total Cyanide	µg/l	10	ISO 17025	< 10
Sulphate as SO_4	µg/l	45	ISO 17025	167000
Total Sulphur	µg/l	15	NONE	56000
Sulphide	µg/l	5	NONE	< 5.0
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO 17025	1.58
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	1.95
Hardness - Total	mgCaCO3/l	1	ISO 17025	301

Total Phenols

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

Speciated PAHs

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

Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16

Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.6
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.2
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4
Copper (dissolved)	µg/l	0.5	ISO 17025	7
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05
Nickel (dissolved)	µg/l	0.5	ISO 17025	6.5
Selenium (dissolved)	µg/l	0.6	ISO 17025	2.3
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	10

Boron (dissolved)	µg/l	10	ISO 17025	79
Calcium (dissolved)	mg/l	0.012	ISO 17025	94
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0

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Analytical Report Number: 24-022996
Project / Site name: Heol Y Crwys

Lab Sample Number				216612
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				03/06/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	

Petroleum Hydrocarbons

TPH - Aliphatic >C5 - C6 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C6 - C8 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C8 - C10 $_{HS_1D_AL}$	µg/l	1	ISO 17025	< 1.0
TPH - Aliphatic >C10 - C12 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C12 - C16 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C21 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C21 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C5 - C35 $_{HS+EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C16 - C35 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10
TPH - Aliphatic >C35 - C44 $_{EH_1D_AL_MS}$	µg/l	10	NONE	< 10

TPH - Aromatic >EC5 - EC7 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC7 - EC8 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC8 - EC10 $_{HS_1D_AR}$	µg/l	1	ISO 17025	< 1.0
TPH - Aromatic >EC10 - EC12 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC12 - EC16 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC16 - EC21 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC21 - EC35 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC35 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC40 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC35 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC40 - EC44 $_{EH_1D_AR_MS}$	µg/l	10	NONE	< 10
TPH - Aromatic >EC5 - EC44 $_{HS+EH_1D_AR_MS}$	µg/l	10	NONE	< 10

TPH (>C5 - C10) $_{HS_1D_TOTAL}$	µg/l	10	NONE	< 10
TPH (>C10 - C20) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH (>C20 - C44) $_{EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10
TPH Total >C5 - C44 $_{HS+EH_1D_TOTAL_MS}$	µg/l	10	NONE	< 10

VOCs

Chloromethane	µg/l	3	ISO 17025	< 3.0
Chloroethane	µg/l	3	ISO 17025	< 3.0
Bromomethane	µg/l	3	ISO 17025	< 3.0
Vinyl Chloride	µg/l	3	NONE	< 3.0
Trichlorofluoromethane	µg/l	3	NONE	< 3.0
1,1-Dichloroethene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	3	ISO 17025	< 3.0
Trans 1,2-dichloroethylene	µg/l	3	ISO 17025	< 3.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	3	ISO 17025	< 3.0
1,1-Dichloroethane	µg/l	3	ISO 17025	< 3.0
2,2-Dichloropropane	µg/l	3	NONE	< 3.0
Chloroform	µg/l	3	ISO 17025	< 3.0
1,1,1-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,2-Dichloroethane	µg/l	3	ISO 17025	< 3.0
1,1-Dichloropropene	µg/l	3	ISO 17025	< 3.0
Cis-1,2-dichloroethene	µg/l	3	ISO 17025	< 3.0
Benzene	µg/l	3	ISO 17025	< 3.0
Carbontetrachloride	µg/l	3	ISO 17025	< 3.0
1,2-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Trichloroethene	µg/l	3	ISO 17025	< 3.0

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Analytical Report Number: 24-022996
Project / Site name: Heol Y Crwys

Lab Sample Number				216612
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				03/06/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Dibromomethane	µg/l	3	ISO 17025	< 3.0
Bromodichloromethane	µg/l	3	ISO 17025	< 3.0
Cis-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Trans-1,3-dichloropropene	µg/l	3	ISO 17025	< 3.0
Toluene	µg/l	3	ISO 17025	< 3.0
1,1,2-Trichloroethane	µg/l	3	ISO 17025	< 3.0
1,3-Dichloropropane	µg/l	3	ISO 17025	< 3.0
Dibromochloromethane	µg/l	3	ISO 17025	< 3.0
Tetrachloroethene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromoethane	µg/l	3	ISO 17025	< 3.0
Chlorobenzene	µg/l	3	ISO 17025	< 3.0
1,1,1,2-Tetrachloroethane	µg/l	3	ISO 17025	< 3.0
Ethylbenzene	µg/l	3	ISO 17025	< 3.0
p & m-xylene	µg/l	3	ISO 17025	< 3.0
Styrene	µg/l	3	ISO 17025	< 3.0
Bromoform	µg/l	3	ISO 17025	< 3.0
o-xylene	µg/l	3	ISO 17025	< 3.0
Isopropylbenzene	µg/l	3	ISO 17025	< 3.0
1,1,2,2-Tetrachloroethane	µg/l	3	NONE	< 3.0
Bromobenzene	µg/l	3	ISO 17025	< 3.0
n-Propylbenzene	µg/l	3	ISO 17025	< 3.0
2-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
4-Chlorotoluene	µg/l	3	ISO 17025	< 3.0
1,3,5-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
tert-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2,4-Trimethylbenzene	µg/l	3	ISO 17025	< 3.0
sec-Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,3-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
p-Isopropyltoluene	µg/l	3	ISO 17025	< 3.0
1,4-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dichlorobenzene	µg/l	3	ISO 17025	< 3.0
Butylbenzene	µg/l	3	ISO 17025	< 3.0
1,2-Dibromo-3-chloropropane	µg/l	3	ISO 17025	< 3.0
1,2,4-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0
Hexachlorobutadiene	µg/l	3	ISO 17025	< 3.0
1,2,3-Trichlorobenzene	µg/l	3	ISO 17025	< 3.0

SVOCs

Aniline	µg/l	0.05	NONE	< 0.05
Phenol	µg/l	0.05	NONE	< 0.05
2-Chlorophenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethyl)ether	µg/l	0.05	NONE	< 0.05
1,3-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,2-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
1,4-Dichlorobenzene	µg/l	0.05	NONE	< 0.05
Bis(2-chloroisopropyl)ether	µg/l	0.05	NONE	< 0.05
2-Methylphenol	µg/l	0.05	NONE	< 0.05
Hexachloroethane	µg/l	0.05	NONE	< 0.05
Nitrobenzene	µg/l	0.05	NONE	< 0.05
4-Methylphenol	µg/l	0.05	NONE	< 0.05
Isophorone	µg/l	0.05	NONE	< 0.05
2-Nitrophenol	µg/l	0.05	NONE	< 0.05

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The results included within the report relate only to the sample(s) submitted for testing.

4041

Analytical Report Number: 24-022996
Project / Site name: Heol Y Crwys

Lab Sample Number				216612
Sample Reference				BH 01
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				03/06/2024
Time Taken				1235
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
2,4-Dimethylphenol	µg/l	0.05	NONE	< 0.05
Bis(2-chloroethoxy)methane	µg/l	0.05	NONE	< 0.05
1,2,4-Trichlorobenzene	µg/l	0.05	NONE	< 0.05
2,4-Dichlorophenol	µg/l	0.05	NONE	< 0.05
4-Chloroaniline	µg/l	0.05	NONE	< 0.05
Hexachlorobutadiene	µg/l	0.05	NONE	< 0.05
4-Chloro-3-methylphenol	µg/l	0.05	NONE	< 0.05
2,4,6-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2,4,5-Trichlorophenol	µg/l	0.05	NONE	< 0.05
2-Methylnaphthalene	µg/l	0.05	NONE	< 0.05
2-Chloronaphthalene	µg/l	0.05	NONE	< 0.05
Dimethylphthalate	µg/l	0.05	NONE	< 0.05
2,6-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
2,4-Dinitrotoluene	µg/l	0.05	NONE	< 0.05
Dibenzofuran	µg/l	0.05	NONE	< 0.05
4-Chlorophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Diethyl phthalate	µg/l	0.05	NONE	< 0.05
4-Nitroaniline	µg/l	0.05	NONE	< 0.05
Azobenzene	µg/l	0.05	NONE	< 0.05
Bromophenyl phenyl ether	µg/l	0.05	NONE	< 0.05
Hexachlorobenzene	µg/l	0.05	NONE	< 0.05
Carbazole	µg/l	0.05	NONE	< 0.05
Dibutyl phthalate	µg/l	0.05	NONE	< 0.05
Anthraquinone	µg/l	0.05	NONE	< 0.05
Butyl benzyl phthalate	µg/l	0.05	NONE	< 0.05
3+4-Methylphenol	µg/l	0.1	NONE	< 0.10

PCBs by GC-MS

PCB Congener 28	µg/l	0.02	NONE	< 0.02
PCB Congener 52	µg/l	0.02	NONE	< 0.02
PCB Congener 101	µg/l	0.02	NONE	< 0.02
PCB Congener 118	µg/l	0.02	NONE	< 0.02
PCB Congener 138	µg/l	0.02	NONE	< 0.02
PCB Congener 153	µg/l	0.02	NONE	< 0.02
PCB Congener 180	µg/l	0.02	NONE	< 0.02
Total ICES-7 PCBs	µg/l	0.14	NONE	< 0.14

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

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The results included within the report relate only to the sample(s) submitted for testing.

4041

Analytical Report Number : 24-022996
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW	In-house method based on USEPA Method 6020 & 200.8 for the determination of trace elements in water by ICP-MS	L012B	W	ISO 17025
PCB's By GC-MS in water	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L028B	W	NONE
Sulphide in water	Determination of sulphide in water by ion selective electrode	In-house method	L029	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Total organic carbon in water	Determination of total organic carbon in water by TOC/DOC NDIR analyser.Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices: SW, GW, PW, PrW (Al, Cu, Fe,Zn)	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW, LL	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil	L039B	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045B	W	ISO 17025
Total petroleum hydrocarbons with carbon banding by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L070B	W	NONE
Total petroleum hydrocarbons by GC-MS in water	Determination of total petroleum hydrocarbons in water by GC-MS/GC-MS	In-house method	L070B	W	NONE
BTEX and/or Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA 8260	L073B	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW	L080	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	ISO 17025
Total petroleum hydrocarbons by GC-MS HS in water	Determination of total petroleum hydrocarbons in water by GC-MS HS	In-house method	L088	W	ISO 17025

4041

Analytical Report Number : 24-022996
Project / Site name: Heol Y Crwys

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method	L099	W	ISO 17025
Speciated PAHs and/or Semi-volatile organic compounds in water	Determination of semi-volatile organic compounds (including PAH) in leachate by extraction in dichloromethane followed by GC-MS	In-house method based on USEPA 8270	L102B	W	ISO 17025
Phenols in water by GC-MS	Determination of phenols in water by GC-MS	In-house method	L102B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

APPENDIX H

LABORATORY GEOTECHNICAL TEST RESULTS

Laboratory Report

UKAS TESTING 2788

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES
A PHENNA GROUP COMPANY

Contract Number: 72175

Client Ref: **14023**
Client PO: **14023/FG**

Date Received: **16-04-2024**
Date Completed: **07-05-2024**
Report Date: **07-05-2024**

Client: **Integral Geotechnique (Wales) Limited**

Contract Title: **Heol Crwys, Cwmavon**
For the attention of: **Finn Gullfoyle**

This report has been checked and approved by:

B. Evans

Brendan Evans
Office Administrator

Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	8
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	3
Particle Density (Gas Jar) BS 1377:1990 - Part 2 : 8.2 - * UKAS	6
Determination of the Swelling Potential of Fill Material (Slag Expansion Test 7 day test) BR 481 - Part B - Appendix B	3
Dry Den/MC (2.5kg Rammer Method 1 litre mould/CBR Mould) BS 1377:1990 - Part 4 : 3.4 - * UKAS	6
Direct Shearbox - set of 3 - 60 x 60mm (3 days) BS 1377:1990 - Part 7 : 4 - * UKAS	3
Disposal of samples for job	1

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

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (HR & HSE Manager)

GEO Site & Testing Services Ltd
Unit 3-4 Heol Aur, Dafen Ind Est, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784 040 Fax: 01554 784 040 info@gstl.co.uk https://gstl.co.uk

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)	
Contract Number	72175	
Project Name	Heol Crwys, Cwmavon	
Date Tested	30/04/2024	
	DESCRIPTIONS	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
TP02	2	B	1.00	-		Grey fine to coarse GRAVEL
TP04	4	B	1.00	-		Grey fine to coarse GRAVEL
TP06	2	B	2.50	-		Brown fine to coarse GRAVEL
				-		
				-		
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Operator
Aaron Hodge

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)	
Contract Number	72175	
Project Name	Heol Crwys, Cwmavon	
Date Tested	30/04/2024	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
TP02	2	B	1.00	-		16		NP		2	
TP04	4	B	1.00	-		14		NP		2	
TP06	2	B	2.50	-		27		NP		3	
				-							
				-							
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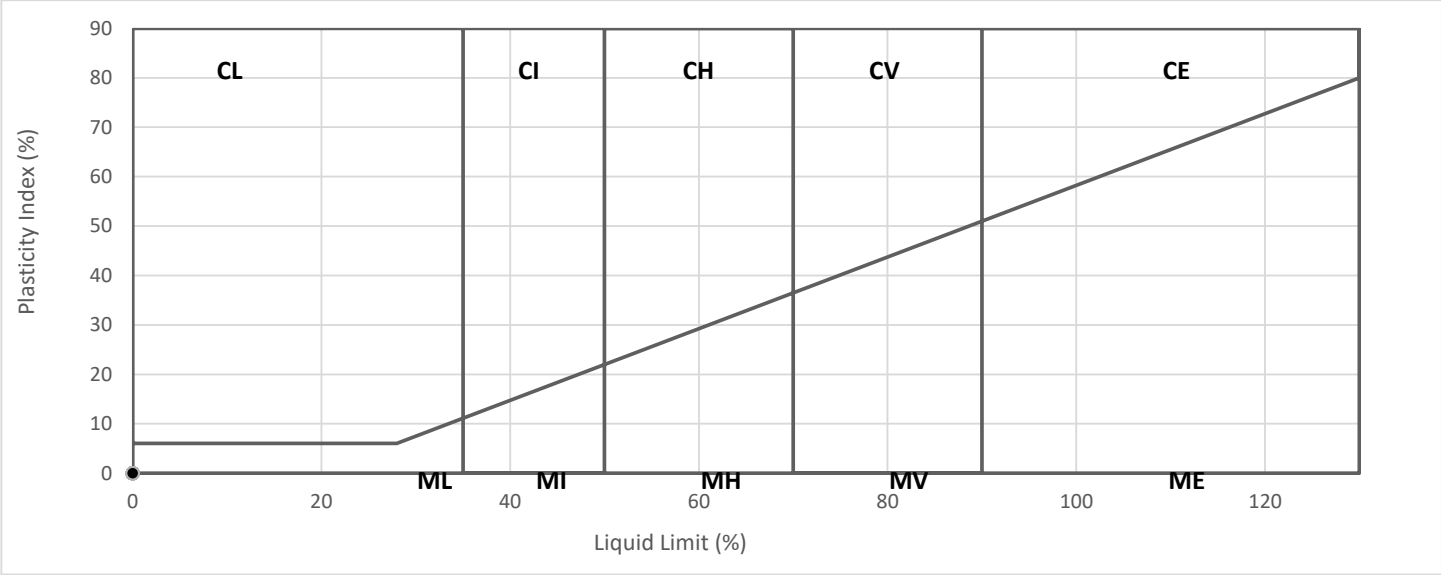
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

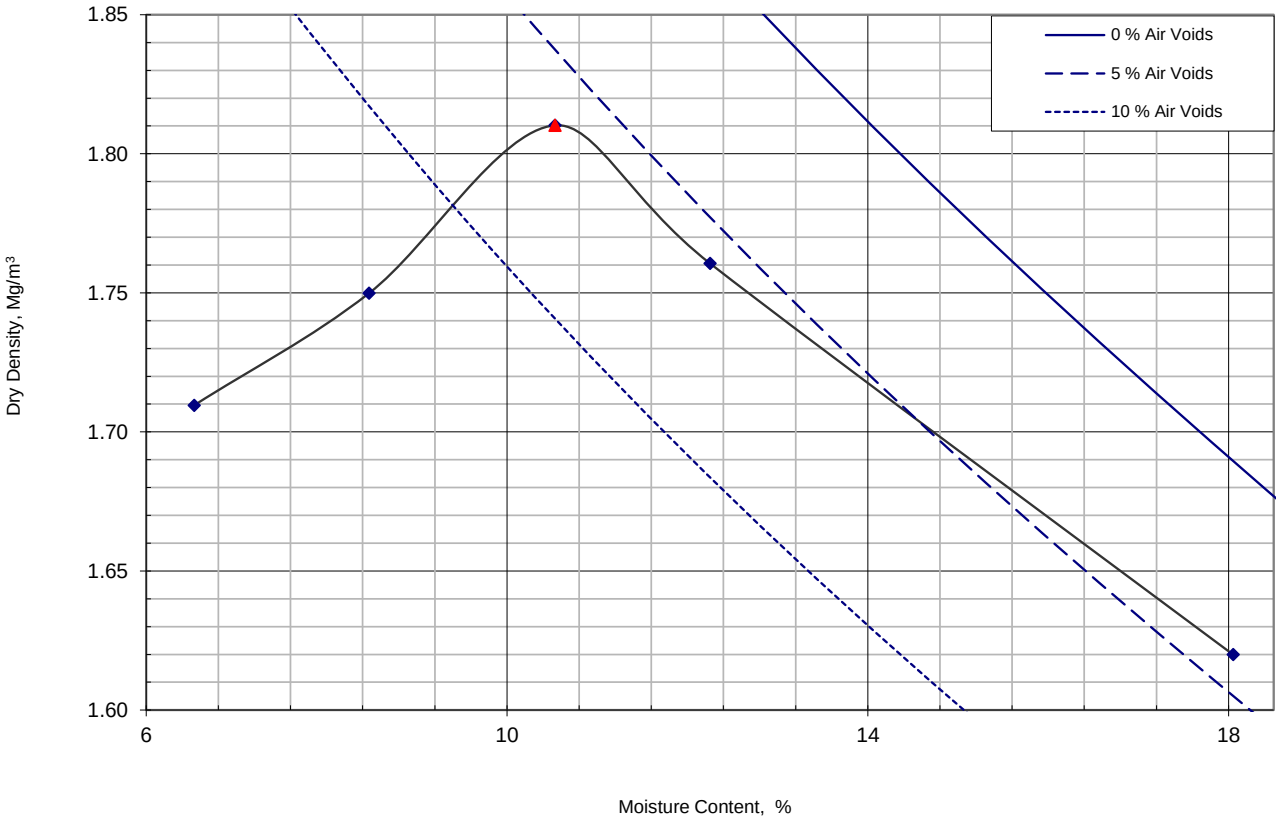
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:2015+A1:2020



Operator
Aaron Hodge

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP02
Project Name	Heol Crwys, Cwmavon	Sample No	2
Date Tested	29/04/2024	Depth Top	1.50
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Grey/ black fine to coarse GRAVEL	Single or Separate Sample Used	Single



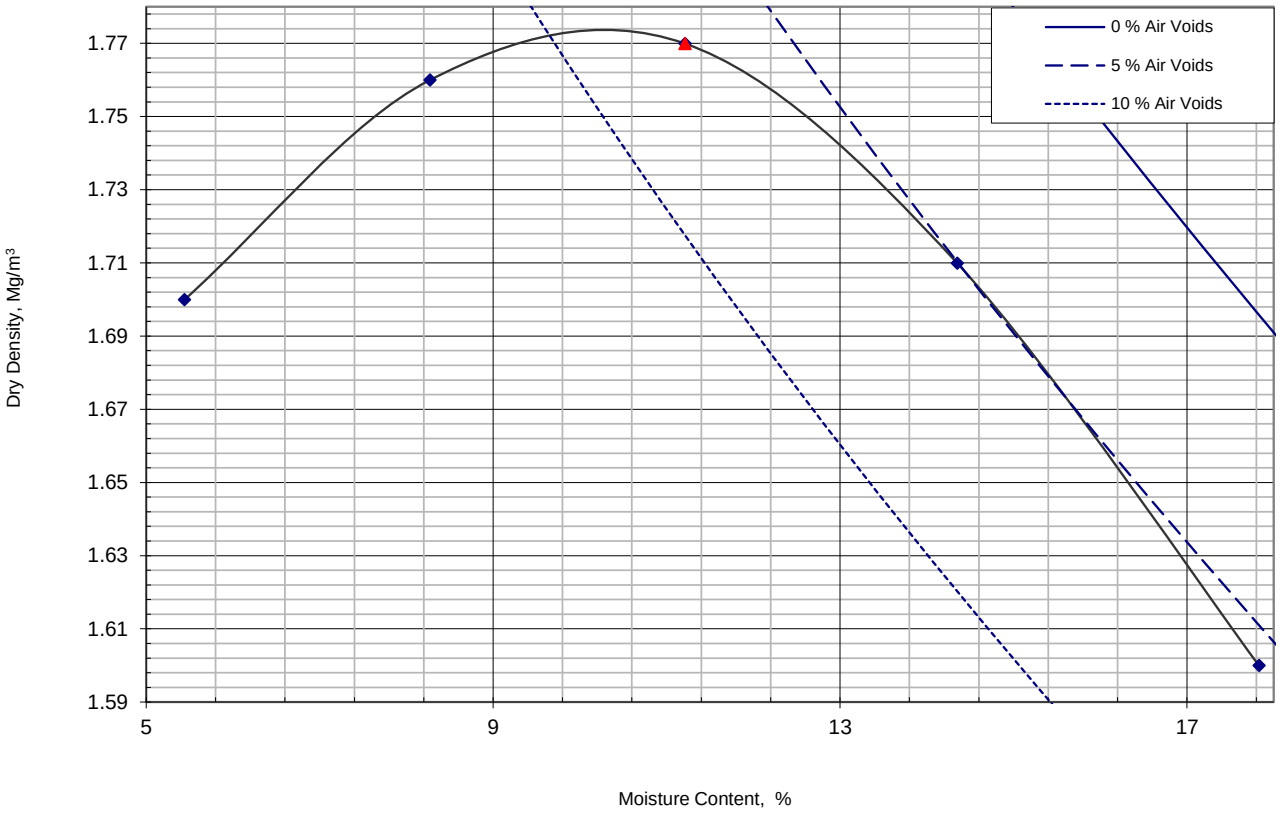
Compaction Point	1	2	3	4	5							
Moisture Content	6.5	8.5	11	12	18							
Bulk Density	1.82	1.90	2.00	1.98	1.91							
Dry Density	1.71	1.75	1.81	1.76	1.62							

Initial Moisture Content	18	%
Maximum Dry Density	1.81	Mg/m3
Optimum Moisture Content	11	%
Particle Density	2.43 Measured	Mg/m3
Material Retained 37.5mm	35	%
Material Retained 20mm	13	%

Operator
Conor

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP04
Project Name	Heol Crwys, Cwmavon	Sample No	4
Date Tested	29/04/2024	Depth Top	1.00
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Grey fine to coarse GRAVEL	Single or Separate Sample Used	Single



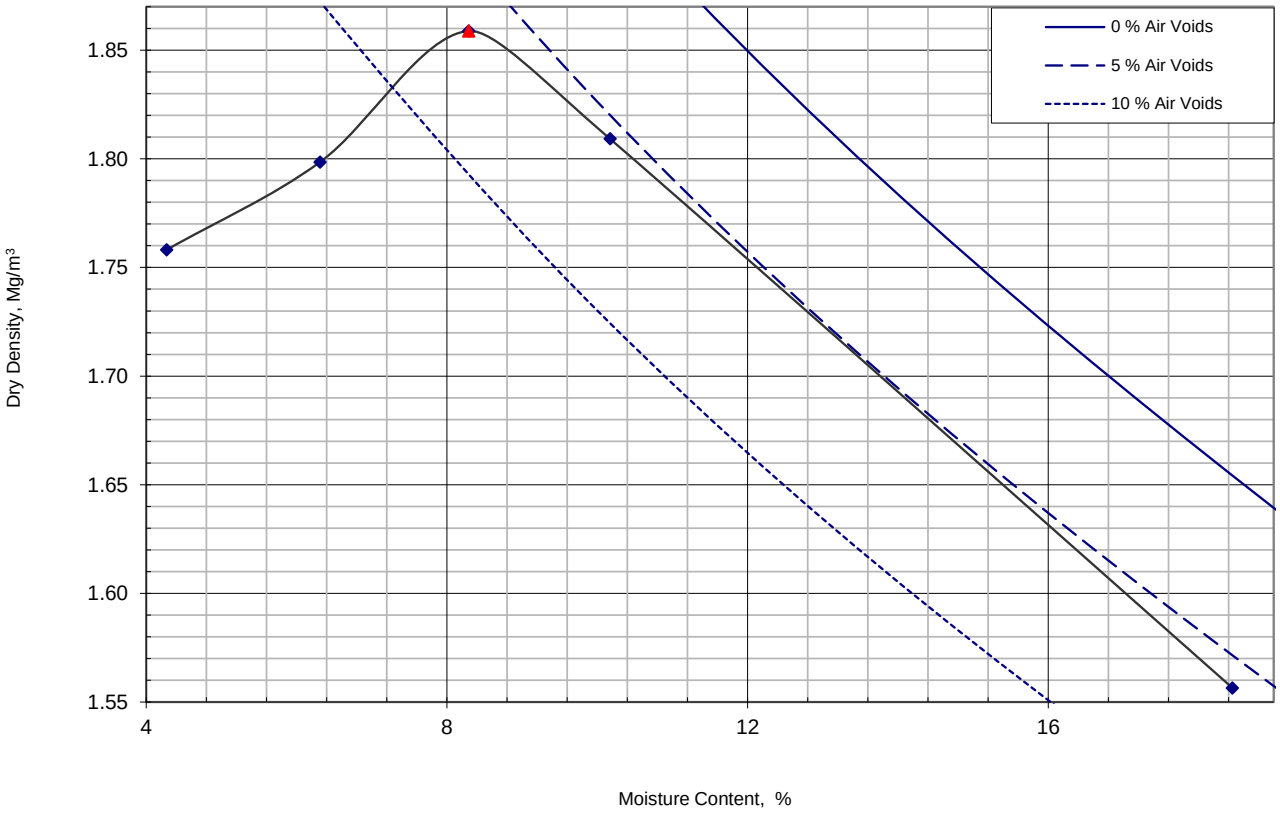
Compaction Point	1	2	3	4	5							
Moisture Content	5.4	8.3	11	14	18							
Bulk Density	1.79	1.91	1.97	1.96	1.89							
Dry Density	1.70	1.76	1.77	1.71	1.60							

