

Mullai Group Limited

JULIAN TERRACE, PORT TALBOT

Site Investigation Report

12603/JJ/20/SI

CLIENT: Mullai Group Limited

PROJECT: Julian Terrace, Port Talbot

TITLE: Site Investigation Report

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1.0 INTRODUCTION

1.1 GENERAL

Mullai Group Limited are proposing to redevelop a site at Julian Terrace in Port Talbot for a mixed commercial and residential end-use.

Vale Consultancy are the appointed Consulting Civil and Structural Engineers for the scheme.

Intégral Géotechnique (Wales) Limited have been appointed as the Geotechnical Engineers to undertake an intrusive site investigation to enable a geotechnical and geoenvironmental appraisal of the site and provide a basis for design.

This report presents the findings of the intrusive 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 proposed development comprises the construction of a mixed commercial and residential unit. The building will be designed with two shop units on the ground floor with residential flats above. Parking areas will also be provided as part of the development.

1.3 SCOPE OF WORKS

The work instructed included a desk study of available information, site reconnaissance and intrusive site investigation. This was followed by laboratory testing and geotechnical and geoenvironmental reporting.

The desk study comprised a review of:

1.3 SCOPE OF WORKS (CONTINUED)

- An Envirocheck Report obtained for the site
- Old Ordnance Survey maps covering the site, included within the Envirocheck Report
- A Radon Report obtained from the British Geological Survey (BGS)
- A Coal Authority Mining Report
- Geological maps of the area provided by the BGS
- the Environment Agency/Natural Resources Wales groundwater vulnerability map and aquifer database for the area.

The desk study information was used to make an initial assessment of the site and to design an intrusive investigation to be carried out by Intégral Géotechnique. The intrusive site investigation was designed in accordance with BS5930+A2:2010, the Code of Practice for Site Investigations, BS10175:2011, 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 intrusive site investigation comprised:

- 5No. machine excavated trial pits carried out during February 2020
- Soil infiltration testing within 2No. trial pits
- Sampling of soil for laboratory chemical and geotechnical 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, NHBC and Natural Resources Wales 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.

1.4 LIMITATIONS (CONTINUED)

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.

2.0 THE SITE

2.1 SITE LOCATION AND DESCRIPTION

The site is located on Julian Terrace approximately 0.6km west of Port Talbot town centre at a National Grid Reference of 275890, 190080, see Figure 1.

The site is roughly rectangular in shape and occupies an area of approximately 0.05 hectares. The boundaries of the site are defined by Julian Terrace to the northeast, an existing access road to the northwest, existing flats to the southwest and a mixed commercial and residential development to the southeast. A site plan is presented in Figure 2.

The site is situated at an approximate elevation of 6m AOD.

The site comprises an area of fenced off tarmac hardstanding previously utilised for parking cars.

2.2 SITE OPERATIONS

No operations are currently undertaken on site. The site is undeveloped and vacant.

2.3 SURROUNDING LAND USE

The surrounding areas are mainly developed for residential use.

2.4 AVAILABLE SITE INVESTIGATION DATA

No existing site investigation data has been made available.

3.0 SITE HISTORY

The recent history of the site has been traced with the aid of an Envirocheck Report, a copy of which is included in Appendix A. The Envirocheck Report includes the following scaled historical maps:

Map Scale	Dates
1:2,500	1876, 1899, 1917, 1939, 1952-1969
1:1,1250	1951-1952, 1958-1967, 1964-1988, 1978-1990, 1991, 1993, 2000 (aerial photo)
1:10,560	1884-1885, 1900, 1921, 1938-1952, 1949,
1:10,000	1964-1965, 1974, 1980-1982, 1993-1996, 1999, 2006, 2019

The earliest edition of the map dated 1876 indicated the site and the surrounding areas to be undeveloped low-lying fields with a number of the field boundaries lined with drainage ditches. A small track feature crossed approximately through the centre of the site on a northeast to southwest orientation. Port Talbot Chemical Works was located approximately 120m to the south of the site and a Tin Plate Works was located approximately 200m to the south.

The 1899 edition of the map indicated that Julian Terrace had been constructed to form the northern boundary of the site with a row of terraced properties constructed within the site itself fronting onto the road. A number of other residential streets had been constructed with terraced properties constructed to the south and southwest of the site including Angel Street and Powell Street. Dunraven Street extended away from the site to the northeast with a residential terrace constructed along it. The area to the north of the site remained undeveloped. There was no longer any indication of the Chemical Works to the south, but the Tin Plate Works had expanded and was now known as Glanwalia Tin Plate Works.

By the edition of the map dated 1917-1919 more residential terraces had been constructed in the vicinity of the site, mainly to the east. Development continued to the south and southwest of the site. The site itself remained unchanged with a row of terraced properties still evident.

The 1936-1940 edition of the map indicated that extensive development had taken place with the areas surrounding the site to now be fully developed for mainly residential use, but with some commercial development such as a public house.

3.0 SITE HISTORY (CONTINUED)

The site and the surrounding areas remained relatively unchanged over the subsequent years until the edition of the map dated 1978-1990 where the terrace of properties within the site had been demolished circa 1990. The buildings to the northwest of the site had also been demolished by this time.

The 1991 edition of the map indicated a health centre to have been constructed to the northwest of the site. The site itself remained undeveloped.

The Google Earth images indicated a new building to have been constructed to the south of the site by 2013. At the time the site itself remained undeveloped and as it is during the present day.

4.0 SITE ENVIRONMENTAL SETTING

4.1 PHYSICAL SETTING

The site is located on relatively level low-lying ground at an approximate elevation of 6m AOD.

4.2 GEOLOGY

The 1