Initial Moisture Content	18	%
Maximum Dry Density	1.77	Mg/m3
Optimum Moisture Content	11	%
Particle Density	2.43 Measured	Mg/m3
Material Retained 37.5mm	7	%
Material Retained 20mm	15	%

Operator
Conor

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP04
Project Name	Heol Crwys, Cwmavon	Sample No	2
Date Tested	29/04/2024	Depth Top	3.00
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Grey fine to coarse GRAVEL	Single or Separate Sample Used	Single



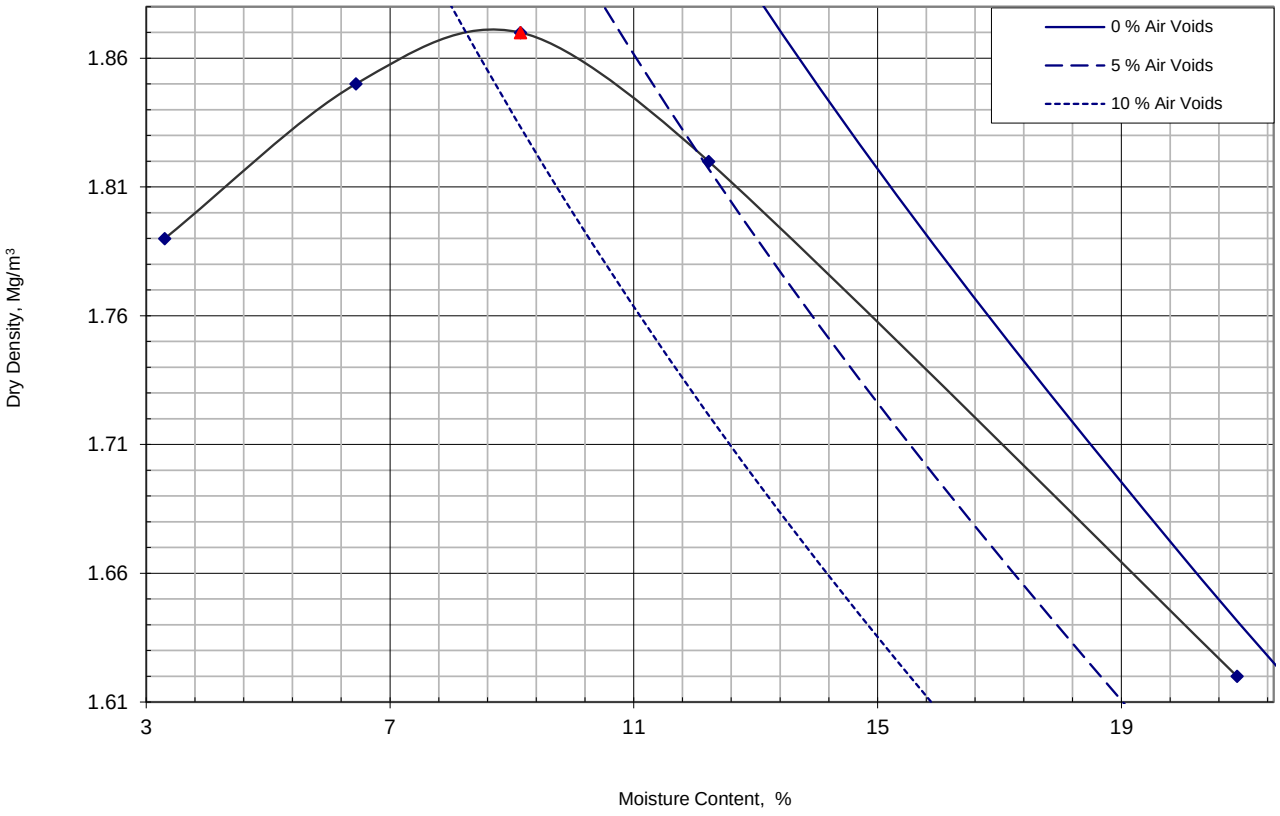
Compaction Point	1	2	3	4	5							
Moisture Content	4.3	6.3	8.3	10	18							
Bulk Density	1.83	1.91	2.01	1.99	1.84							
Dry Density	1.76	1.80	1.86	1.81	1.56							

Initial Moisture Content	18	%
Maximum Dry Density	1.86	Mg/m3
Optimum Moisture Content	8.3	%
Particle Density	2.38 Measured	Mg/m3
Material Retained 37.5mm	6	%
Material Retained 20mm	16	%

Operator
Conor

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP06
Project Name	Heol Crwys, Cwmavon	Sample No	2
Date Tested	29/04/2024	Depth Top	1.00
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Black slightly clayey sandy GRAVEL	Single or Separate Sample Used	Single



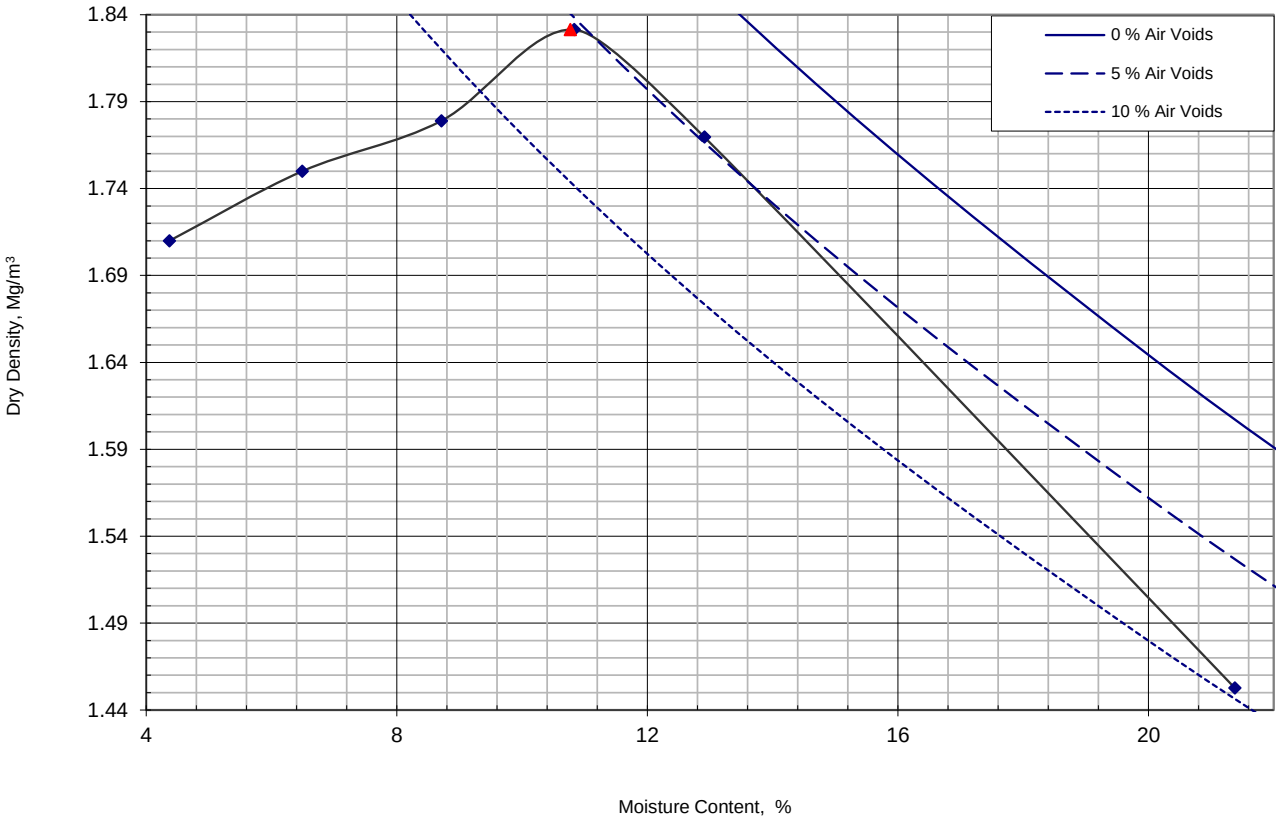
Compaction Point	1	2	3	4	5							
Moisture Content	3.3	6.4	9.1	12	21							
Bulk Density	1.85	1.97	2.04	2.04	1.96							
Dry Density	1.79	1.85	1.87	1.82	1.62							

Initial Moisture Content	21	%
Maximum Dry Density	1.87	Mg/m3
Optimum Moisture Content	9.1	%
Particle Density	2.5 Measured	Mg/m3
Material Retained 37.5mm	6	%
Material Retained 20mm	16	%

Operator
Conor

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP08
Project Name	Heol Crwys, Cwmavon	Sample No	2
Date Tested	29/04/2024	Depth Top	2.20
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Grey fine to coarse GRAVEL	Single or Separate Sample Used	Single



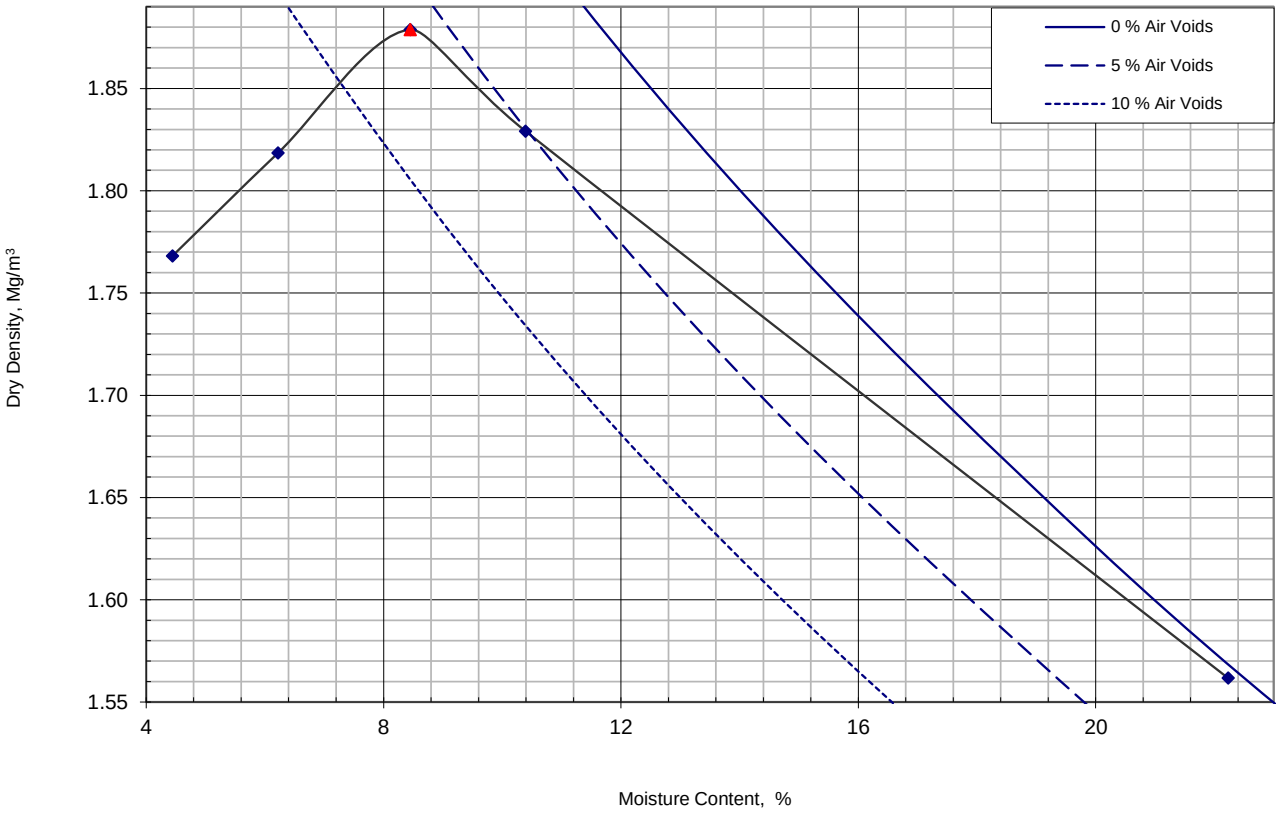
Compaction Point	1	2	3	4	5	6						
Moisture Content	4.4	6.5	8.7	11	13	21						
Bulk Density	1.78	1.86	1.93	2.03	2.00	1.76						
Dry Density	1.71	1.75	1.78	1.83	1.77	1.45						

Initial Moisture Content	21	%
Maximum Dry Density	1.83	Mg/m3
Optimum Moisture Content	11	%
Particle Density	2.45 Measured	Mg/m3
Material Retained 37.5mm	34	%
Material Retained 20mm	12	%

Operator
Conor

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**Dry Density / Moisture Content Relationship** **BS 1377:Part 4:1990**	Contract Number	72175
		Borehole / Pit No	TP11
Project Name	Heol Crwys, Cwmavon	Sample No	2
Date Tested	29/04/2024	Depth Top	1.50
Compaction Method	2.5 Kg Rammer	Depth Base	
Compaction Clause	BS1377:Part 4:1990, Clause 3.3	Sample Type	B
Sample Description	Grey sandy silty clayey GRAVEL	Single or Separate Sample Used	Single



Compaction Point	1	2	3	4	5							
Moisture Content	4.4	6.2	8.5	10	22							
Bulk Density	1.85	1.93	2.04	2.02	1.91							
Dry Density	1.77	1.82	1.88	1.83	1.56							

Initial Moisture Content	22	%
Maximum Dry Density	1.88	Mg/m3
Optimum Moisture Content	8.5	%
Particle Density	2.41 Measured	Mg/m3
Material Retained 37.5mm	9	%
Material Retained 20mm	17	%

UKAS TESTING 2788

Operator
Conor

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE DENSITY BY GAS JAR (BS 1377 : PART 2 : 8.2 : 1990)**	
Contract Number	72175	
Project Name	Heol Crwys, Cwmavon	
Date Tested	29/04/2024	

Hole Reference	Sample Number	Sample Type	Depth (m)							Particle Density		Remarks
TP02	2	B	1.50	-						2.43		
TP04	4	B	1.00	-						2.43		
TP04	2	B	3.00	-						2.38		
TP11	2	B	1.50	-						2.41		
TP08	2	B	2.20	-						2.45		
TP06	2	B	1.00	-						2.50		
				-								
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Key	Reported As
Moisture Content	%
Bulk Density	Mg/m^3
Dry Density	Mg/m^3
Particle Density	Mg/m^3
Air Voids	%

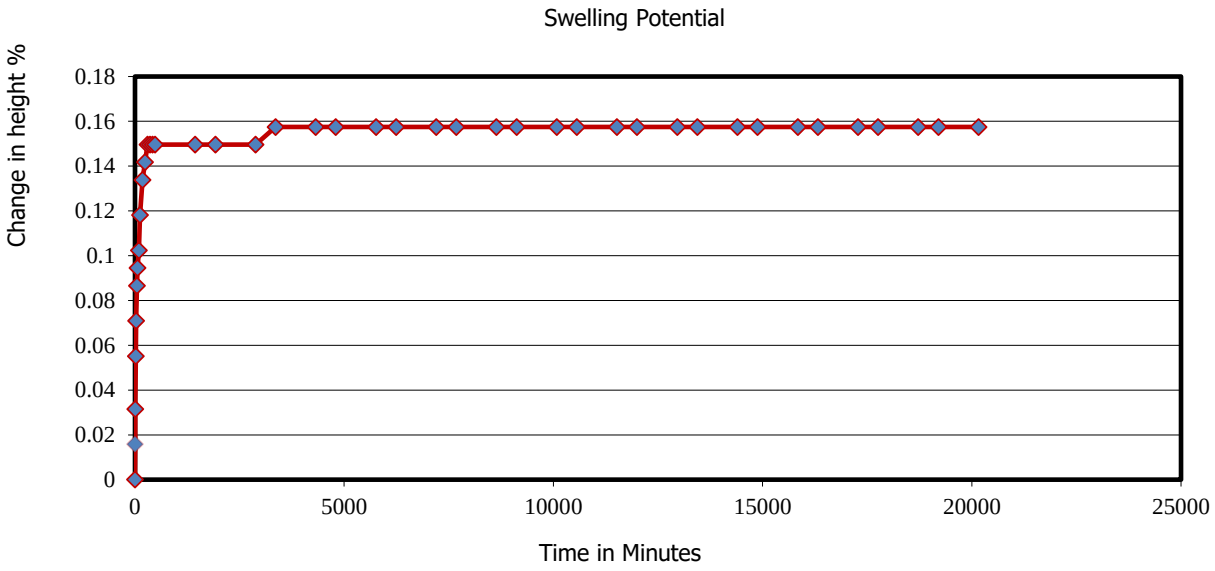
Operator
Cam Evans

UKAS TESTING 2788

Test Report: **Determination of the Swelling Potential of Fill Material. Rapid Assessment, In house Method**

Client:	Integral Geotechnique (Wales) Limited
Client ref:	14023
Project Name:	Heol Crwys, Cwmavon
Contract Number:	72175
Date Test Started:	15/04/24
BH/TP:	TP02
Sample Number:	2
Depth (m) :	1.00
Sample Type:	B
Operator:	Darcy E
Description:	Grey fine to coarse GRAVEL

INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.00	Final Height - mm:	127.20
Moisture Content - %:	20.5	Moisture Content - %:	22
Bulk Density - Mg/m3:	1.90	Bulk Density - Mg/m3:	1.91
Dry Density - Mg/m3:	1.57	Dry Density - Mg/m3:	1.57
Test Temperature C°:	90		



Swelling after 336 Hours -%
0.16

For and behalf of GEO Site & Testing Services Ltd

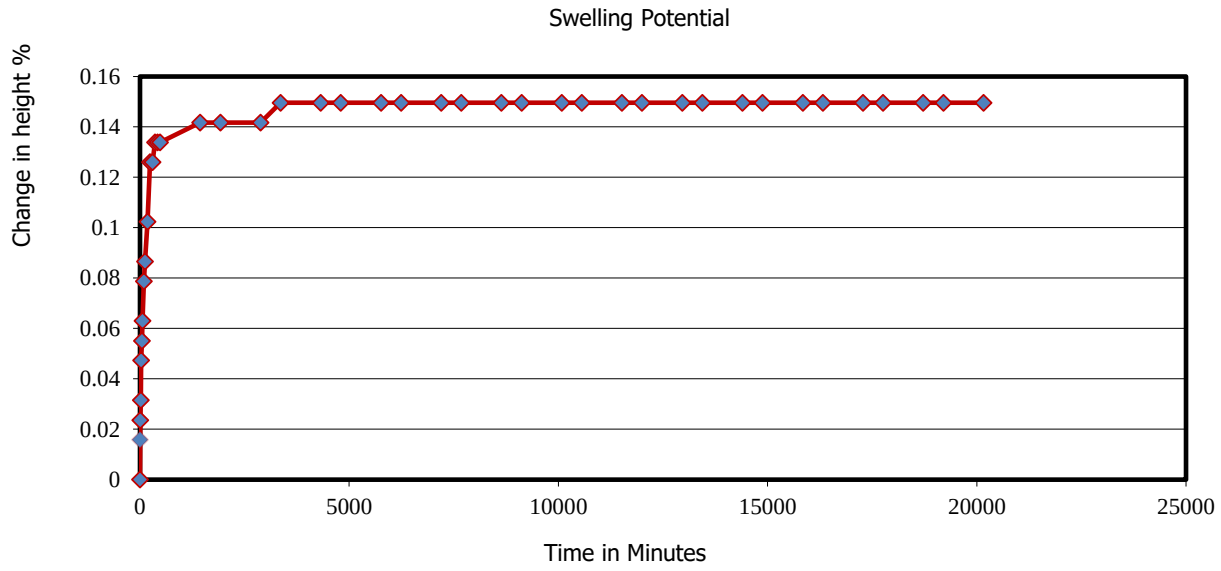
Remarks:

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

Test Report: **Determination of the Swelling Potential of Fill Material. Rapid Assessment, In house Method**

Client:	Integral Geotechnique (Wales) Limited
Client ref:	14023
Project Name:	Heol Crwys, Cwmavon
Contract Number:	72175
Date Test Started:	15/04/24
BH/TP:	TP08
Sample Number:	2
Depth (m) :	1.00
Sample Type:	B
Operator:	Darcy E
Description:	Grey fine to coarse GRAVEL

INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.00	Final Height - mm:	127.19
Moisture Content - %:	21.8	Moisture Content - %:	23
Bulk Density - Mg/m3:	1.77	Bulk Density - Mg/m3:	1.78
Dry Density - Mg/m3:	1.45	Dry Density - Mg/m3:	1.45
Test Temperature C°:	90		



Swelling after 336 Hours -%
0.15

For and behalf of GEO Site & Testing Services Ltd

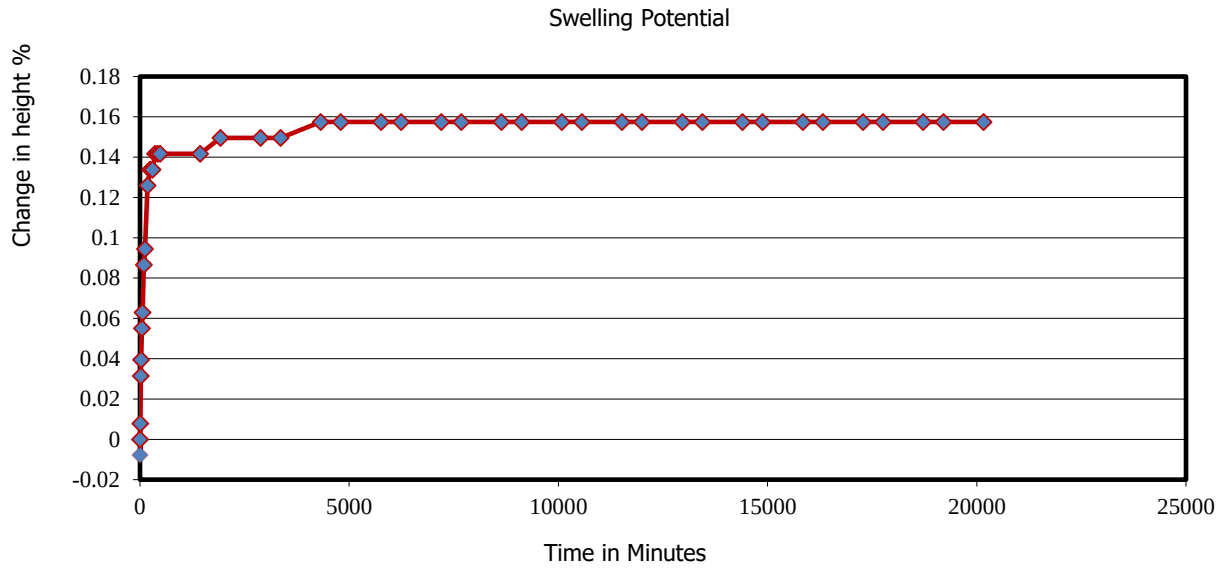
Remarks:

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

Test Report: **Determination of the Swelling Potential of Fill Material. Rapid Assessment, In house Method**

Client:	Integral Geotechnique (Wales) Limited
Client ref:	14023
Project Name:	Heol Crwys, Cwmavon
Contract Number:	72175
Date Test Started:	15/04/24
BH/TP:	TP11
Sample Number:	2
Depth (m) :	1.50
Sample Type:	B
Operator:	Darcy E
Description:	Grey fine to coarse GRAVEL

INITIAL CONDITIONS.		**FINAL CONDITIONS.**	
Initial Height - mm:	127.00	Final Height - mm:	127.20
Moisture Content - %:	19.1	Moisture Content - %:	22
Bulk Density - Mg/m3:	1.84	Bulk Density - Mg/m3:	1.86
Dry Density - Mg/m3:	1.54	Dry Density - Mg/m3:	1.54
Test Temperature C°:	90		



Swelling after 336 Hours -%
0.16

For and behalf of GEO Site & Testing Services Ltd

Remarks:

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

Test Report: MS DIRECT SHEARBOX TEST.BS1377:Part 7:4.5 :1990.

Borehole Number:	TP02	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	

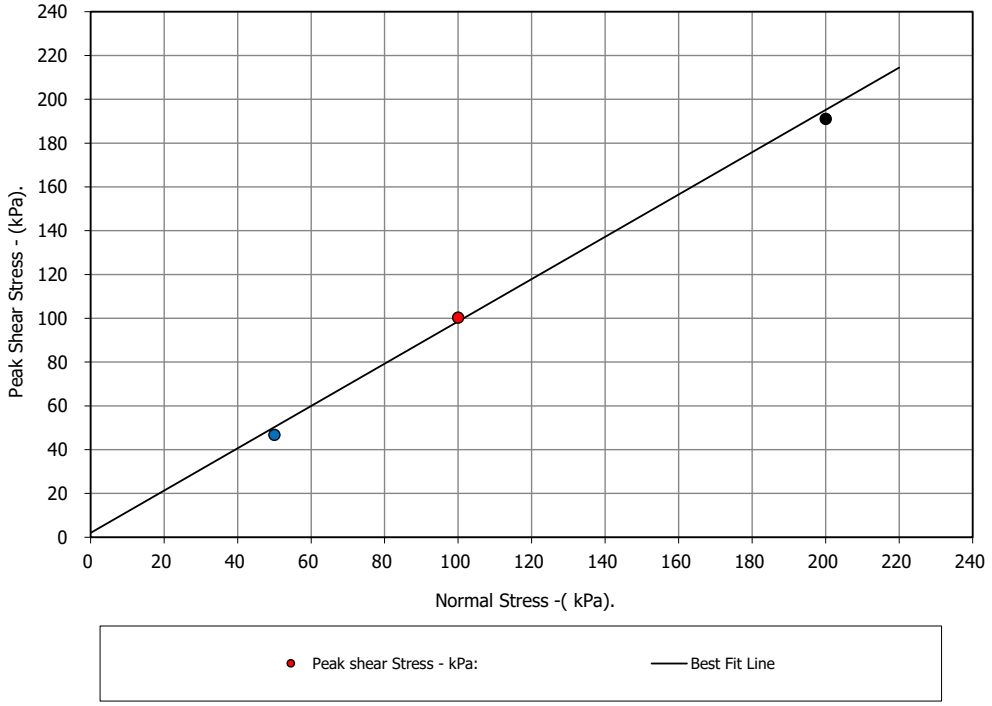
Sample Type:	B
Particle Density - Mg/m3:	2.45 (Measured)
Specimen Tested:	Submerged, Remoulded (Light Tamping) Material above 2mm removed.

Sample Description:
Grey/ black sandy fine to coarse GRAVEL

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	24.80	24.80	24.80
Length - mm:	60.00	60.00	60.00
Moisture Content - %:	27	27	27
Bulk Density - Mg/m3:	1.67	1.67	1.67
Dry Density - Mg/m3:	1.32	1.32	1.32
Voids Ratio:	0.8564	0.8603	0.8564
Degree of Saturation - %:	76.42	76.07	76.42
Normal Pressure- kPa	50	100	200
Consolidation			
Consolidated Height - mm:	22.96	23.35	22.97
Shear			
Rate of Horizontal Displacement (mm/min)	0.500	0.500	0.500
Horizontal Displacement at Peak Shear Stress (mm)	10.00	5.04	4.15
Peak shear Stress - kPa:	47	100	191

PEAK	
Angle of Shearing Resistance:(θ)	**44.0**
Effective Cohesion - kPa:	**2.0**

FAILURE CONDITIONS



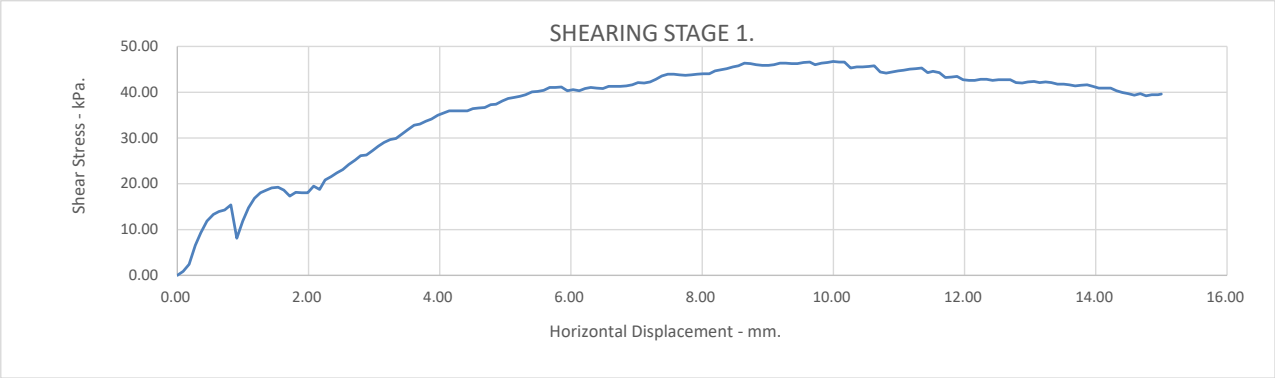
UKAS TESTING 2788

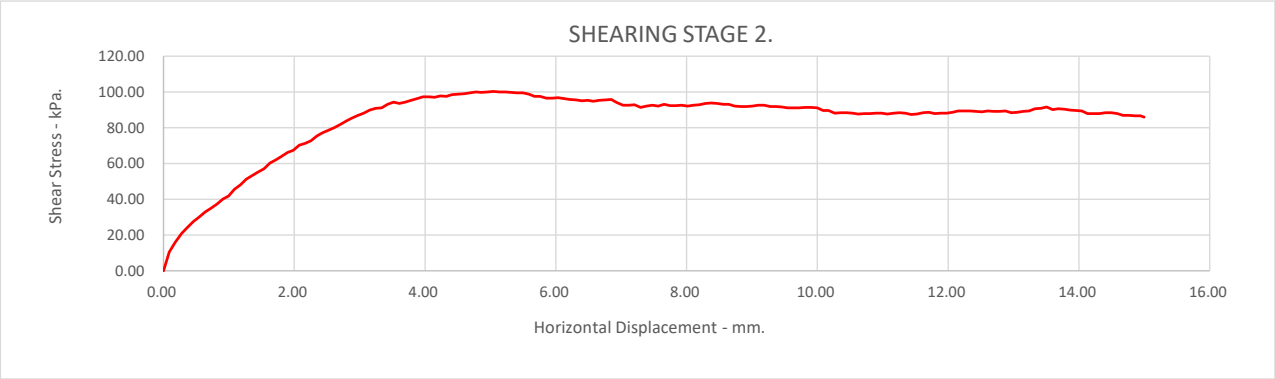
GSTL GEOTECHNICAL SITE & TESTING LABORATORIES

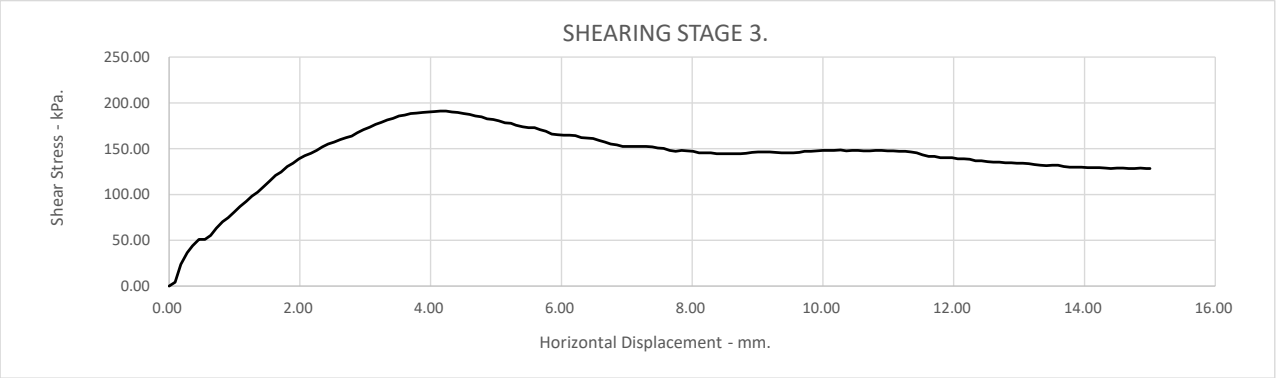
Heol Crwys, Cwmavon

Contract No.:
72175
Client Ref Number:
14023.00

Borehole Number:	TP02	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	







GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

Heol Crwys, Cwmavon

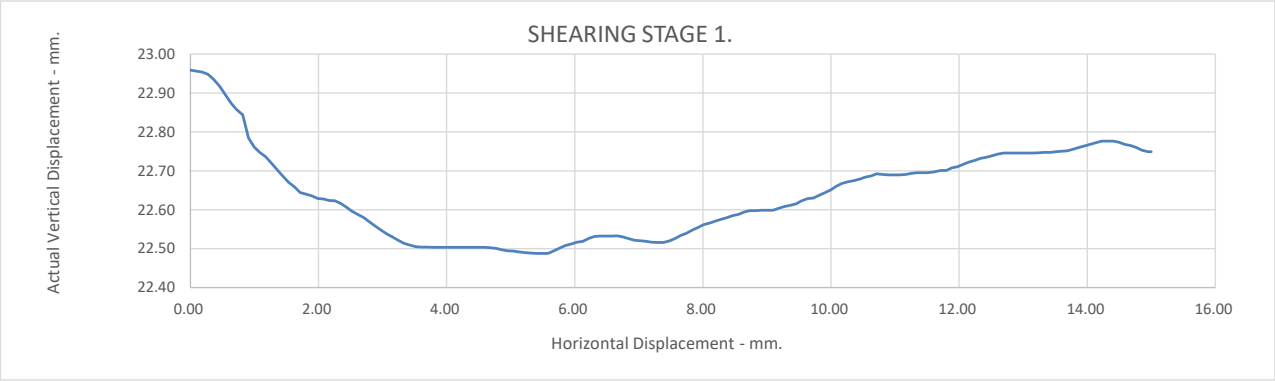
Contract No.:

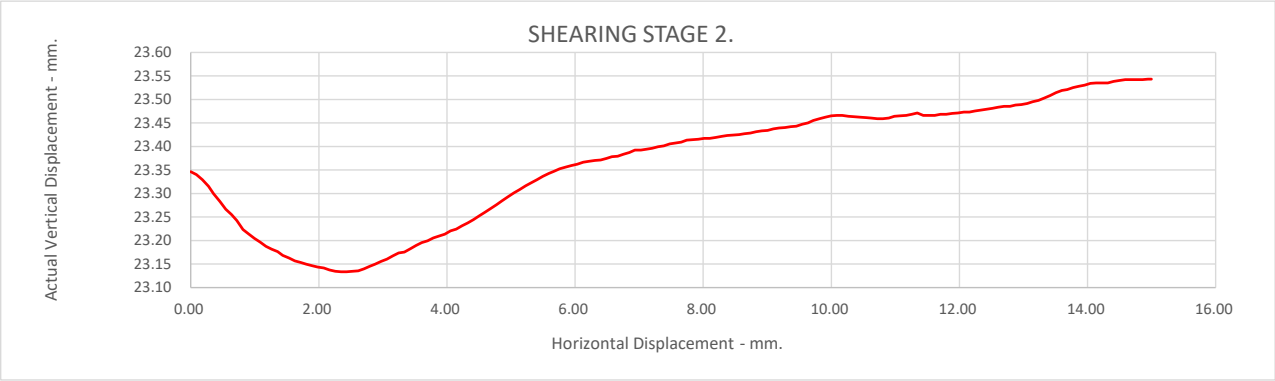
72175

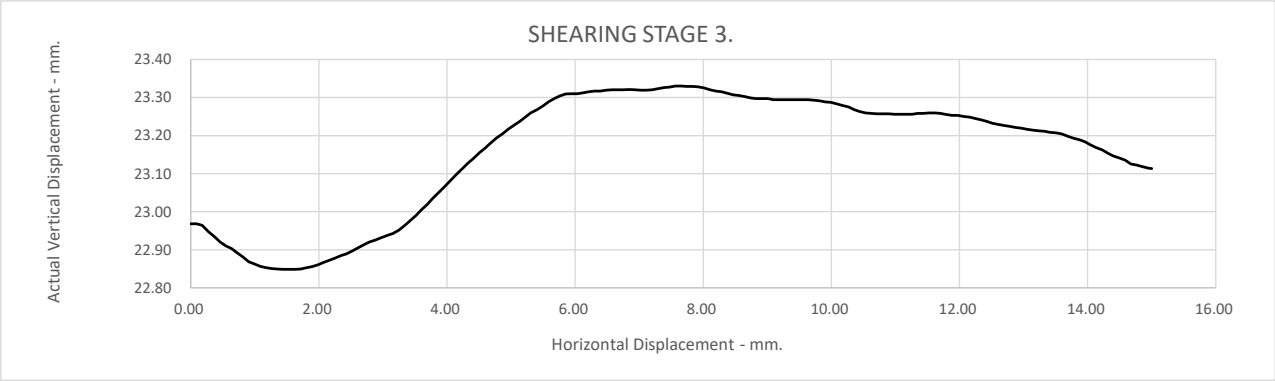
Client Ref Number:

14023.00

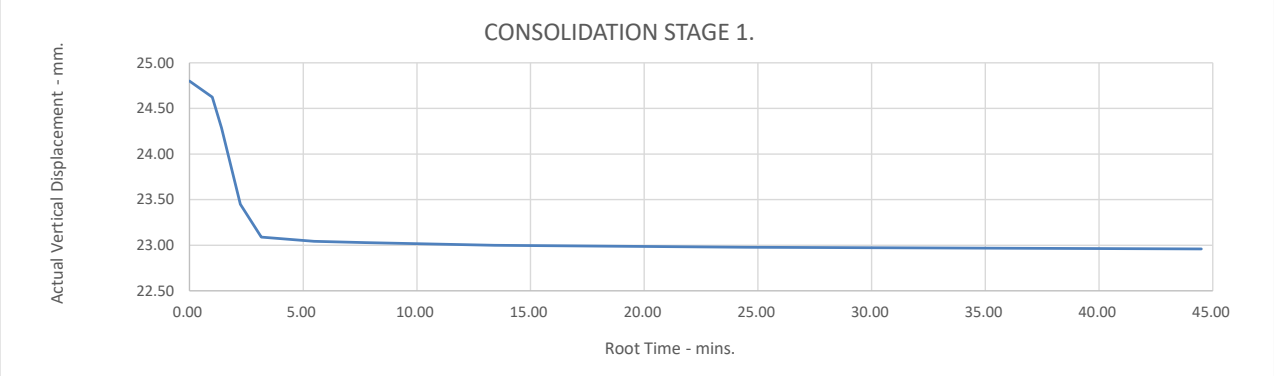
Borehole Number:	TP02	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	

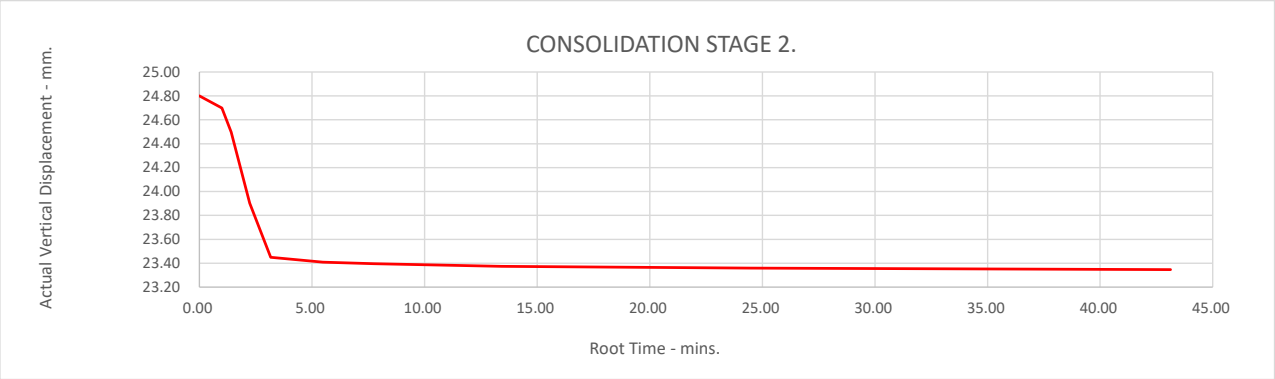


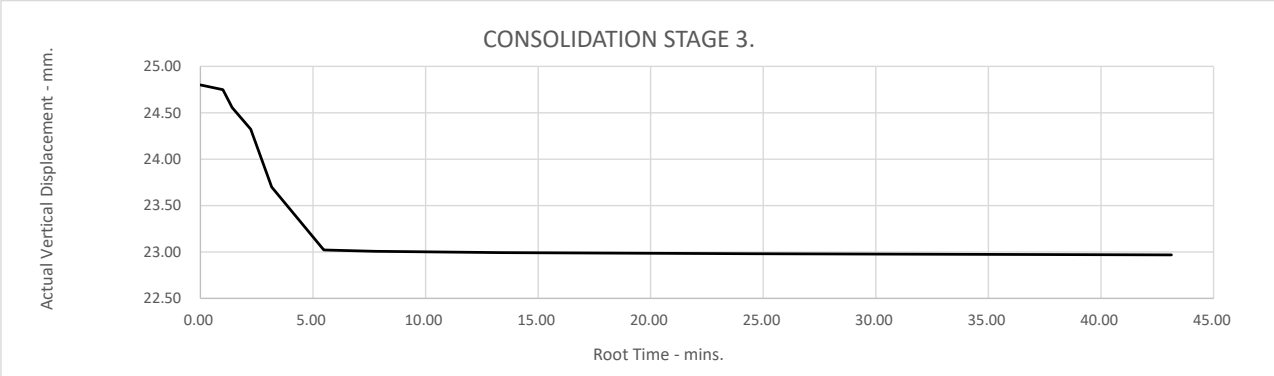




Borehole Number:	TP02	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	







Test Report: MS DIRECT SHEARBOX TEST.BS1377:Part 7:4.5 :1990.

Borehole Number:	TP08	Depth from (m):	2.20
Sample Number :	2	Depth to (m):	

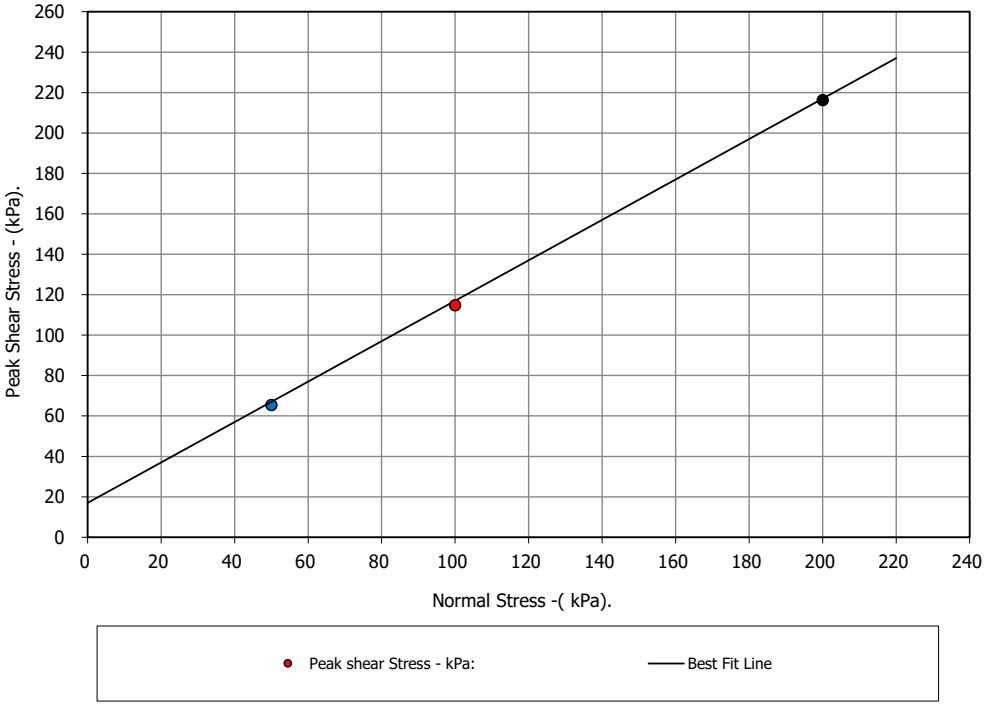
Sample Type:	B
Particle Density - Mg/m3:	2.45 (Measured)
Specimen Tested:	Submerged, Remoulded (Light Tamping) Material above 2mm removed.

Sample Description:
Grey sandy fine to coarse GRAVEL

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	24.80	24.80	24.80
Length - mm:	60.00	60.00	60.00
Moisture Content - %:	24	24	24
Bulk Density - Mg/m3:	1.45	1.45	1.45
Dry Density - Mg/m3:	1.16	1.16	1.16
Voids Ratio:	1.1102	1.1087	1.1033
Degree of Saturation - %:	53.98	54.05	54.31
Normal Pressure- kPa	50	100	200
Consolidation			
Consolidated Height - mm:	23.50	22.38	22.47
Shear			
Rate of Horizontal Displacement (mm/min)	0.500	0.500	0.500
Horizontal Displacement at Peak Shear Stress (mm)	6.22	6.22	6.31
Peak shear Stress - kPa:	65	115	216

PEAK	
Angle of Shearing Resistance:(θ)	**45.0**
Effective Cohesion - kPa:	**17**

FAILURE CONDITIONS



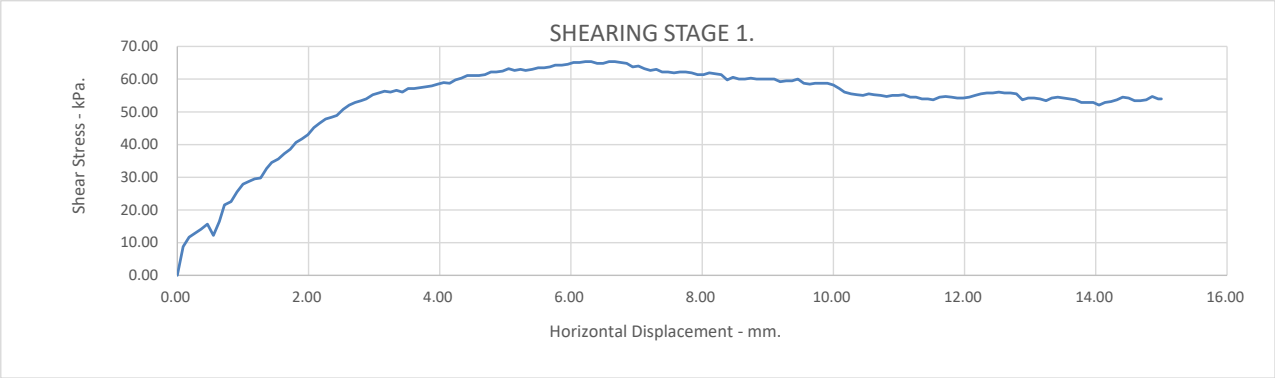
UKAS TESTING 2788

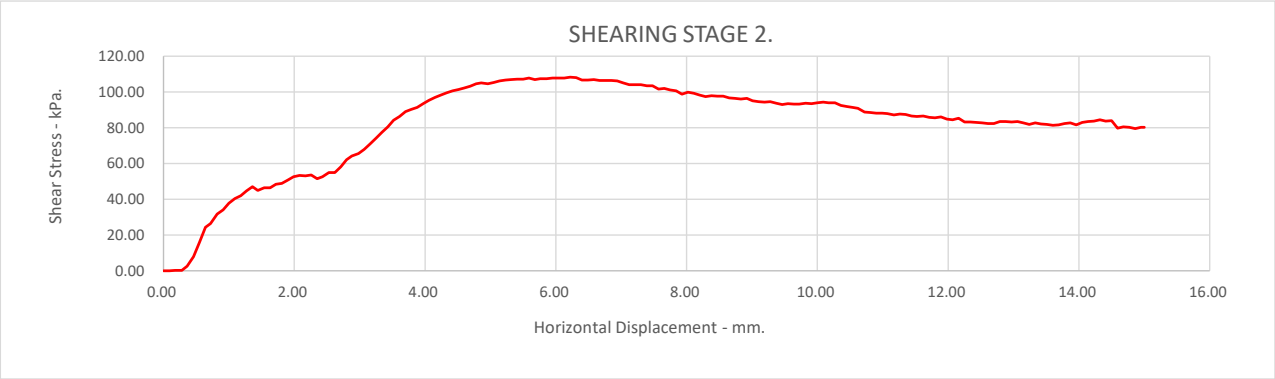
GSTL GEOTECHNICAL SITE & TESTING LABORATORIES

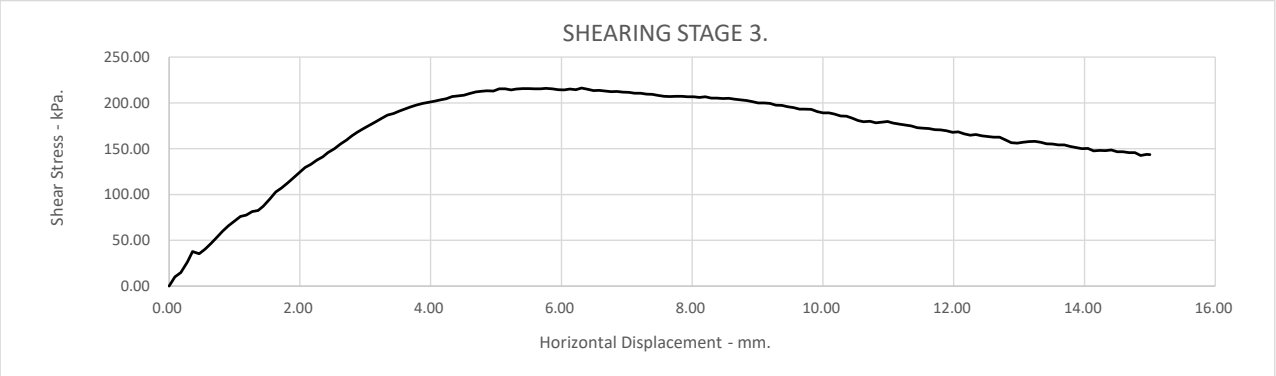
Heol Crwys, Cwmavon

Contract No.:
72175
Client Ref Number:
14023.00

Borehole Number:	TP08	Depth from (m):	2.20
Sample Number :	2	Depth to (m):	







GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

Heol Crwys, Cwmavon

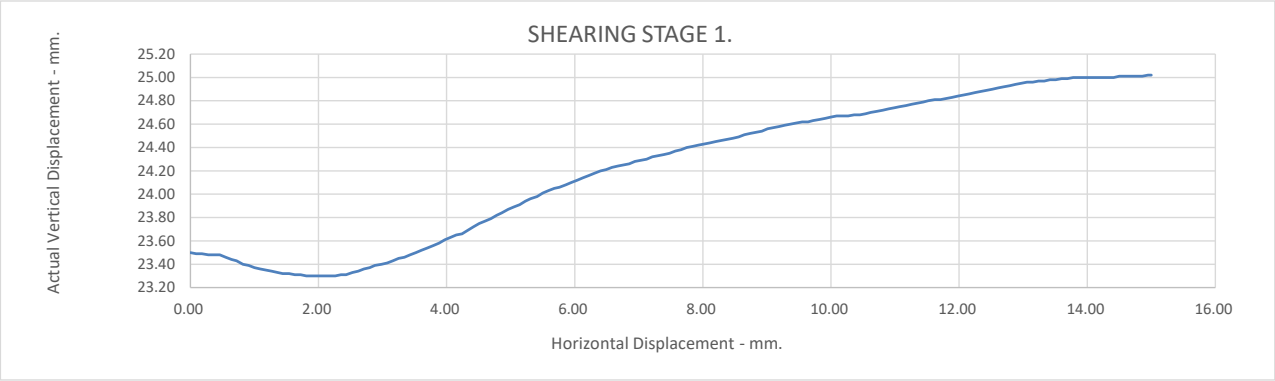
Contract No.:

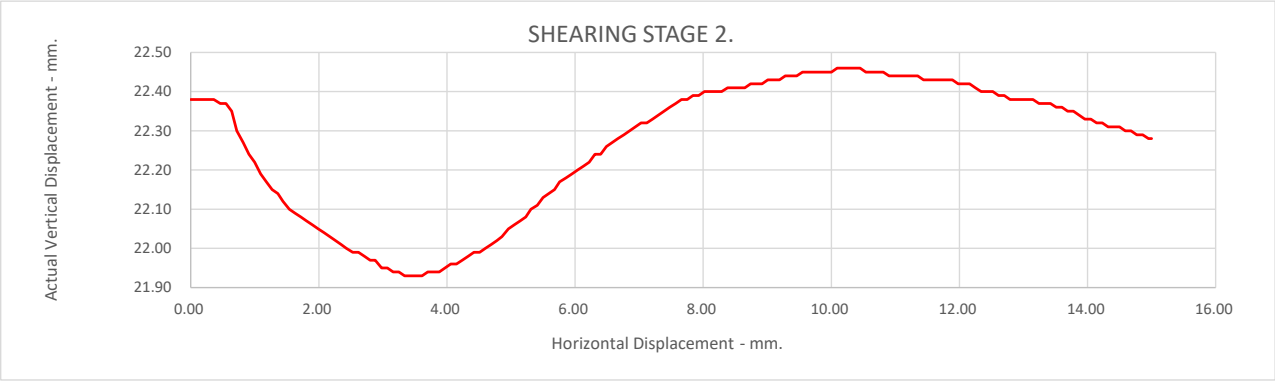
72175

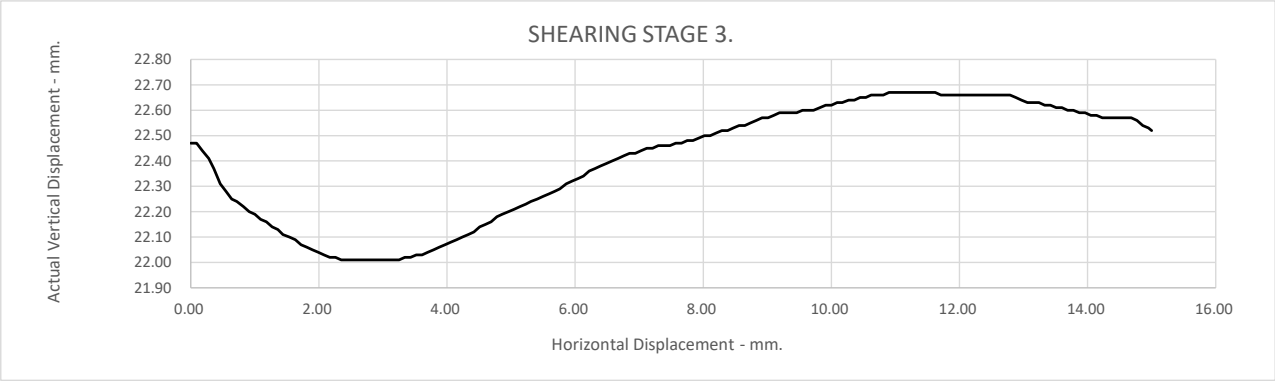
Client Ref Number:

14023.00

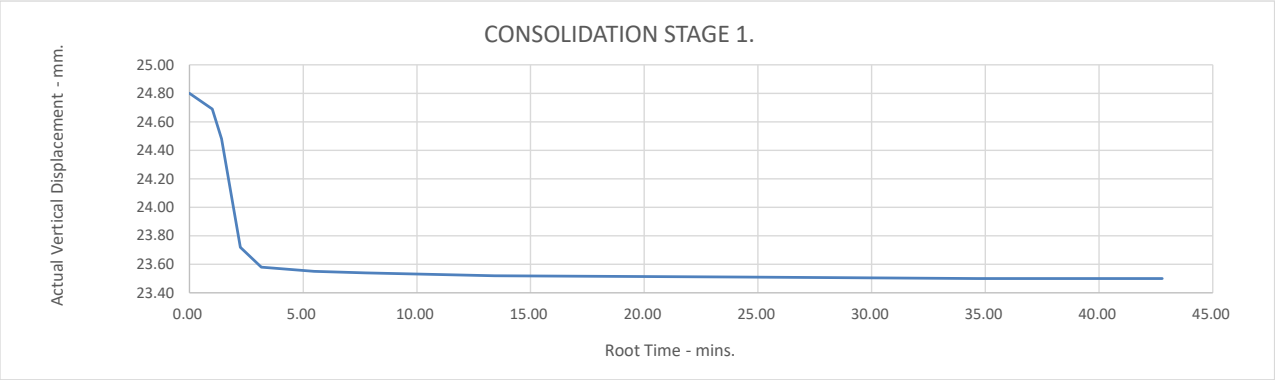
Borehole Number:	TP08	Depth from (m):	2.20
Sample Number :	2	Depth to (m):	

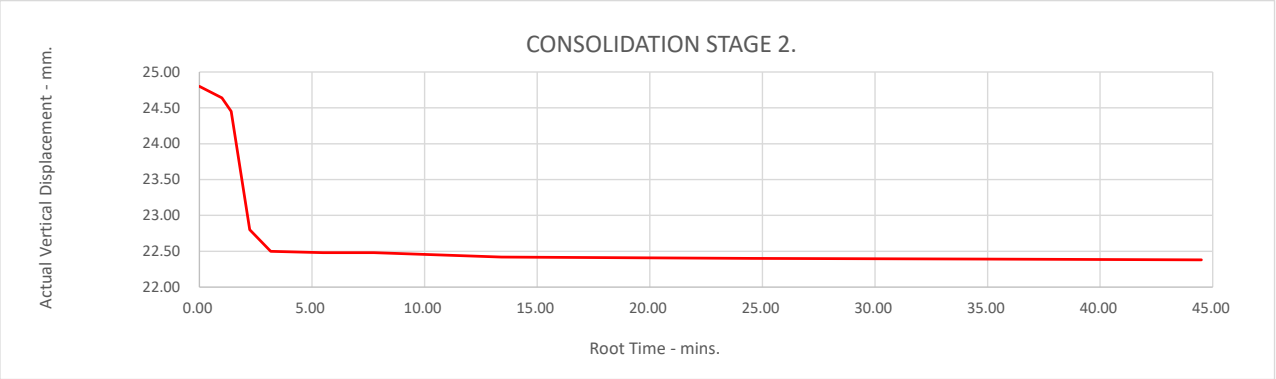


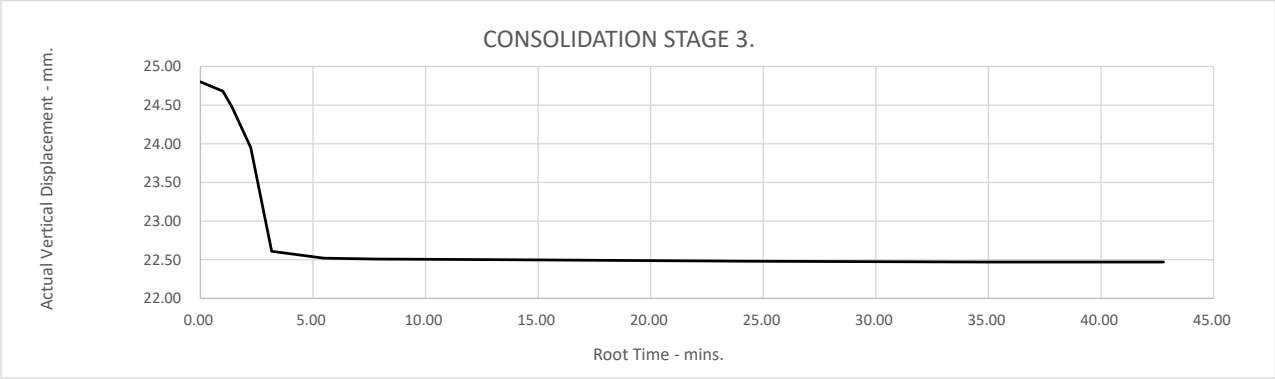




Borehole Number:	TP08	Depth from (m):	2.20
Sample Number :	2	Depth to (m):	







Test Report: MS DIRECT SHEARBOX TEST.BS1377:Part 7:4.5 :1990.

Borehole Number:	TP11	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	

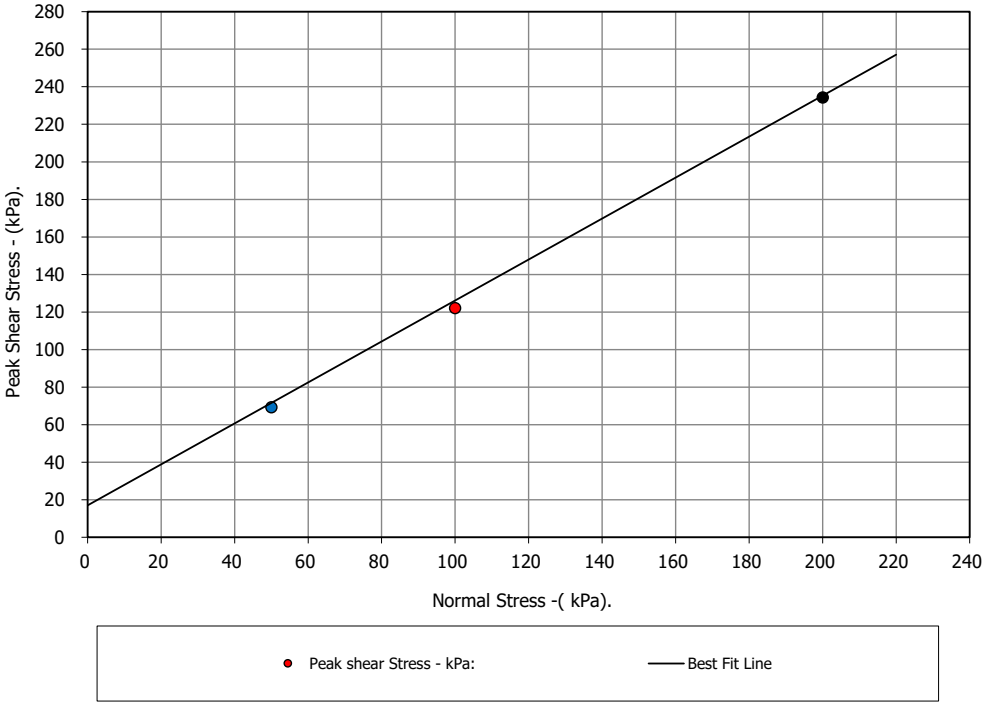
Sample Type:	B
Particle Density - Mg/m3:	2.41 (Measured)
Specimen Tested:	Submerged, Remoulded (Light Tamping) Material above 2mm removed.

Sample Description:
Grey sandy silty clayey GRAVEL

STAGE	**1**	**2**	**3**
Initial Conditions			
Height - mm:	24.80	24.80	24.80
Length - mm:	60.00	60.00	60.00
Moisture Content - %:	26	26	26
Bulk Density - Mg/m3:	1.92	1.92	1.92
Dry Density - Mg/m3:	1.53	1.53	1.53
Voids Ratio:	0.5723	0.5764	0.5787
Degree of Saturation - %:	107.59	106.84	106.41
Normal Pressure- kPa	50	100	200
Consolidation			
Consolidated Height - mm:	23.44	23.35	22.62
Shear			
Rate of Horizontal Displacement (mm/min)	0.500	0.500	0.500
Horizontal Displacement at Peak Shear Stress (mm)	3.70	6.13	4.69
Peak shear Stress - kPa:	69	122	234

PEAK	
Angle of Shearing Resistance:(θ)	**47.5**
Effective Cohesion - kPa:	**17**

FAILURE CONDITIONS



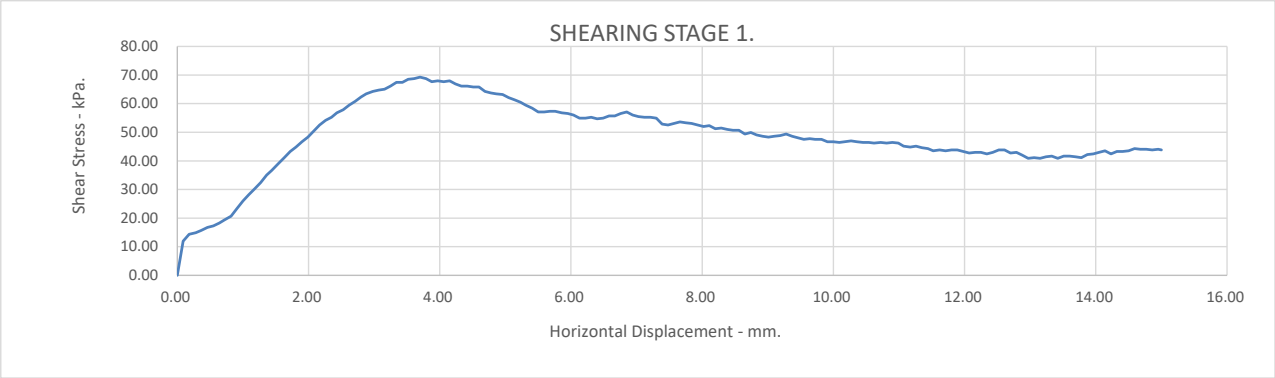
UKAS TESTING 2788

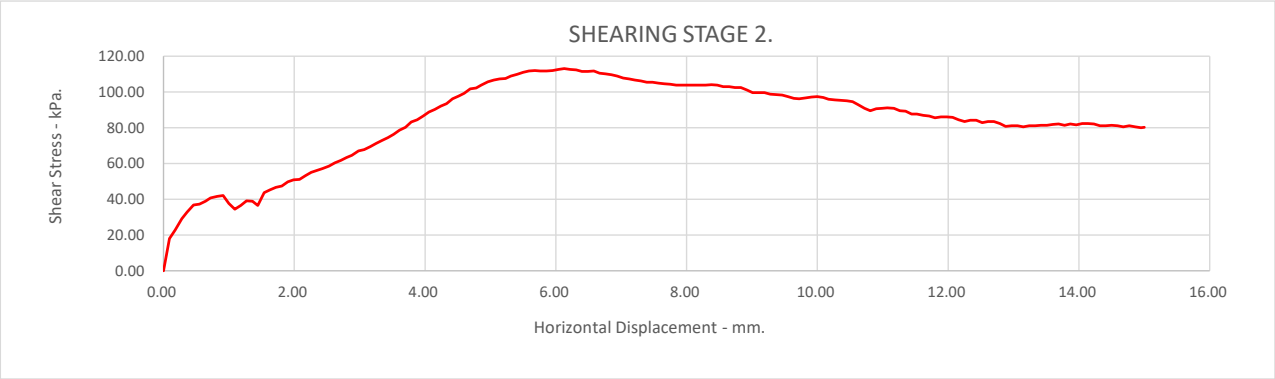
GSTL GEOTECHNICAL SITE & TESTING LABORATORIES

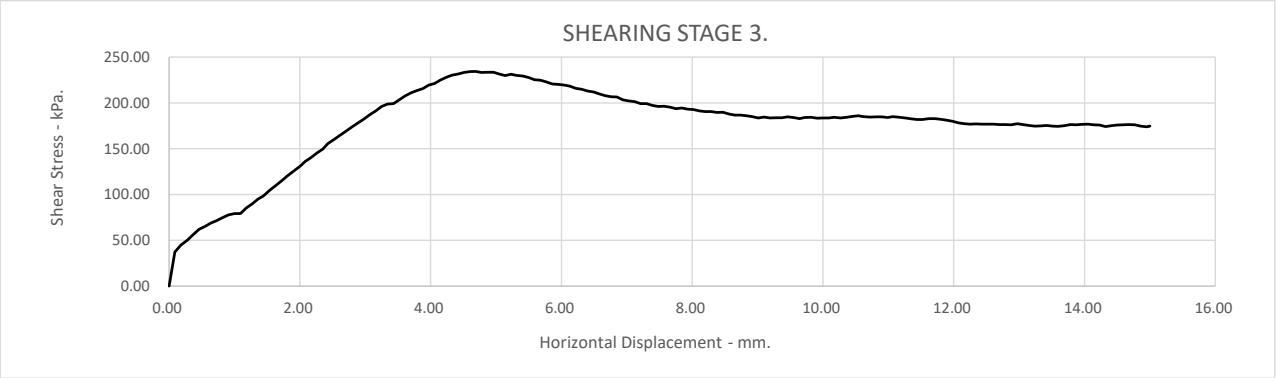
Heol Crwys, Cwmavon

Contract No.:
72175
Client Ref Number:
14023.00

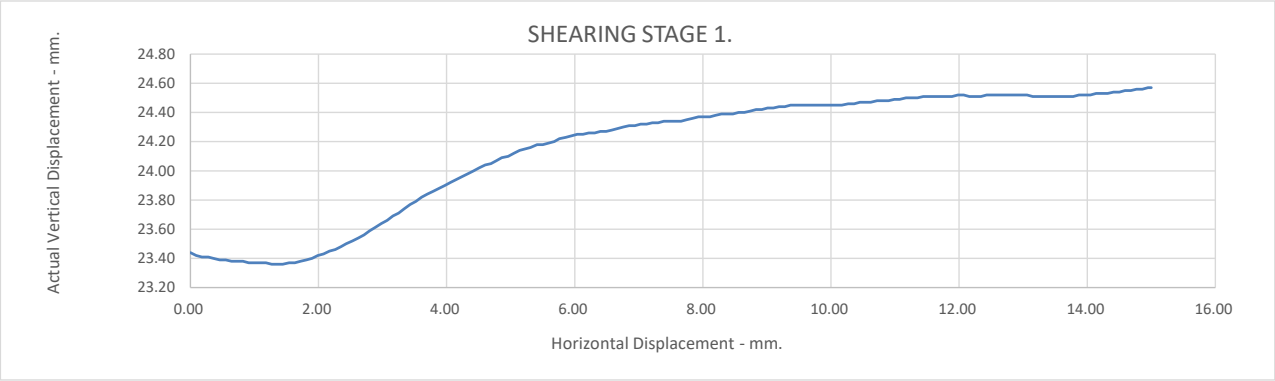
Borehole Number:	TP11	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	

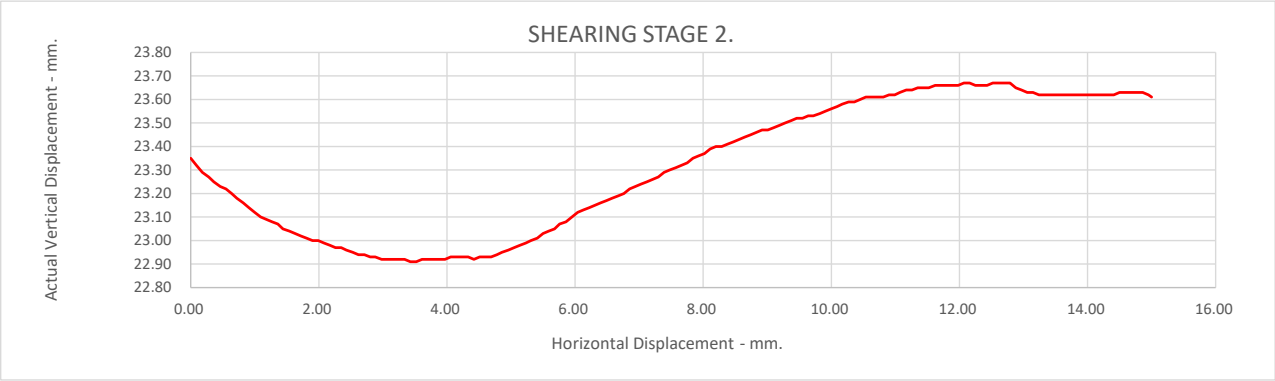


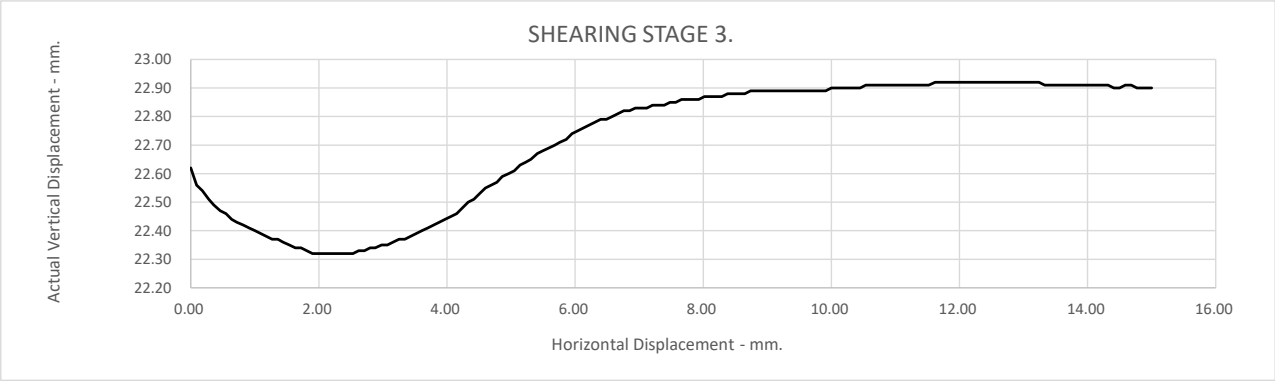




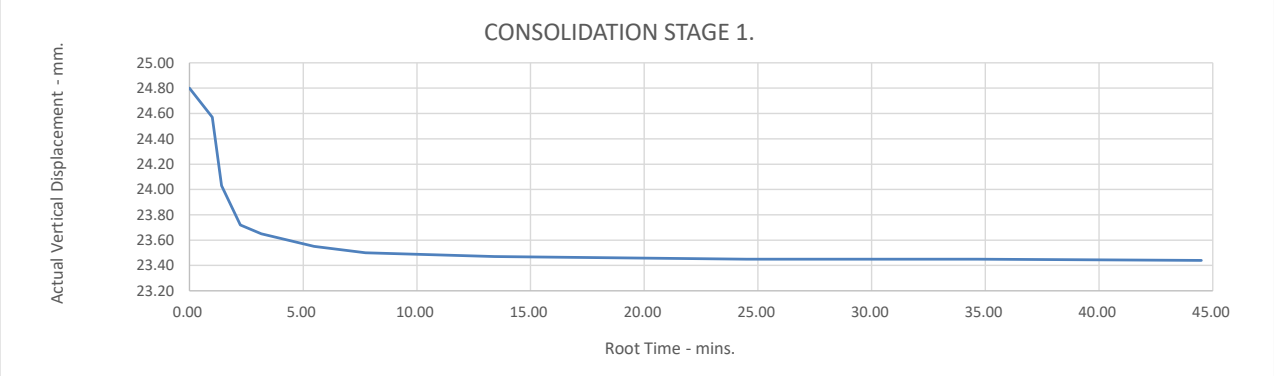
Borehole Number:	TP11	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	

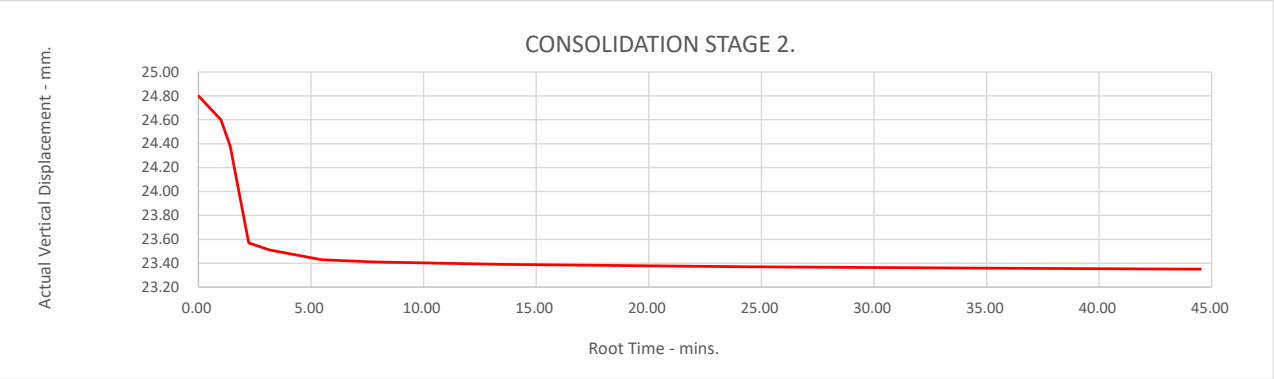


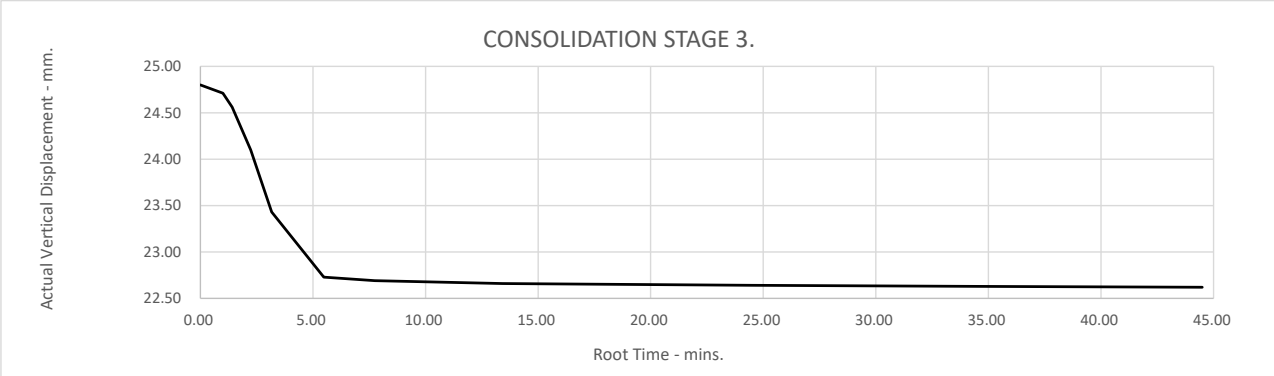




Borehole Number:	TP11	Depth from (m):	1.50
Sample Number :	2	Depth to (m):	







Laboratory Report

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES
A PHENNA GROUP COMPANY

Contract Number: 68885

Client Ref: **14023**
Client PO: **14023/FG**

Date Received: **27-09-2023**
Date Completed: **09-10-2023**
Report Date: **09-10-2023**

Client: **Integral Geotechnique (Wales) Limited**
7 Beddau Way
Castlegate Business Park
Caerphilly
Cardiff
CF83 2AX

This report has been checked and approved by:

B. Evans

Brendan Evans
Office Administrator

Contract Title: **Heol Crwys, Cwmavon**
For the attention of: **Finn Gullfoyle**

Test Description	Qty
Moisture Content BS 1377:1990 - Part 2 : 3.2 - * UKAS	3
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	3
Water Soluble Sulphate 2:1 extract Sub-contracted Test	3
pH value of soil Sub-contracted Test	3
Disposal of samples for job	1

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

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Manager)

GEO Site & Testing Services Ltd
Units 3-4, Heol Aur, Dafen, Llanelli, Carmarthenshire, Wales SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)**	
Contract Number	68885	
Project Name	Heol Crwys, Cwmavon	
Date Tested	02/10/2023	
	DESCRIPTIONS	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
WS02		2 x D	1.00	-		Black silty GRAVEL
WS05		3 x D	1.00	-		Brown silty GRAVEL
WS10		4 x D	1.50	-		Brown sandy silty GRAVEL
				-		
				-		
				-		
				-		
				-		
				-		
				-		
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Operator
Clayton Jenkins

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)	
Contract Number	68885	
Project Name	Heol Crwys, Cwmavon	
Date Tested	02/10/2023	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
WS02		2 x D	1.00	-		19		NP		9	
WS05		3 x D	1.00	-		6.0		NP		13	
WS10		4 x D	1.50	-		13		NP		11	
				-							
				-							
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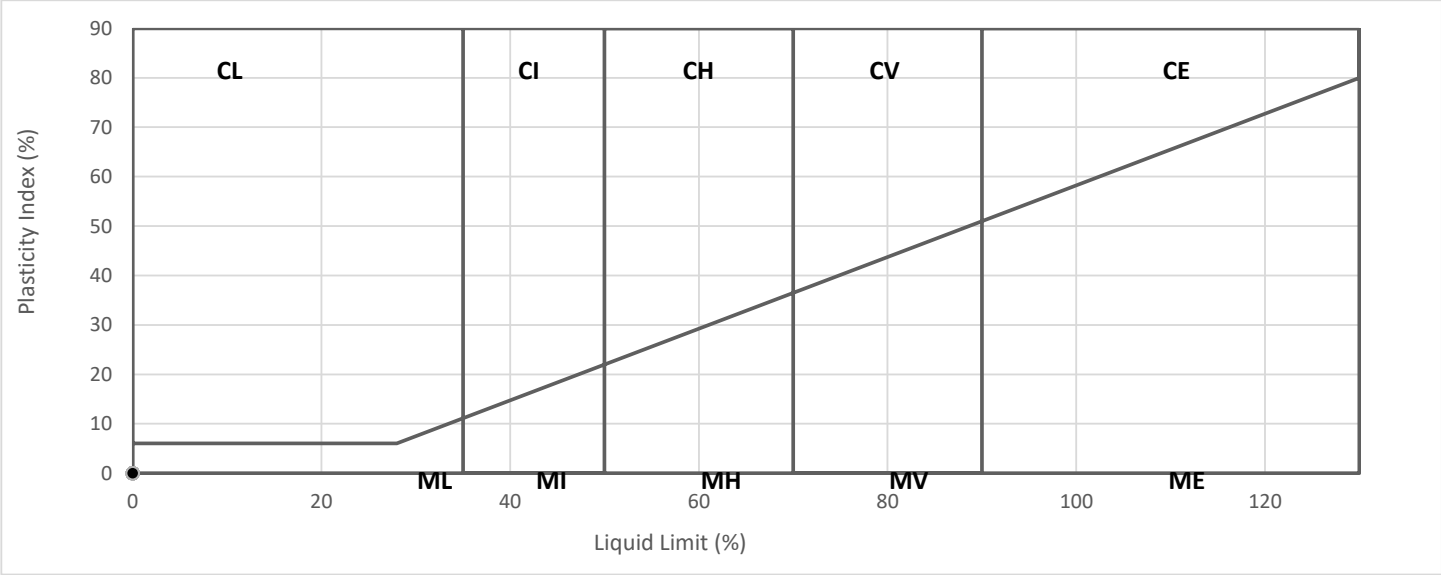
Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:2015+A1:2020



Operator
Clayton Jenkins

UKAS TESTING 2788

7 - 11 Harding Street
Leicester
LE1 4DH

GSTL
Unit 3-4 Heol Aur
Dafen Ind Estate
Dafen
SA14 8QN

Analytical Test Report: L23/05706/GSL - 23-37827

Your Project Reference:	**14023 Heol Crwys, Cwmavon**		
Your Order Number:	68885	Samples Received / Instructed:	29/09/2023 / 29/09/2023
Report Issue Number:	1	Sample Tested:	29/09 to 09/10/2023
Samples Analysed:	3 soil samples	Report issued:	09/10/2023

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue: 29.08.2023

Issued by: J. Gane

Issue No: 4

Rev No: 3

7 - 11 Harding Street
Leicester
LE1 4DH

L23/05706/GSL - 23-37827

Project Reference - 14023 Heol Crwys, Cwmavon

Analytical Test Results - Chemical Analysis

Lab Reference			317736	317737	317738
Client Sample ID			-	-	-
Client Sample Location			WS02	WS05	WS10
Client Sample Type			D	D	D
Client Sample Number			-	-	-
Depth - Top (m)			1.00	1.00	1.50
Depth - Bottom (m)			1.00	1.00	1.50
Date of Sampling			-	-	-
Time of Sampling			-	-	-
Sample Matrix			Other	Clay	Sand
Determinant	**Units**	**Accreditation**			
Water soluble sulphate (as SO_4)	(mg/l)	u	160	85	16
pH Value	pH Units	MCERTS	8.2	8.2	8.9

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L23/05706/GSL - 23-37827

Project Reference - 14023 Heol Crwys, Cwmavon

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
317736	-	WS02	D	-	Made Ground- black sandy clay loam	-	-	100
317737	-	WS05	D	-	Made Ground- black gravelly sandy clay with frequent slag	-	-	100
317738	-	WS10	D	-	Mottled cream orange very gravelly sand	-	-	29

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L23/05706/GSL - 23-37827

Project Reference - 14023 Heol Crwys, Cwmavon

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
317736	-	WS02	D	-	
317737	-	WS05	D	-	
317738	-	WS10	D	-	

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Leicester
LE1 4DH

L23/05706/GSL - 23-37827

Project Reference - 14023 Heol Crwys, Cwmavon

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

7 - 11 Harding Street
Leicester
LE1 4DH

L23/05706/GSL - 23-37827

Project Reference - 14023 Heol Crwys, Cwmavon

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whist in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
317736	-	WS02	D	-	MS - CL - Anions by Aquakem (2:1Extract)	A
317736	-	WS02	D	-	MS - CL - Sample Preparation	A
317736	-	WS02	D	-	MS - CL - pH in Soils	A
317737	-	WS05	D	-	MS - CL - Anions by Aquakem (2:1Extract)	A
317737	-	WS05	D	-	MS - CL - Sample Preparation	A
317737	-	WS05	D	-	MS - CL - pH in Soils	A
317738	-	WS10	D	-	MS - CL - Anions by Aquakem (2:1Extract)	A
317738	-	WS10	D	-	MS - CL - Sample Preparation	A
317738	-	WS10	D	-	MS - CL - pH in Soils	A

APPENDIX I

IN-SITU GAS AND GROUNDWATER LEVEL MONITORING RESULTS

FIELD GAS MONITORING RESULTS - SUMMARY

Job No.: 14023
Site: Heol Y Crwys, Cwmavon

Maximum Methane Concentration (%v/v)	Maximum Carbon Dioxide Concentration (%v/v)	Maximum Gas Concentration (%v/v)	Maximum Gas Flow Rate (l/hr)	**GSV (l/hr)**
<0.5	1.40	1.40	<0.3	**<0.0042**

Methane							
Location	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	**Maximum**
BH 01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.50**
BH 02	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.50**
BH 03	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**<0.50**

Carbon Dioxide							
Location	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	**Maximum**
BH 01	0.30	0.20	0.30	0.20	0.10	0.20	**0.30**
BH 02	1.30	1.40	1.20	1.10	1.00	0.80	**1.40**
BH 03	0.10	0.20	0.10	0.20	0.20	0.10	**0.20**

Oxygen							
Location	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	**Minimum**
BH 01	19.90	20.00	19.60	19.80	19.50	19.80	**19.50**
BH 02	20.00	19.60	19.90	19.20	19.60	19.20	**19.20**
BH 03	21.10	20.30	20.00	19.30	20.00	20.10	**19.30**

Gas Flow Rate							
Location	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	**Maximum**
BH 01	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**<0.30**
BH 02	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**<0.30**
BH 03	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	**<0.30**

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	24.04.24
Monitoring Round:	1

Monitoring Conditions			**Barometric Pressure (mb)**	
Weather:	Sunny		**On Arrival:**	1013
Ambient Temp:	12	°C	**During Monitoring:**	1013
Instrument:	GA5000		**End of Monitoring:**	1013

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	2.91	<0.5	<0.5			19.90	20.00	0.30	0.20	<1	<1	<0.3	<0.1
BH 02	3.0	Dry	<0.5	<0.5			20.00	20.00	1.30	1.30	<1	<1	<0.3	0.10
BH 03	3.0	Dry	<0.5	<0.5			21.10	21.10	0.10	0.10	<1	<1	<0.3	0.10

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	08.05.24
Monitoring Round:	2

Monitoring Conditions			Barometric Pressure (mb)	
Weather:	Sunny		**On Arrival:**	1012
Ambient Temp:	20	°C	**During Monitoring:**	1012
Instrument:	GA5000		**End of Monitoring:**	1012

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	Damp	<0.5	<0.5			20.00	20.00	0.20	0.20	<1	<1	<0.3	0.10
BH 02	3.0	Dry	<0.5	<0.5			19.60	19.60	1.40	1.30	<1	<1	<0.3	0.10
BH 03	3.0	Dry	<0.5	<0.5			20.30	20.30	0.20	0.20	<1	<1	<0.3	0.20

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	22.05.24
Monitoring Round:	3

Monitoring Conditions			Barometric Pressure (mb)	
Weather:	Cloudy		**On Arrival:**	989
Ambient Temp:	14	°C	**During Monitoring:**	989
Instrument:	GA5000		**End of Monitoring:**	989

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	Dry	<0.5	<0.5			19.60	19.60	0.30	0.20	<1	<1	<0.3	0.10
BH 02	3.0	Dry	<0.5	<0.5			19.90	19.90	1.20	1.20	<1	<1	<0.3	0.20
BH 03	3.0	Dry	<0.5	<0.5			20.00	20.20	0.10	0.10	<1	<1	<0.3	0.10

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	03.06.24
Monitoring Round:	4

Monitoring Conditions			**Barometric Pressure (mb)**	
Weather:	Sunny		**On Arrival:**	1019
Ambient Temp:	18	°C	**During Monitoring:**	1019
Instrument:	GA5000		**End of Monitoring:**	

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	Dry	<0.5	<0.5			19.80	19.80	0.20	0.20	<1	<1	<0.3	0.10
BH 02	3.0	Dry	<0.5	<0.5			19.20	19.20	1.10	1.20	<1	<1	<0.3	0.10
BH 03	3.0	Dry	<0.5	<0.5			19.30	19.30	0.20	0.20	<1	<1	<0.3	0.10

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	11.06.24
Monitoring Round:	5

Monitoring Conditions			Barometric Pressure (mb)	
Weather:	Cloudy		**On Arrival:**	991
Ambient Temp:	18	°C	**During Monitoring:**	991
Instrument:	GA5000		**End of Monitoring:**	991

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	Dry	<0.5	<0.5			19.50	19.50	0.10	0.10	<1	<1	<0.3	0.20
BH 02	3.0	Dry	<0.5	<0.5			19.60	19.60	1.00	1.00	<1	<1	<0.3	0.10
BH 03	3.0	Dry	<0.5	<0.5			20.00	20.10	0.20	0.20	<1	<1	<0.3	0.10

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

FIELD GAS MONITORING RESULTS

Job No.:	14023
Site:	Heol Y Crwys, Cwmavon
Monitoring Date:	10.07.24
Monitoring Round:	6

Monitoring Conditions			**Barometric Pressure (mb)**	
Weather:	Light Rain		**On Arrival:**	989
Ambient Temp:	15	°C	**During Monitoring:**	989
Instrument:	GA5000		**End of Monitoring:**	989

Location	Well Base Level (mbgl)	Water Level (mbgl)	Methane (CH4) %v/v		Methane % LEL		Oxygen (O2) %v/v		Carbon Dioxide (CO2) %v/v		Carbon Monoxide (CO) (ppm)	Hydrogen Sulphide (H2S) (ppm)	Peak Gas Flow (l/hr)	VOC Vapours (ppm>background)
			Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady				
BH 01	3.0	Dry	<0.5	<0.5	0.00	0.00	19.80	19.80	0.20	0.10	<1	<1	<0.3	0.10
BH 02	3.0	Dry	<0.5	<0.5	0.00	0.00	19.20	19.50	0.80	0.80	<1	<1	<0.3	0.10
BH 03	3.0	Dry	<0.5	<0.5	0.00	0.00	20.10	20.10	0.10	0.10	<1	<1	<0.3	0.10

Typical Instrument Accuracy:

$\%CH_4$	0-70% +/- 0.5%	CO	0-500ppm +/- 2% FS
$\%CO_2$	0-60% +/- 0.5%	H_2S	0-5000ppm +/- 2.0% FS
$\%O_2$	0-25% +/- 1.0%	Flow from borehole	+/- 0.3l/h

LEL = Lower Explosive Limit
N/R = No Reading Taken
FS = Full Scale

Notes:

Intégral Géotechnique

Groundwater Quality Monitoring Results

Site:	Heol Y Crwys, Cwmavon	Job No:	14023
Date:	24.04.24	Weather:	Sunny
Name of Engineer:	RH		

Sample No.	Water level (mbgl)	Well Base Level (mbgl)	pH (pH Units)	Temperature (C)	Conductivity (uS/cm)	Total disolved solids (ppm)	Salinity (PSU)	Oxygen Reduction Potential (mV)	Disolved Oxygen (%)	Comments
BH 01	8	10.10	7.89	12.01	1009	356	0.19	N/R	N/R	Fast Recharge
BH 02	Dry	12.10								
BH 03	Dry	6.20								

Notes:

1. Instrument Used: HI Multiparameter
2. Typical Accuracy: Water

Temperature	+/- 0.15 ˚C	DO	+/- 1%	PSU	+/- 2% or '+/- 0.01 PSU
pH	+/- 0.01 pH	Conductivity	+/- 1% or '+/- 1uS/cm	Resistivity	+/- 1% or '+/- 1mg/L
ORP	+/- 1mV				

3. N/R = No Reading Taken

Intégral Géotechnique

Groundwater Quality Monitoring Results

Site:	Heol Y Crwys, Cwmavon	Job No:	14023
Date:	08.05.24	Weather:	Sunny
Name of Engineer:	RH		

Sample No.	Water level (mbgl)	Well Base Level (mbgl)	pH (pH Units)	Temperature (C)	Conductivity (uS/cm)	Total disolved solids (ppm)	Salinity (PSU)	Oxygen Reduction Potential (mV)	Disolved Oxygen (%)	Comments
BH 01	8.04	10.18	7.79	12.31	854	319	0.20	N/R	N/R	Fast Recharge
BH 02	Dry	12.62								
BH 03	Dry	6.20								

Notes:

1. Instrument Used: HI Multiparameter
2. Typical Accuracy: Water

Temperature	+/- 0.15 ˚C	DO	+/- 1%	PSU	+/- 2% or '+/- 0.01 PSU
pH	+/- 0.01 pH	Conductivity	+/- 1% or '+/- 1uS/cm	Resistivity	+/- 1% or '+/- 1mg/L
ORP	+/- 1mV				

3. N/R = No Reading Taken

Intégral Géotechnique

Groundwater Quality Monitoring Results

Site:	Heol Y Crwys, Cwmavon	Job No:	14023
Date:	03.06.24	Weather:	Sunny
Name of Engineer:	RH		

Sample No.	Water level (mbgl)	Well Base Level (mbgl)	pH (pH Units)	Temperature (C)	Conductivity (uS/cm)	Total disolved solids (ppm)	Salinity (PSU)	Oxygen Reduction Potential (mV)	Disolved Oxygen (%)	Comments
BH 01	8.11	10.18	7.69	12.01	694	257	0.18	N/R	N/R	Fast Recharge
BH 02	Dry	12.62								
BH 03	Dry	6.20								

Notes:

1. Instrument Used: HI Multiparameter
2. Typical Accuracy: Water

Temperature	+/- 0.15 ˚C	DO	+/- 1%	PSU	+/- 2% or '+/- 0.01 PSU
pH	+/- 0.01 pH	Conductivity	+/- 1% or '+/- 1uS/cm	Resistivity	+/- 1% or '+/- 1mg/L
ORP	+/- 1mV				

3. N/R = No Reading Taken

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APPENDIX J

SUMMARY OF CHEMICAL RESULTS – TOPSOIL / DISTURBED TOPSOIL (2023)

SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Topsoil/Disturbed Topsoil
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	WS02	0.10	46	1.1	0.93	< 0.2	21	U/S**	180	310	0.4	25	< 1.0	32	350
3	WS03	0.10	65	0.7	0.65	< 0.2	20	< 1.8	100	130	1.5	20	< 1.0	35	250
3	WS05	0.10	26	0.8	1.8	< 0.2	25	< 1.8	130	46	< 0.3	11	< 1.0	45	110
4	WS07	0.10	29	0.6	0.83	< 0.2	26	< 1.8	76	67	< 0.3	23	< 1.0	35	120
5	WS10	0.20	35	0.5	0.7	< 0.2	24	< 1.8	91	96	< 0.3	19	< 1.0	37	210
		Screening Criteria Value	37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 14023

Site: Heol Y Crwys, Cwmavon

Soil Type: Topsoil/Disturbed Topsoil

Soil Organic Matter: 2.5%

INORGANIC CHEMICALS & OTHERS

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	WS02	0.10	< 1.0	15.10	27.00	< 1.0	6.20	0.012	670.00	< 1.0	630.00	5.70	9.80	Not-detected	#N/A
3	WS03	0.10	< 1.0	10.90	24.00	< 1.0	5.40	0.007	740.00	< 1.0	520.00	4.10	7.05	Not-detected	#N/A
3	WS05	0.10	< 1.0	15.60	18.00	< 1.0	8.00	0.030	1200.00	82.00	1400.00	7.10	12.21	Not-detected	#N/A
4	WS07	0.10	< 1.0	11.40	26.00	< 1.0	5.80	0.012	950.00	< 1.0	600.00	4.60	7.91	Not-detected	#N/A
5	WS10	0.20	< 1.0	6.40	20.00	< 1.0	7.50	0.011	230.00	< 1.0	380.00	2.40	4.13	Not-detected	#N/A
		Screening Criteria Value	34.0	-	-	200.0	-	-	-	-	-	-	-	-	0.001
		Source of Screening Criteria Value	ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Topsoil/Disturbed Topsoil
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	WS02	0.10	< 0.05	0.06	0.08	0.73	0.86	1.4	0.56	0.35	1	0.22	1	0.05	0.6	0.09	0.47	0.83
3	WS03	0.10	< 0.05	< 0.05	< 0.05	0.3	0.29	0.44	0.2	0.17	0.43	0.06	0.42	< 0.05	0.19	< 0.05	0.17	0.33
3	WS05	0.10	< 0.05	< 0.05	< 0.05	0.2	0.17	0.28	0.15	0.09	0.22	< 0.05	0.26	< 0.05	0.11	0.16	0.32	0.19
4	WS07	0.10	< 0.05	< 0.05	< 0.05	0.08	0.08	0.11	< 0.05	< 0.05	0.09	< 0.05	0.14	< 0.05	< 0.05	0.05	0.13	0.11
5	WS10	0.20	< 0.05	< 0.05	< 0.05	0.24	0.26	0.43	0.15	0.11	0.39	< 0.05	0.53	< 0.05	0.16	0.06	0.44	0.41
Screening Criteria Value			510.0	420.0	5400.0	11.0	2.7	3.3	240.0	93.0	22.0	0.28	560.0	400.0	36.0	5.6	220.0	1200.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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APPENDIX K

SUMMARY OF CHEMICAL RESULTS – MADE GROUND (2023 AND 2024)

SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	WS01	0.40	51	0.5	1	< 0.2	17	< 1.8	310	900	< 0.3	31	< 1.0	34	290
2	WS04	0.30	66	0.4	1.1	< 0.2	13	< 1.8	400	130	< 0.3	34	< 1.0	33	130
3	WS05	0.50	63	0.4	1.7	< 0.2	25	< 1.8	400	98	< 0.3	42	< 1.0	51	210
4	WS06	0.40	110	0.2	0.35	< 0.2	8.9	< 1.8	66	55	0.9	9	< 1.0	18	27
5	WS07	0.60	47	0.3	0.64	< 0.2	18	< 1.8	57	48	< 0.3	22	< 1.0	26	73
6	WS08	0.10	25	0.5	0.79	< 0.2	25	< 1.8	81	58	< 0.3	21	< 1.0	38	100
7	WS09	0.40	98	0.3	1.1	< 0.2	27	< 1.8	850	280	< 0.3	34	< 1.0	72	380
8	WS09	0.80	420	0.3	1	< 0.2	15	< 1.8	2900	400	0.4	50	< 1.0	38	3100
9	HD01	0.40	110	0.2	0.76	< 0.2	27	< 1.8	1200	420	< 0.3	39	< 1.0	82	490
		Screening Criteria Value	37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 14023

Site: Heol Y Crwys, Cwmavon

Soil Type: Made Ground

Soil Organic Matter: 2.5%

INORGANIC CHEMICALS & OTHERS

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	WS01	0.40	< 1.0	12.80	17.00	< 1.0	8.20	0.127	1400.00	11.00	1100.00	4.30	7.40	Not-detected	#N/A
2	WS04	0.30	< 1.0	25.80	17.00	< 1.0	7.10	0.017	440.00	2.60	630.00	-	<0.1	Not-detected	#N/A
3	WS05	0.50	< 1.0	17.50	18.00	< 1.0	7.90	0.024	1500.00	32.00	1500.00	6.40	11.01	Not-detected	#N/A
4	WS06	0.40	< 1.0	17.50	11.00	< 1.0	7.70	0.031	11000.00	< 1.0	4900.00	3.10	5.33	Not-detected	#N/A
5	WS07	0.60	< 1.0	19.40	8.30	< 1.0	7.40	0.016	4000.00	< 1.0	1900.00	5.20	8.94	Not-detected	#N/A
6	WS08	0.10	< 1.0	7.20	23.00	< 1.0	7.50	0.009	460.00	< 1.0	400.00	3.10	5.33	Not-detected	#N/A
7	WS09	0.40	< 1.0	9.30	12.00	< 1.0	8.20	0.021	470.00	4.40	510.00	2.90	4.99	Not-detected	#N/A
8	WS09	0.80	< 1.0	19.00	17.00	< 1.0	7.90	0.030	2000.00	4.60	1800.00	6.00	10.32	Detected	<0.001
9	HD01	0.40	< 1.0	12.60	11.00	< 1.0	6.90	0.074	4200.00	3.40	2800.00	2.70	4.64	Not-detected	#N/A
		Screening Criteria Value	34.0	-	-	200.0	-	-	-	-	-	-	-	-	0.001
		Source of Screening Criteria Value	ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	**WS01**	**0.40**	0.05	< 0.05	0.09	0.71	0.63	1	0.38	0.36	0.9	0.15	1.2	0.06	0.38	0.21	0.84	1
2	**WS04**	**0.30**	< 0.05	< 0.05	0.05	0.31	0.17	0.34	0.11	0.09	0.5	< 0.05	0.36	< 0.05	0.11	1.8	0.64	0.27
3	**WS05**	**0.50**	< 0.05	< 0.05	< 0.05	0.35	0.25	0.45	0.18	0.1	0.53	0.08	0.4	0.07	0.15	0.29	0.68	0.3
4	**WS06**	**0.40**	0.1	< 0.05	1.2	< 0.05	< 0.05	0.11	< 0.05	0.13	0.32	< 0.05	0.06	0.22	< 0.05	0.83	1.2	0.07
5	**WS07**	**0.60**	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.39	< 0.05	0.05	0.09	< 0.05	1.2	1.4	0.1
6	**WS08**	**0.10**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
7	**WS09**	**0.40**	0.06	< 0.05	0.07	0.64	0.57	0.87	0.33	0.35	0.9	0.11	0.93	0.08	0.33	0.19	0.64	0.71
8	**WS09**	**0.80**	< 0.05	< 0.05	0.1	1.2	0.56	1.4	0.37	1.7	1.2	0.06	1.3	0.15	0.38	0.57	1.6	0.9
9	**HD01**	**0.40**	< 0.05	< 0.05	< 0.05	0.12	0.09	0.19	0.06	< 0.05	0.27	< 0.05	0.18	< 0.05	0.07	0.41	0.53	0.15
		Screening Criteria Value	**510.0**	**420.0**	**5400.0**	**11.0**	**2.7**	**3.3**	**240.0**	**93.0**	**22.0**	**0.28**	**560.0**	**400.0**	**36.0**	**5.6**	**220.0**	**1200.0**
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (June 2024)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	S1	0.30	55	0.4	1.3	1.9	29	< 1.8	100	230	< 0.3	28	< 1.0	35	790
2	S2	0.25	370	0.5	1.2	< 0.2	19	< 1.8	3300	290	0.7	35	< 1.0	47	240
3	S3	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-
4	S4	0.10	23	0.3	0.35	0.5	6.9	< 1.8	39	27	< 0.3	7.9	< 1.0	11	65
5	S6	0.20	87	1	0.88	< 0.2	9.7	< 1.8	110	53	< 0.3	23	< 1.0	26	69
6	S8	0.20	51	< 0.2	0.56	< 0.2	11	< 1.8	66	50	< 0.3	22	2.8	21	70
7	S9	0.30	130	0.2	1	< 0.2	26	< 1.8	600	330	< 0.3	30	< 1.0	55	600
8	S10	0.10	29	< 0.2	2.8	< 0.2	83	< 1.8	150	230	< 0.3	14	< 1.0	210	430
		Screening Criteria Value	37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

INORGANIC CHEMICALS & OTHERS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (June 2024)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	S1	0.30	< 1.0	8.10	22.00	< 1.0	6.70	0.011	730.00	< 1.0	440.00	2.40	4.13	Not-detected	#N/A
2	S2	0.25	< 1.0	16.00	16.00	< 1.0	8.40	0.058	1200.00	14.00	1400.00	4.60	7.91	Not-detected	#N/A
3	S3	0.30	-	-	14.00	-	-	-	-	-	-	-	<0.1	Not-detected	#N/A
4	S4	0.10	< 1.0	8.60	4.60	< 1.0	9.30	0.228	2800.00	18.00	1600.00	2.10	3.61	Not-detected	#N/A
5	S6	0.20	< 1.0	24.00	9.30	< 1.0	6.60	1.220	4800.00	2.70	2400.00	4.70	8.08	Not-detected	#N/A
6	S8	0.20	< 1.0	40.00	12.00	< 1.0	8.10	0.027	3900.00	< 1.0	1900.00	7.10	12.21	Not-detected	#N/A
7	S9	0.30	< 1.0	11.00	13.00	< 1.0	7.00	0.025	3000.00	3.00	2200.00	3.00	5.16	Not-detected	#N/A
8	S10	0.10	< 1.0	5.90	9.20	< 1.0	8.50	0.088	1200.00	630.00	2600.00	3.10	5.33	Not-detected	#N/A
Screening Criteria Value			34.0	-	-	200.0	-	-	-	-	-	-	-	-	0.001
Source of Screening Criteria Value			ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (June 2024)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	S1	0.30	0.29	< 0.05	0.63	1.6	1.7	1.8	0.89	0.92	1.6	0.18	3	0.2	0.83	0.33	2.3	2.7
2	S2	0.25	0.44	0.05	0.56	1.5	1.2	1.8	0.63	0.83	1.9	0.21	2.8	0.45	0.57	0.87	2.5	2.2
3	S3	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	S4	0.10	< 0.05	< 0.05	< 0.05	0.37	0.45	0.62	0.28	0.26	0.59	< 0.05	0.5	0.07	0.27	0.46	0.91	0.51
5	S6	0.20	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.75	1.4	< 0.05
6	S8	0.20	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.23	< 0.05	3.4	4.2	< 0.05
7	S9	0.30	< 0.05	< 0.05	< 0.05	0.36	0.33	0.45	0.2	0.22	0.56	< 0.05	0.53	0.09	0.18	0.45	0.67	0.54
8	S10	0.10	< 0.05	< 0.05	0.09	0.38	0.33	0.51	0.18	0.16	0.5	0.06	0.56	0.06	0.17	0.11	0.32	0.4
Screening Criteria Value			510.0	420.0	5400.0	11.0	2.7	3.3	240.0	93.0	22.0	0.28	560.0	400.0	36.0	5.6	220.0	1200.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

Job No.: 14023

Site: Heol Y Crwys, Cwmavon

Soil Type: Made Ground (June 2024)

Soil Organic Matter: 2.5%

PETROLEUM HYDROCARBONS

No.	Location	Depth (m)	Aliphatic C5-C6 (mg/kg)	Aliphatic C6-C8 (mg/kg)	Aliphatic C8-C10 (mg/kg)	Aliphatic C10-C12 EPH (mg/kg)	Aliphatic C12-C16 EPH (mg/kg)	Aliphatic C16-C35 EPH (mg/kg)	Aliphatic C35-C44 EPH (mg/kg)	Aromatic C5-C7 (mg/kg)	Aromatic C7-C8 (mg/kg)	Aromatic C8-C10 (mg/kg)	Aromatic C10-C12 EPH (mg/kg)	Aromatic C12-C16 EPH (mg/kg)	Aromatic C16-C21 EPH (mg/kg)	Aromatic C21-C35 EPH (mg/kg)	Aromatic C35-C40 EPH (mg/kg)
1	S1	0.30	< 0.020	< 0.020	< 0.050	< 1.0	< 2.0	< 10	21	< 0.010	< 0.010	< 0.050	< 1.0	< 2.0	< 10	12	< 10
2	S2	0.25	< 0.020	< 0.020	< 0.050	1.2	4.1	250	72	< 0.010	< 0.010	< 0.050	1.2	6.1	18	55	13
3	S3	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	S4	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	S6	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	S8	0.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	S9	0.30	< 0.020	< 0.020	< 0.050	< 1.0	< 2.0	< 10	< 8.4	< 0.010	< 0.010	< 0.050	< 1.0	< 2.0	< 10	< 10	< 10
8	S10	0.10	< 0.020	< 0.020	< 0.050	< 1.0	< 2.0	< 10	< 8.4	< 0.010	< 0.010	< 0.050	< 1.0	< 2.0	< 10	< 10	< 10
		Screening Criteria Value	78.0	230.0	65.0	330.0	2400.0	92000.0	92000.0	0.2	290.0	83.0	180.0	330.0	540.0	1500.0	1500.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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Intégral Géotechnique

SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (March 2025)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Arsenic (mg/kg)	Boron (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Chromium (VI) (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (Elemental) (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
1	S11	0.20	50	1.6	1.3	< 0.2	37	< 1.8	410	120	< 0.3	18	3.1	62	790
2	S12	0.40	95	1.2	1.2	3.3	31	< 1.8	280	740	< 0.3	31	2.7	62	240
3	S13	0.20	58	1.3	0.85	< 0.2	15	< 1.8	170	590	< 0.3	32	< 1.0	32	110
4	S14	0.30	7.5	1.6	0.35	0.4	6.9	< 1.8	28	39	< 0.3	5.2	< 1.0	8.9	65
		Screening Criteria Value	37.0	290.0	1.7	11.0	-	6.0	2400.0	200.0	1.2	130.0	250.0	410.0	3700.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

INORGANIC CHEMICALS & OTHERS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (March 2025)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Cyanide (mg/kg)	Loss on ignition, dried solids (%)	Moisture content at 30 C (%)	Phenol (mg/kg)	pH (pH units)	Water Soluble Sulphate (g/l)	Sulphate Total as SO4 (mg/kg)	Sulphide (mg/kg)	Total Sulphur (mg/kg)	TOC by Ignition in O2 (%)	Equivalent SOM (%)	Asbestos in Soil	Asbestos Quantification (%)
1	S11	0.20	< 1.0	8.80	9.10	< 1.0	9.70	0.197	2000.00	2.10	1500.00	2.50	4.30	Not-detected	-
2	S12	0.40	< 1.0	13.00	11.00	< 1.0	6.70	0.233	1600.00	17.00	1400.00	4.60	7.91	Not-detected	-
3	S13	0.20	< 1.0	21.00	13.00	< 1.0	7.10	0.270	1500.00	4.20	760.00	7.00	12.04	Not-detected	-
4	S14	0.30	< 1.0	1.60	3.00	< 1.0	9.70	0.841	2800.00	20.00	900.00	0.50	0.86	**Detected**	**0.002**
Screening Criteria Value			**34.0**	-	-	**200.0**	-	-	-	-	-	-	-	-	**0.001**
Source of Screening Criteria Value			ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

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SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (March 2025)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Acenaphthene (mg/kg)	Acenaphthylene (mg/kg)	Anthracene (mg/kg)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(ghi)perylene (mg/kg)	Benzo(k)fluoranthene (mg/kg)	Chrysene (mg/kg)	Dibenzo(ah)anthracene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno(123cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
1	S11	0.20	< 0.05	< 0.05	< 0.05	0.25	0.27	0.41	< 0.05	0.17	0.41	< 0.05	0.58	< 0.05	0.14	0.11	0.63	0.44
2	S12	0.40	< 0.05	< 0.05	< 0.05	0.1	< 0.05	0.21	< 0.05	0.06	0.25	< 0.05	0.15	< 0.05	0.06	0.1	0.24	0.13
3	S13	0.20	< 0.05	< 0.05	< 0.05	0.28	0.24	0.41	0.14	0.16	0.42	0.07	0.34	< 0.05	0.14	0.19	0.49	0.31
4	S14	0.30	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	0.07	< 0.05
		Screening Criteria Value	510.0	420.0	5400.0	11.0	2.7	3.3	240.0	93.0	22.0	0.28	560.0	400.0	36.0	5.6	220.0	1200.0
		Source of Screening Criteria Value	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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SUMMARY OF LABORATORY SOIL TEST RESULTS

PETROLEUM HYDROCARBONS

Job No.: 14023
Site: Heol Y Crwys, Cwmavon
Soil Type: Made Ground (March 2025)
Soil Organic Matter: 2.5%

No.	Location	Depth (m)	Aliphatic C5-C6 (mg/kg)	Aliphatic C6-C8 (mg/kg)	Aliphatic C8-C10 (mg/kg)	Aliphatic C10-C12 EPH (mg/kg)	Aliphatic C12-C16 EPH (mg/kg)	Aliphatic C16-C35 EPH (mg/kg)	Aliphatic C35-C44 EPH (mg/kg)	Aromatic C5-C7 (mg/kg)	Aromatic C7-C8 (mg/kg)	Aromatic C8-C10 (mg/kg)	Aromatic C10-C12 EPH (mg/kg)	Aromatic C12-C16 EPH (mg/kg)	Aromatic C16-C21 EPH (mg/kg)	Aromatic C21-C35 EPH (mg/kg)	Aromatic C35-C40 EPH (mg/kg)
1	S11	0.20	< 0.010	< 0.010	< 0.010	< 1.0	< 2.0	47	8.5	< 0.010	< 0.010	< 0.020	< 1.0	< 2.0	< 10	< 10	< 10
2	S12	0.40	< 0.010	< 0.010	< 0.010	< 1.0	< 2.0	< 10	< 8.4	< 0.010	< 0.010	< 0.020	< 1.0	< 2.0	< 10	< 10	< 10
3	S13	0.20	< 0.010	< 0.010	< 0.010	< 1.0	< 2.0	< 10	< 8.4	< 0.010	< 0.010	< 0.020	< 1.0	4.8	< 10	< 10	< 10
4	S14	0.30	< 0.010	< 0.010	< 0.010	< 1.0	< 2.0	< 10	< 8.4	< 0.010	< 0.010	< 0.020	< 1.0	< 2.0	< 10	< 10	< 10
Screening Criteria Value			78.0	230.0	65.0	330.0	2400.0	92000.0	92000.0	0.2	290.0	83.0	180.0	330.0	540.0	1500.0	1500.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

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APPENDIX L

SUMMARY OF CHEMICAL RESULTS – GROUNDWATER

Summary of Groundwater Results - Heol Crwys

14023

	Determinand	Unit	Sample Location			Guideline Value		
			Round 1	Round 2	Round 3	MAC-EQS Inland Surface Water C5 >200mg/lCa CO3	Freshwater AA-EQS >250mg/l CaCO3	UK (England and Wales) Drinking Water Standards
			BH 01	BH 01	BH 01			
Metals and Non-Metals	Arsenic	ug/l	1.17	0.86	0.60	-	50	10
	Beryllium	ug/l	< 0.1	< 0.1	< 0.1	-	-	-
	Boron	ug/l	63.00	60.00	79.00	-	2000	1000
	Cadmium	ug/l	0.14	0.03	0.20	1.5	0.25	5
	Calcium	mg/l	81.00	97.00	94.00	-	-	-
	Chromium	ug/l	< 0.2	< 5.0	< 5.0	32	3.4	50
	Copper	ug/l	**5.30**	**7.60**	**7**	-	1	2000
	Cyanide	ug/l	< 10	< 10	< 10	5	1	50
	Lead	ug/l	< 0.2	< 0.2	< 0.2	14	1.2	10
	Mercury	ug/l	< 0.05	< 0.05	< 0.05	0.07	-	1
	Nickel	ug/l	**6.20**	**6.20**	**6.50**	34	4	20
	pH	pH Units	7.20	7.20	7.00	-	-	-
	Phenol	ug/l	<10	< 10	< 10	46	7.7	0.5
	Selenium	ug/l	3.40	0.60	2.30	-	-	10
	Sulphate as SO4	ug/l	121000.00	163000.00	167000.00	-	400000	250000
	Total Hardness as CaCO3	mgCaCO3/l	261.00	311.00	301	-	-	-
	Vanadium	ug/l	0.30	0.50	0.20	-	60	-
	Zinc	ug/l	6.80	9.30	10.00	-	10.9	5000
PAH	Acenaphthene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Acenaphthylene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Anthracene	ug/l	< 0.01	< 0.01	< 0.01	0.1	0.1	-
	Benzo (a) anthracene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Benzo (g,h,i) perylene	ug/l	< 0.01	< 0.01	< 0.01	0.0082	-	-
	Benzo (a) pyrene	ug/l	< 0.01	< 0.01	< 0.01	0.27	0.00017	0.01
	Benzo (b) fluoranthene	ug/l	< 0.01	< 0.01	< 0.01	0.017	-	-
	Benzo (k) fluoranthene	ug/l	< 0.01	< 0.01	< 0.01	0.017	-	-
	Chrysene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Dibenz (a,h) anthracene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Fluoranthene	ug/l	< 0.01	< 0.01	< 0.01	0.12	0.0063	-
	Fluorene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Indeno (1,2,3) cd pyrene	ug/l	< 0.01	< 0.01	< 0.01	-	-	-
	Naphthalene	ug/l	< 0.01	< 0.01	< 0.01	130	2	-
	Phenanthrene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	Pyrene	ug/l	< 0.01	< 0.01	< 0.01	-	10	-
	PAH, Total	ug/l	< 0.16	< 0.16	< 0.16	-	0.00017	0.1
VPH/EPH	Aliphatic VPH >C5 - C6	ug/l	<10	<10	<10	50	-	1
	Aliphatic VPH >C6 - C8	ug/l	<10	<10	<10	50	-	1
	Aliphatic VPH >C8 - 10	ug/l	<10	<10	<10	50	-	1
	Aliphatic EPH >C10 - C12	ug/l	<10	<10	<10	50	-	1
	Aliphatic EPH >C12 - C16	ug/l	<10	<10	<10	50	-	1
	Aliphatic EPH >C16 - C21	ug/l	<10	<10	<10	50	-	1
	Aliphatic EPH >C21 - C35	ug/l	<10	<10	<10	50	-	1
	Aliphatic EPH >C35 - C44	ug/l	<10	<10	<10	50	-	1
	Aromatic VPH >C5 - C7	ug/l	<10	<10	<10	50	-	1
	Aromatic VPH >C7 - C8	ug/l	<10	<10	<10	50	-	1
	Aromatic VPH >C8 - C10	ug/l	<10	<10	<10	50	-	1
	Aromatic EPH >C10 - C12	ug/l	<10	<10	<10	50	-	1
	Aromatic EPH >C12 - C16	ug/l	<10	<10	<10	50	-	1
	Aromatic EPH >C16 - C21	ug/l	<10	<10	<10	50	-	1
	Aromatic EPH >C21 - C35	ug/l	<10	<10	<10	50	-	1
	Aromatic EPH >C35 - C44	ug/l	<10	<10	<10	50	-	1

Notes:
Benzo(a)pyrene is used as an indicator for PAH contamination.
EQS for Benzene used for all VPH/EPH compounds

Hardness value of 311 used to determine MAC-EQS Class and Freshwater EQS Hardness Band

Results exceeding the AA-EQS value, or the most conservative EQS/UKDWS guideline value where AA-EQS values are unavailable, are highlighted in red bold type
Results exceeding the AA-EQS but below the site specific PNEC, are highlighted in **blue bold type**

Sources:
MAC-EQS and AA-EQS values sourced from the Environment Agency/Water Framework Directive
Drinking Water Standards sourced from The Water Supply (Water Quality) Regulations 2018 Water, England and Wales: 2018 No.647 (W.121)

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APPENDIX M

WATER FRAMEWORK DIRECTIVE M-BAT TOOL

Metal Bioavailability Assessment Tool (M-BAT)

Back

Calculate

Clear Data

INPUT DATA											RESULTS (Copper)				RESULTS (Zinc)				RESULTS (Mn)				RESULTS (Ni)			
ID	Location	Waterbody	Date	Measured Cu Concentration (dissolved) (µg l⁻¹)	Measured Zn Concentration (dissolved) (µg l⁻¹)	Measured Mn Concentration (dissolved) (µg l⁻¹)	Measured Ni Concentration (dissolved) (µg l⁻¹)	pH	DOC	Ca	Site-specific PNEC Dissolved Copper (µg l⁻¹)	BioF	Bioavailable Copper Concentration (µg l⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Zinc (µg l⁻¹)	BioF	Bioavailable Zinc Concentration (µg l⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Manganese (µg l⁻¹)	BioF	Bioavailable Manganese Concentration (µg l⁻¹)	Risk Characterisation Ratio	Site-specific PNEC Dissolved Nickel (µg l⁻¹)	BioF	Bioavailable Nickel Concentration (µg l⁻¹)	Risk Characterisation Ratio
1	BH01 R1	Superficials	24/04/2024	5.3	6.8		6.2	7.2	0.39	81	1.74	0.68	3.62	3.62	15.73	0.69	4.71	0.43	1033.09	0.12			13.39	0.30	1.85	0.46
2	BH01 R2	Superficials	08/05/2024	7.6	9.3		6.2	7.2	2.51	97	10.46	0.10	0.73	0.73	20.60	0.53	4.92	0.45	1033.09	0.12			15.23	0.26	1.63	0.41
3	BH01 R3	Superficials	03/06/2024	7	10		6.5	7	1.58	94	9.1	0.17	1.57	1.57	18.87	0.58	5.78	0.53	1521.55	0.08			16.04	0.25	1.62	0.41

APPENDIX N

COAL AUTHORITY CONSULTANTS COAL MINING REPORT

The Coal Authority

Consultants

Coal Mining Report

Heol Crwys
Cwmavon
Neath Port Talbot
SA12 9PA

Date of enquiry:	14 May 2024
Date enquiry received:	14 May 2024
Issue date:	14 May 2024
Our reference:	51003424359001
Your reference:	14023/LW

Consultants

Coal Mining Report

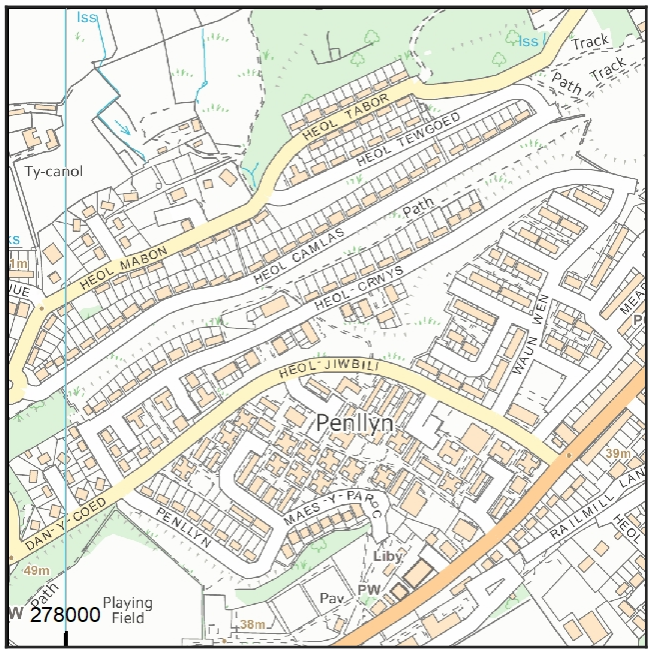
This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

INTEGRAL GEOTECHNIQUE (WALES) LTD.

Enquiry address

Heol Crwys
Cwmavon
Neath Port Talbot
SA12 9PA



Approximate position of property

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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
MEADOW	LOWER NINE FOOT TOP LEAF	Coal	4XRG	47	Beneath Property	22.4	North	169	1863
MEADOW	MIDDLE 9FT TOP LEAF	Coal	4XRF	48	Beneath Property	35.6	North	150	1860
MEADOW	LOWER NINE FOOT (TOP LEAF)	Coal	4XQ7	145	Beneath Property	23.8	North	140	1860
MEADOW	UPPER SEVEN FOOT	Coal	4XQ3	153	Beneath Property	26.6	North	40	1900
MEADOW	LOWER NINE FOOT (TOP LEAF)	Coal	4XQ6	155	Beneath Property	16.2	North	140	1862
MEADOW	LOWER NINE FOOT (TOP LEAF)	Coal	4XQ8	157	East	26.6	North	140	1861
MEADOW	LOWER NINE FOOT (TOP LEAF)	Coal	4XQ5	157	North-West	15.8	South-West	140	1863
unnamed	FIVE FOOT GELLIDEG	Coal	4XPY	161	South	16.6	South-West	91	1862
unnamed	FIVE FOOT GELLIDEG	Coal	4XPZ	168	Beneath Property	32.0	North	91	1860

Probable unrecorded shallow workings

None.

Spine roadways at shallow depth

Distance to spine roadway (m)	Direction to spine roadway
Within	N/A
Within	N/A

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Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	278192-006	278396 192458	This shaft was filled with steel and copper slag in 1969.	Coal	
Adit	278192-062	278203 192549		Coal	
Adit	278192-103	278168 192538		Coal	

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

R14549	SWR2009	SWR2012
R12069	SWR2654	SW2437
PO0	5038	10962

Our records show we have more plans than those shown above which could affect the enquiry boundary.

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
LOWER NINE FOOT TOP LEAF	Coal	Yes	Within	N/A	103

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

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Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

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Section 3 – Licensing and future mining activity

Future underground mining
None recorded.

Coal mining licensing
None recorded within 200 metres of the enquiry boundary.

Court orders
None recorded.

Section 46 notices
No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices
The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land
The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

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Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

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Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk.**

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

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Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

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Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

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The Coal Authority

Summary of findings

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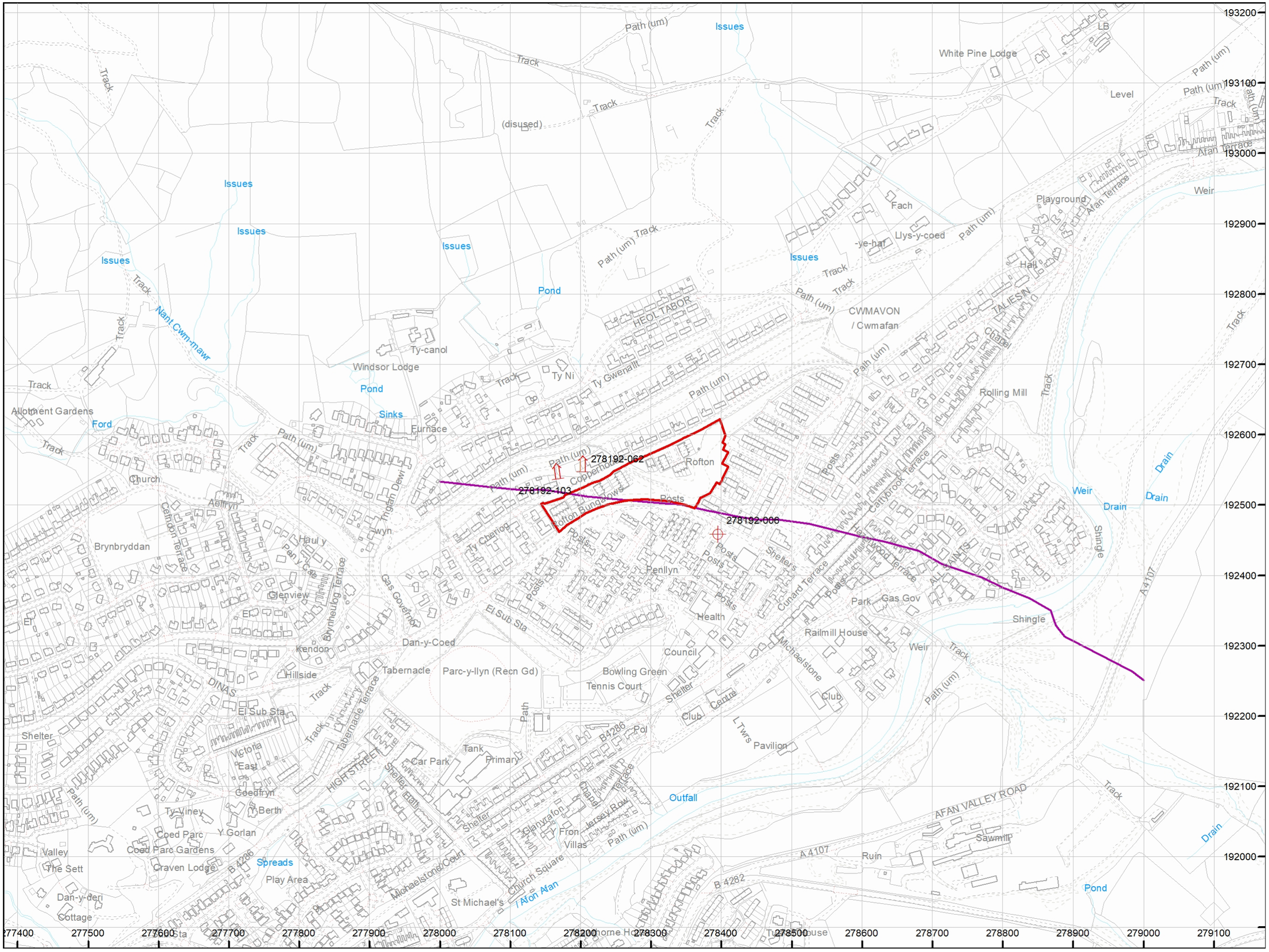
The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

- Approximate position of the enquiry boundary shown
- Disused mine shaft
- Disused adit
- Outcrop (Proven)

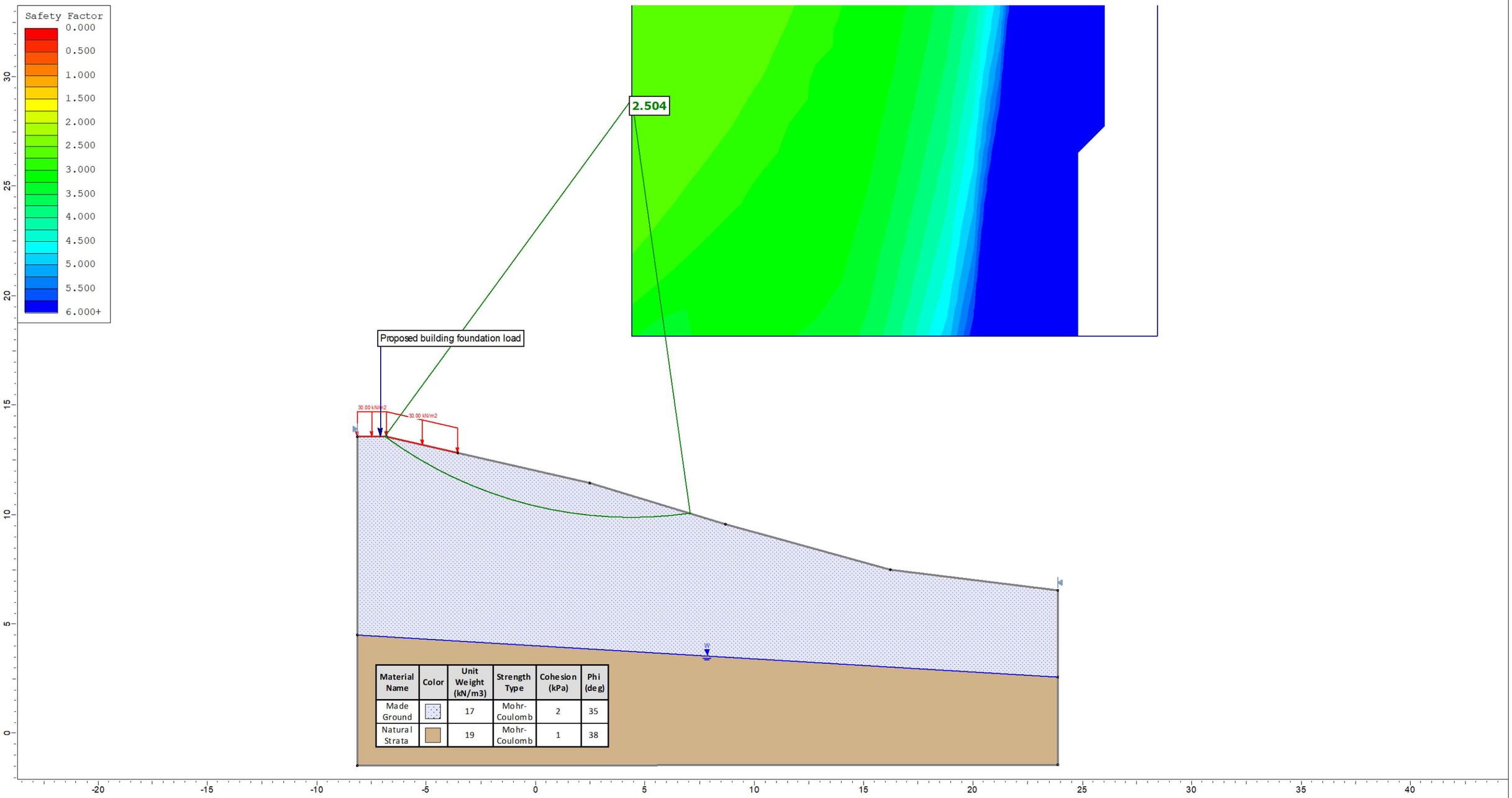


How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
www.groundstability.com

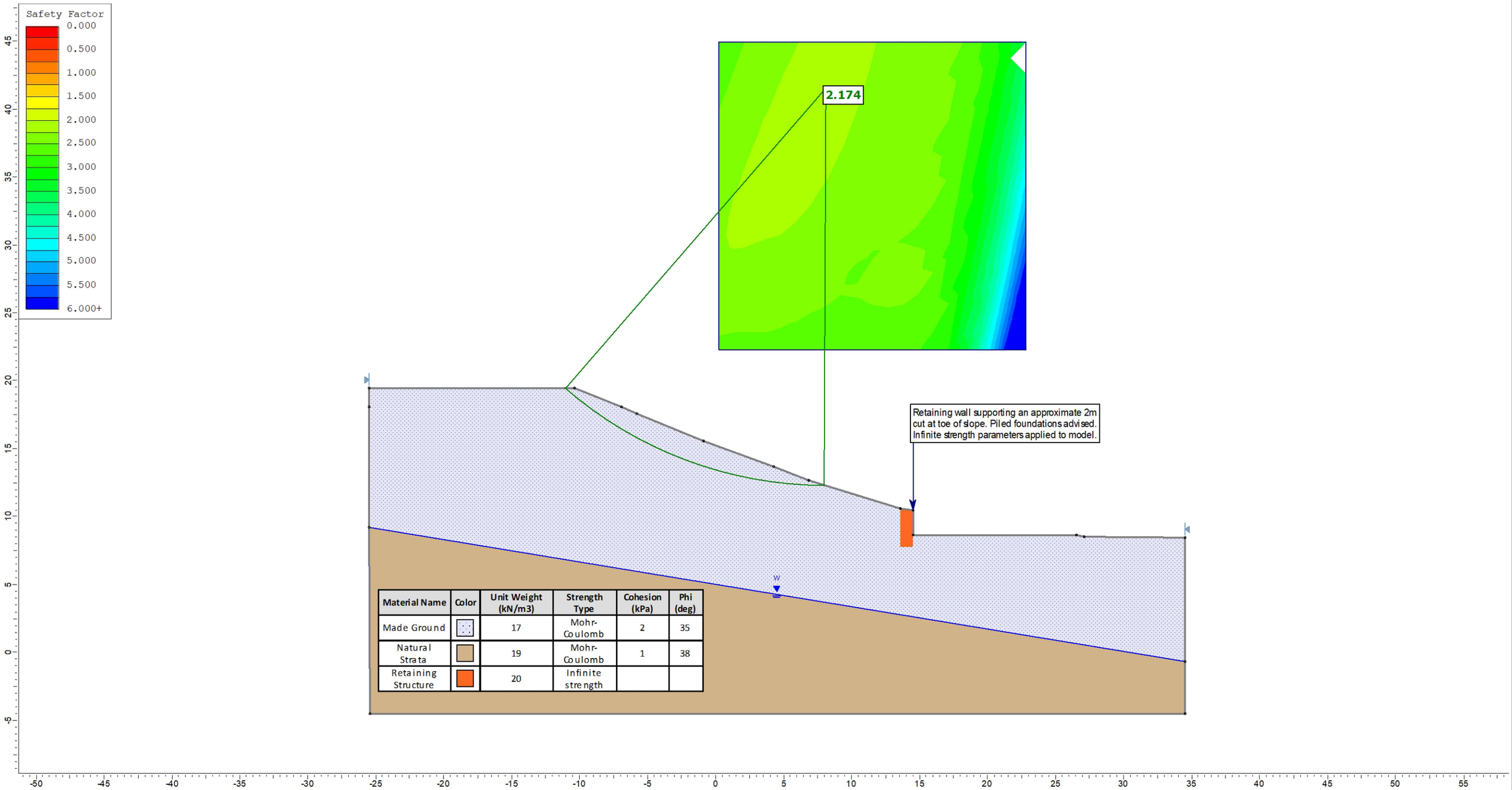
APPENDIX O

SLOPE STABILITY MODELLING RESULTS (SECTION AA TO SECTION FF)



Appendix O: Slope Stability Modelling Results - Section AA

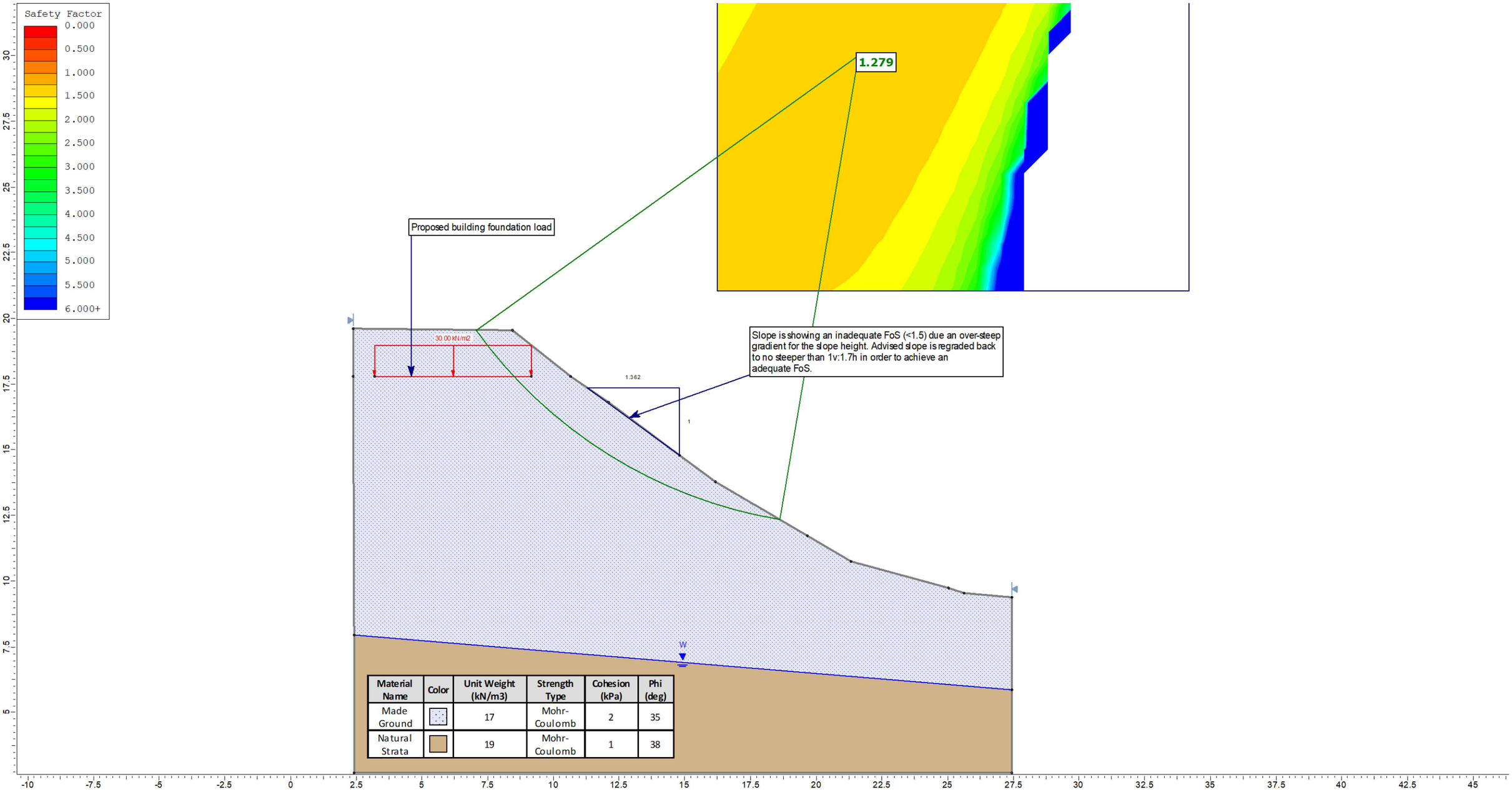
Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: n/a		



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Made Ground		17	Mohr-Coulomb	2	35
Natural Strata		19	Mohr-Coulomb	1	38
Retaining Structure		20	Infinite strength		

Appendix O: Slope Stability Modelling Results - Section BB

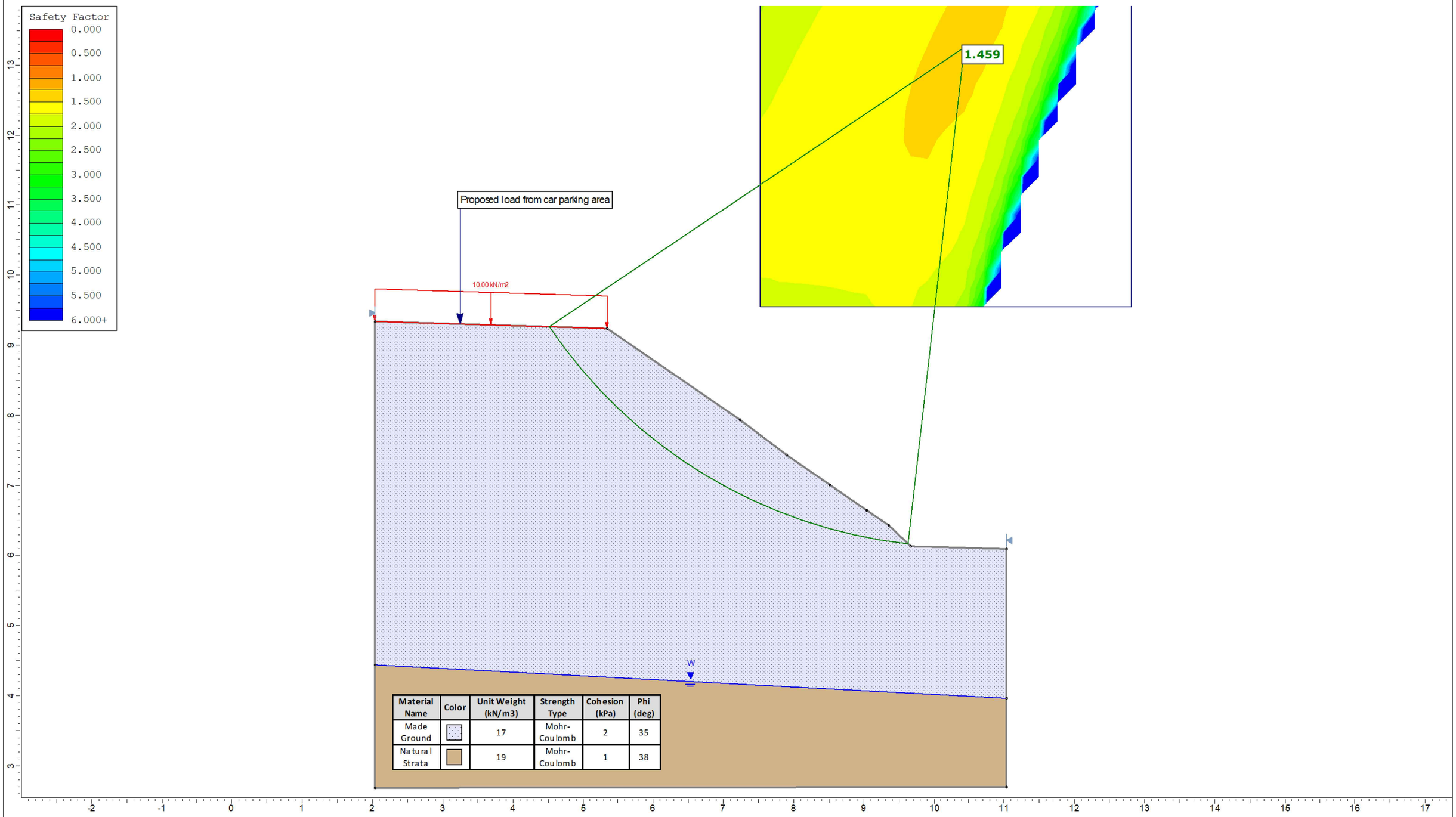
Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: n/a		



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Made Ground		17	Mohr-Coulomb	2	35
Natural Strata		19	Mohr-Coulomb	1	38

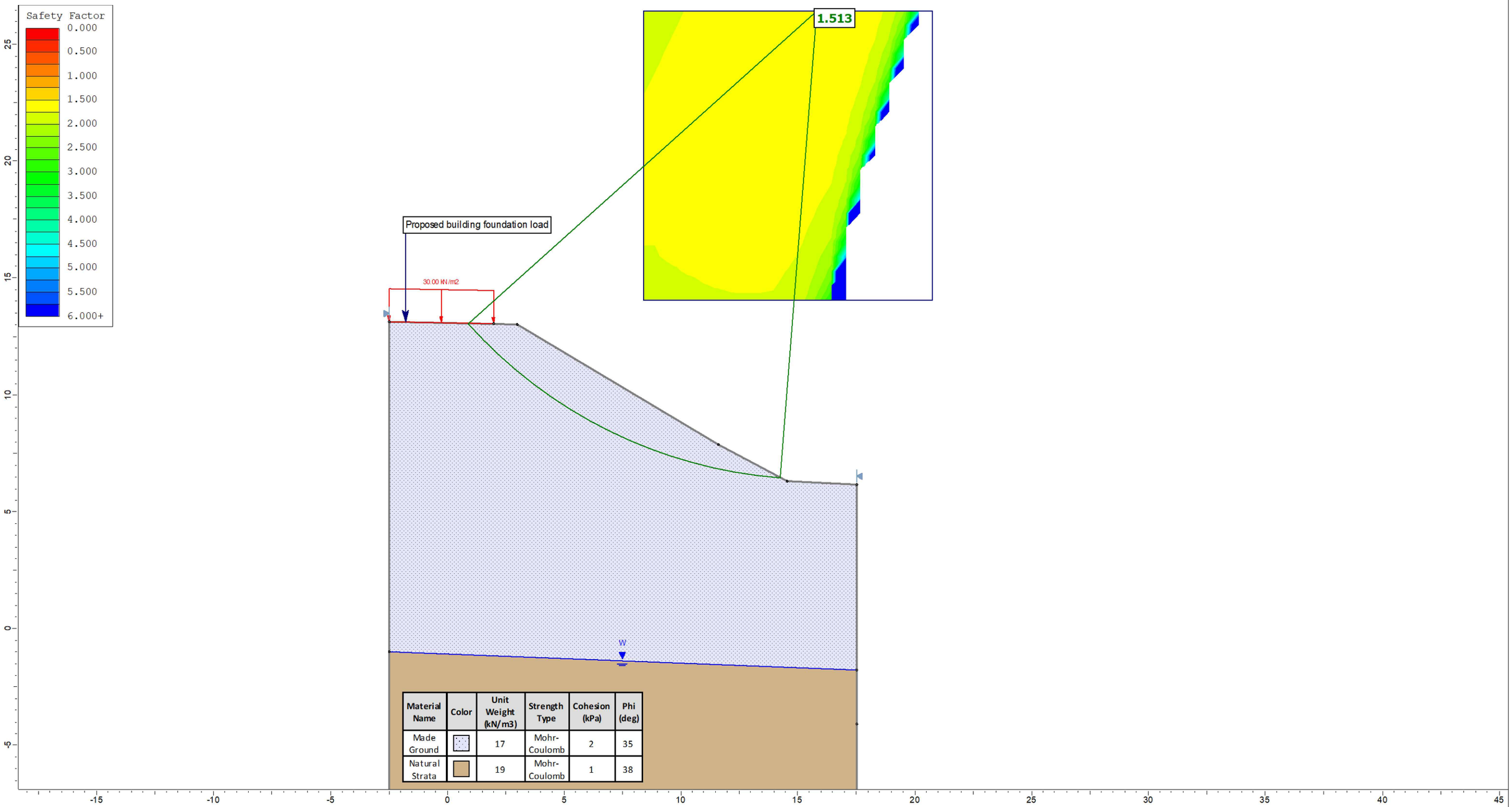
Appendix O: Slope Stability Modelling Results - Section CC

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: n/a		



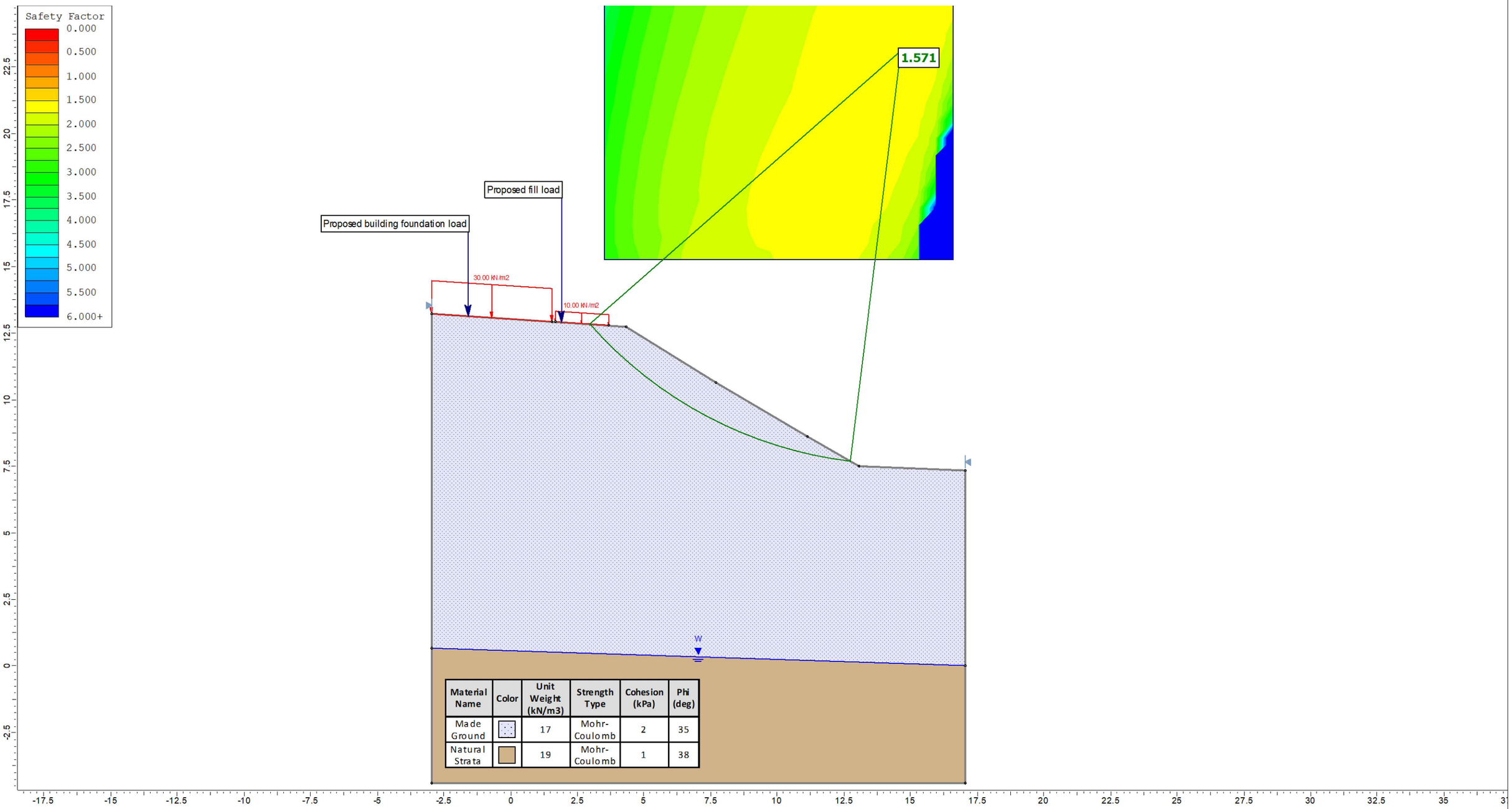
Appendix O: Slope Stability Modelling Results - Section DD

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: n/a		



Appendix O: Slope Stability Modelling Results - Section EE

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: n/a		



Appendix O: Slope Stability Modelling Results - Section FF

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique
Client: Tai Tarian Ltd	Scale: n/a	

Integral House,
7 Beddau Way,
Castlegate Business Park,
Caerphilly,
CF83 2AX.
Tel: 029 2080 7991

APPENDIX P

CLEA MODELLING FOR SITE SPECIFIC SCREENING VALUE (SSSV)

Appendix P: Site-Specific Screening Value (SSSV) – Trichlorofluoromethane (CFC-11)

Intégral Géotechnique

This appendix presents the derivation of a Site-Specific Screening Value (SSSV) for trichlorofluoromethane (CFC-11) to support the human health risk assessment for a residential development scenario with homegrown produce.

Trichlorofluoromethane (CFC-11) was detected in soil sample S14 at a concentration of 240µg/kg, exceeding the laboratory limit of detection. As no Soil Guideline Values (SGVs) or Category 4 Screening Levels (C4SLs) currently exist for this compound, a site-specific screening value has been calculated to assess potential risk.

Chemical and Toxicological Properties

Parameter	Value	Justification / Source
Molecular Weight	137.37 g/mol	PubChem
Vapour Pressure	23,000 Pa @ 25°C	HSDB
Water Solubility	110 mg/L @ 25°C	HSDB
Henry's Law Constant	0.086 atm·m^3/mol	USEPA
Koc (organic carbon partition coefficient)	24 cm^3/g	USEPA (estimated)
TOC (sample S14)	0.5%	Laboratory data
Kd (calculated)	0.12 cm^3/g	Derived from Koc and TOC
Oral HCV (TDI)	20 µg/kg BW/day	USEPA IRIS
Inhalation HCV (RfC)	500 µg/m^3	USEPA IRIS
Oral MDI – Adult	1,400 µg/day	Derived
Oral MDI – Child	300 µg/day	Derived
Inhalation MDI – Adult	7,500 µg/day	Derived
Inhalation MDI – Child	2,500 µg/day	Derived

Soil-Plant and Exposure Pathway Factors

Given the high volatility and low water solubility of trichlorofluoromethane, conservative default values have been applied for plant uptake and exposure modelling under residential with homegrown produce conditions.

Parameter	Value / Notes	Justification / Source
Soil-to-Plant CF (Green Veg)	0.001 mg/kg FW per mg/kg soil	Very low uptake for volatile compounds
Type (Green Veg)	Fresh Weight (FW)	CLEA recommendation for VOCs
Soil-to-Plant CF (Root Veg)	0.001 mg/kg FW per mg/kg soil	Low water solubility, high volatility
Type (Root Veg)	Fresh Weight (FW)	CLEA standard
Soil-to-Plant CF (Tuber Veg)	0.001 mg/kg FW per mg/kg soil	Low water solubility, high volatility
Type (Tuber Veg)	Fresh Weight (FW)	CLEA standard
Soil-to-Plant CF (Herbaceous Fruit)	0.001 mg/kg FW per mg/kg soil	Minimal plant transfer
Type (Herbaceous Fruit)	Fresh Weight (FW)	Standard for produce in CLEA
Soil-to-Plant CF (Shrub Fruit)	0.001 mg/kg FW per mg/kg soil	Conservative default
Type (Shrub Fruit)	Fresh Weight (FW)	Standard
Soil-to-Plant CF (Tree Fruit)	0.001 mg/kg FW per mg/kg soil	Volatile compound with low plant uptake
Type (Tree Fruit)	Fresh Weight (FW)	CLEA model input requirement
Apply Top 2 Method	Yes	Standard for homegrown produce scenarios
Soil-to-Dust Transport Factor	0.01 g/g DW	CLEA default
Subsurface Soil to Indoor Air Correction Factor	1	No barrier assumed
Relative Bioavailability – Soil and Dust	1 (assumed 100%)	Conservative assumption

Abbreviations

SSSV: Site-Specific Screening Value

HCV: Health Criteria Value

TDI: Tolerable Daily Intake

RfC: Reference Concentration

MDI: Minimal Dose Intake

BW: Body Weight

Koc: Organic Carbon-Water Partition Coefficient

Kd: Soil-Water Partition Coefficient

TOC: Total Organic Carbon

VOC: Volatile Organic Compound

FW: Fresh Weight

DW: Dry Weight

USEPA: United States Environmental Protection Agency

HSDB: Hazardous Substances Data Bank

CLEA Software Version 1.071

Report generated	14/04/2025
Report title	Heol Y Crwys, Cwmavon
Created by	FG at Integral Geotechnique (Wales) Ltd

BASIC SETTINGS

Land Use	Residential with produce						
Building	Small terraced house						
Receptor	Female (res)	Start age class	1	End age class	6	Exposure Duration	6 years
Soil	Sandy loam						

Exposure Pathways

Direct soil and dust ingestion	✓	Dermal contact with indoor dust	✓	Inhalation of indoor dust	✓
Consumption of homegrown produce	✓	Dermal contact with soil	✓	Inhalation of soil dust	✓
Soil attached to homegrown produce	✓			Inhalation of indoor vapour	✓
				Inhalation of outdoor vapour	✓

Land Use Residential with produce

Receptor Female (res)

Age Class	Exposure Frequencies (days yr^{-1})						Occupation Periods (hr day^{-1})		Soil to skin adherence factors (mg cm^{2})		Direct soil ingestion rate (g day^{-1})	Body weight (kg)	Body height (m)	Inhalation rate (m^3 day^{-1})	Max exposed skin factor		Total skin area (m^2)
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor	Indoors	Outdoors	Indoor	Outdoor					Indoor (m^2 m^{-2})	Outdoor (m^2 m^{-2})	
1	180	180	180	180	365	365	23.0	1.0	0.06	1.00	0.10	5.60	0.7	8.5	0.32	0.26	3.43E-01
2	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	9.80	0.8	13.3	0.33	0.26	4.84E-01
3	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	12.70	0.9	12.7	0.32	0.25	5.82E-01
4	365	365	365	365	365	365	23.0	1.0	0.06	1.00	0.10	15.10	0.9	12.2	0.35	0.28	6.36E-01
5	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	16.90	1.0	12.2	0.35	0.28	7.04E-01
6	365	365	365	365	365	365	19.0	1.0	0.06	1.00	0.10	19.70	1.1	12.2	0.33	0.26	7.94E-01
7	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	22.10	1.2	12.4	0.22	0.15	8.73E-01
8	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	25.30	1.2	12.4	0.22	0.15	9.36E-01
9	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	27.50	1.3	12.4	0.22	0.15	1.01E+00
10	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	31.40	1.3	12.4	0.22	0.15	1.08E+00
11	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	35.70	1.4	12.4	0.22	0.14	1.19E+00
12	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	41.30	1.4	13.4	0.22	0.14	1.29E+00
13	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	47.20	1.5	13.4	0.22	0.14	1.42E+00
14	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	51.20	1.6	13.4	0.22	0.14	1.52E+00
15	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	56.70	1.6	13.4	0.21	0.14	1.60E+00
16	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	59.00	1.6	13.4	0.21	0.14	1.63E+00
17	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.00	1.6	14.8	0.33	0.27	1.78E+00
18	0	0	0	0	0	0	0.0	0.0	0.00	0.00	0.00	70.90	1.6	12.0	0.33	0.27	1.80E+00

Consumption Rates

Consumption rates (g FW kg^{-1} bodyweight day^{-1}) by Produce Group

Age Class	MEAN RATES						90TH PERCENTILE RATES					
	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit	Green veg	Root veg	Tuber veg	Herb. Fruit	Shrub fruit	Tree fruit
1							7.12E+00	1.07E+01	1.60E+01	1.83E+00	2.23E+00	3.82E+00
2							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
3							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
4							6.85E+00	3.30E+00	5.46E+00	3.96E+00	5.40E-01	1.20E+01
5							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
6							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
7							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
8							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
9							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
10							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
11							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
12							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
13							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
14							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
15							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
16							3.74E+00	1.77E+00	3.38E+00	1.85E+00	1.60E-01	4.26E+00
17							2.94E+00	1.40E+00	1.79E+00	1.61E+00	2.20E-01	2.97E+00
18							2.94E+00	1.40E+00	1.79E+00	1.61E+00	2.20E-01	2.97E+00

Top 2 applied? No

Where top 2 method is applied, two produce categories use 90th percentile rates, while the remainder use the mean. Produce categories vary on a chemical-by-chemical basis. Where top 2 method is not used, all produce categories for all chemicals assume 90th percentile rates.

Building Small terraced house

Soil Sandy loam

Building footprint (m^2)	2.80E+01
Living space air exchange rate (hr^{-1})	5.00E-01
Living space height (above ground, m)	4.80E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm^2)	4.23E+02
Dust loading factor ($\mu g\ m^{-3}$)	5.00E+01

Porosity, Total ($cm^3\ cm^{-3}$)	5.30E-01
Porosity, Air-Filled ($cm^3\ cm^{-3}$)	2.00E-01
Porosity, Water-Filled ($cm^3\ cm^{-3}$)	3.30E-01
Residual soil water content ($cm^3\ cm^{-3}$)	1.20E-01
Saturated hydraulic conductivity ($cm\ s^{-1}$)	3.56E-03
van Genuchten shape parameter *m* (dimensionless)	3.20E-01
Bulk density ($g\ cm^{-3}$)	1.21E+00
Threshold value of wind speed at 10m ($m\ s^{-1}$)	7.20E+00
Empirical function (F_x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02
Soil pH	7.00E+00
Soil Organic Matter content (%)	1.00E+00
Fraction of organic carbon ($g\ g^{-1}$)	5.80E-03
Effective total fluid saturation (unitless)	5.12E-01
Intrinsic soil permeability (cm^2)	4.75E-08
Relative soil air permeability (unitless)	6.42E-01
Effective air permeability (cm^2)	3.05E-08

Soil - Vapour Model

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate (cm^3 s^{-1})	2.50E+01
Building ventilation rate (cm^3 s^{-1})	1.87E+04
Averaging time surface emissions (yr)	6
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	2400.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover (m^2 m^{-2})	0.75

* Air dispersion factor in g m^{-2} s^{-1} per kg m^{-3}

Soil - Plant Model

	Dry weight conversion factor	Homegrown fraction Average	Homegrown fraction High	Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type Average

CLEA Software Version 1.071

Report generated	14-Apr-25
Report title	Heol Y Crwys, Cwmavon
Created by	FG at Integral Geotechnique (Wales) Ltd

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Trichlorofluoromethane	8.33E+02	2.86E+08	8.33E+02	1.00	0.00	1.00	6.38E+23 (sol)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
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Environment Agency

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
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Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Trichlorofluoromethane	100.0	0.0	0.0	100.0	8.33E+02	3.50E-20	8.33E+00	3.54E-07	0.00E+00	2.42E-23	4.43E-15	0.00E+00	8.33E-02	8.33E-01	8.33E-01	8.33E-01	8.33E-01	8.33E-01
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Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
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Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Trichlorofluoromethane	6.18E-03	7.67E-04	3.06E-03	7.28E-07	1.85E-16	7.88E-02	4.55E-01	30.87	3.83	15.29	0.00	0.00	0.00	50.00	0.00
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Environment Agency

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
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Environment Agency

			Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)		Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Trichlorofluoromethane	TDI	20	TDI	500	1400	7500	2.44E-04	6.65E-06	1.00E-09	24	2.51	0.1	0.01	1	1	1
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Environment Agency

	Oral Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)	Inhalation Health Criteria Value ($\mu g\ kg^{-1}\ BW\ day^{-1}$)	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
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Environment Agency

		Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Trichlorofluoromethane	5.80E+21	2.30E+04	1.10E+02	0.0001 fw	0.001 fw	0.001 fw	0.001 fw	0.001 fw	0.001 fw
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Environment Agency

	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
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FIGURES

Figure 1: Site Location Plan

Project: Heol Crwys, Cwmavon	Job no.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian	Scale: 1:25,000 at A4		

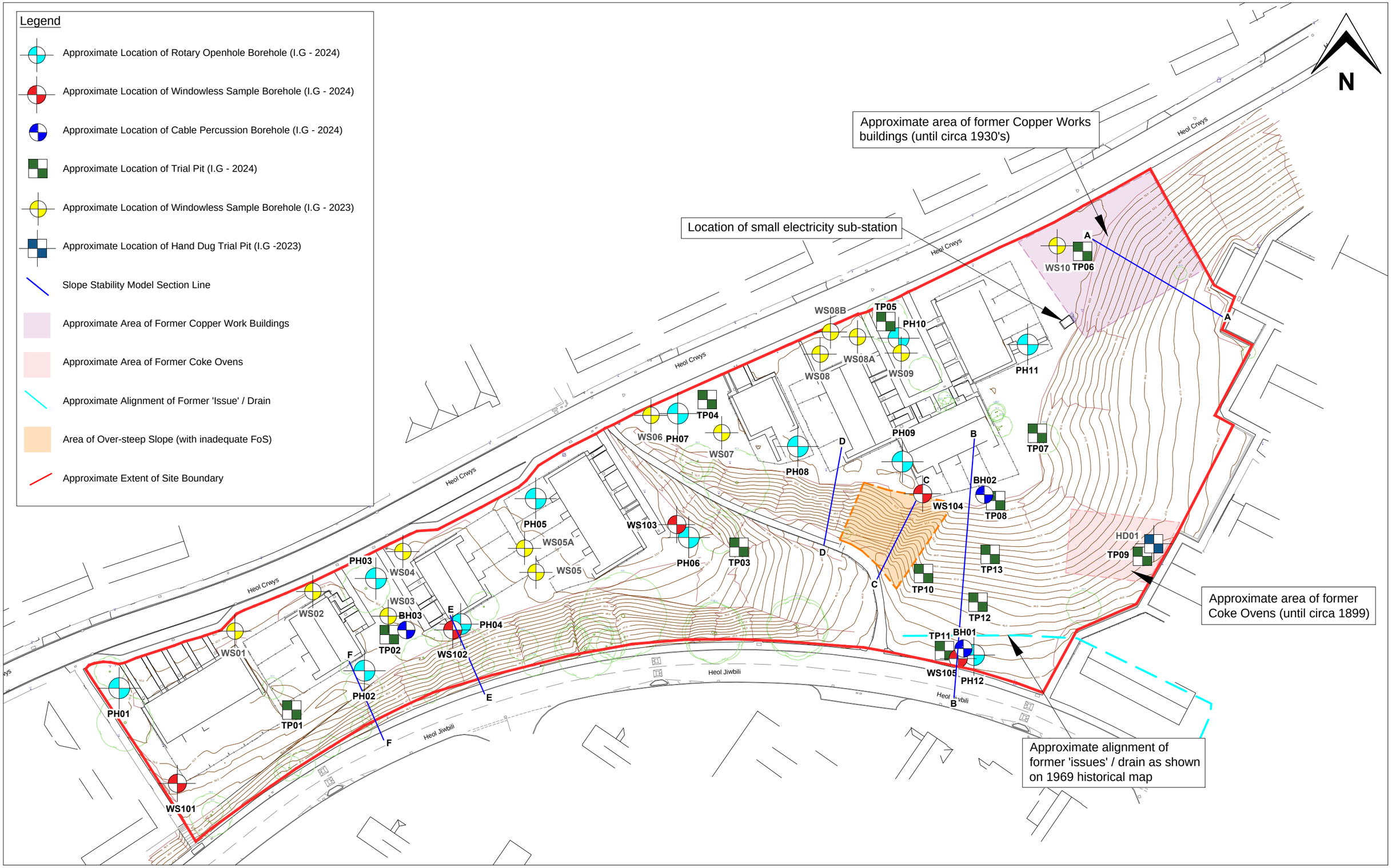

Figure 2: Site Plan / Exploratory Hole Location Plan

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		

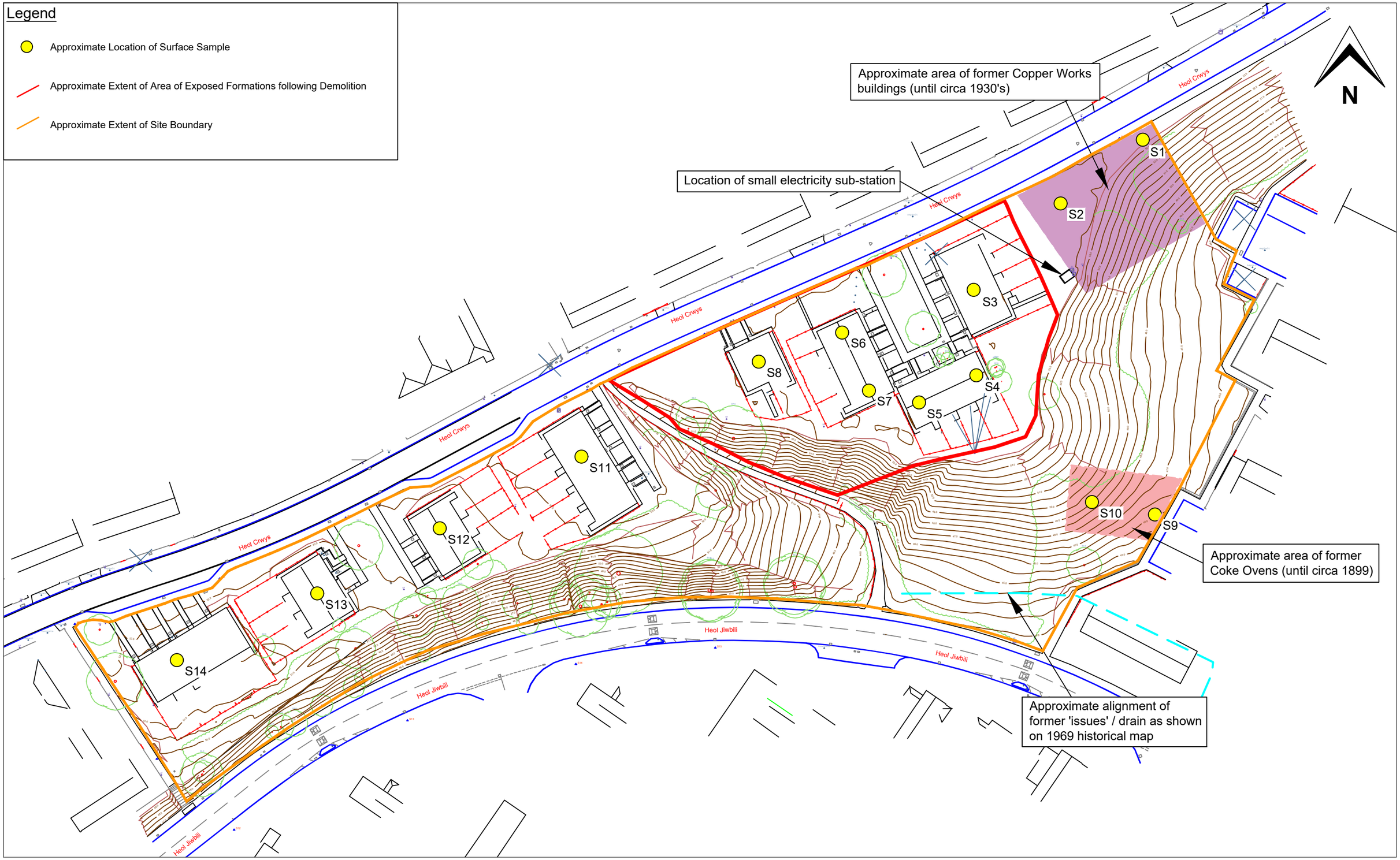

Figure 2a: Post Demolition Sampling Locations

Project: Heol Y Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:1000 at A3		

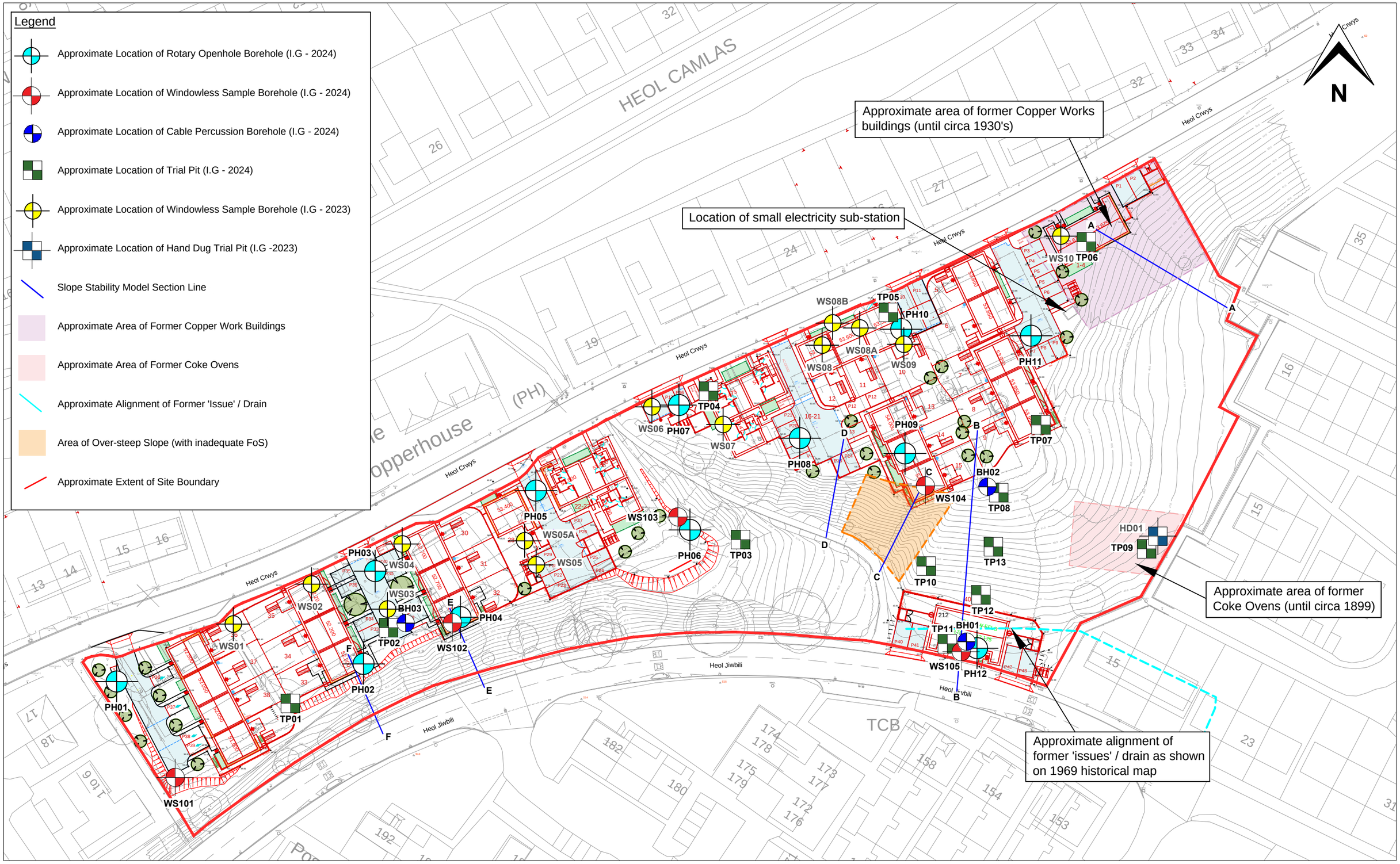

Figure 3: Extract of Proposed Development Layout

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		

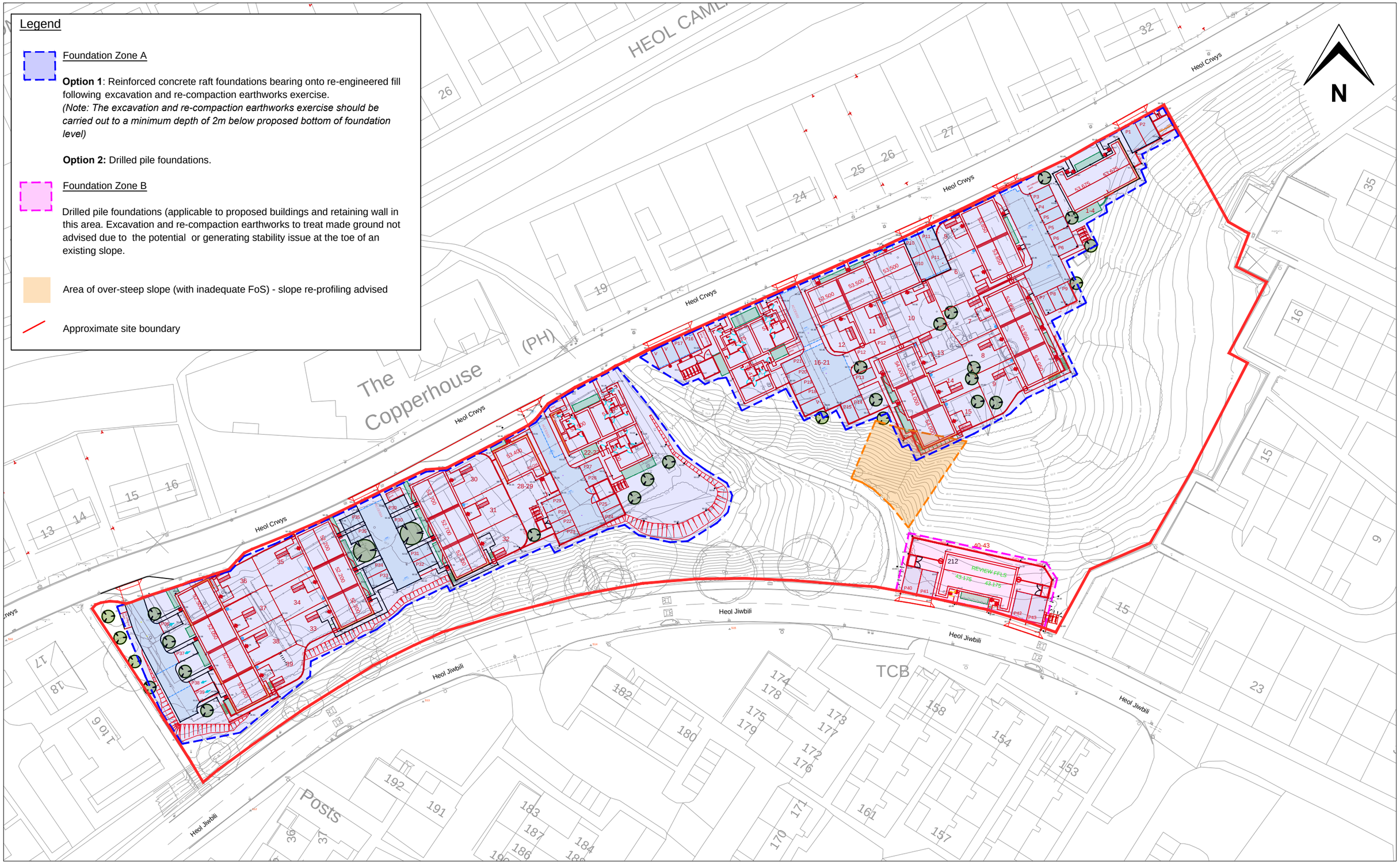

Figure 4: Foundation Zone Plan

Project: Heol Crwys, Cwmavon	Job No.: 14023	Intégral Géotechnique	Integral House, 7 Beddau Way, Castlegate Business Park, Caerphilly, CF83 2AX. Tel: 029 2080 7991
Client: Tai Tarian Ltd	Scale: 1:800 at A3		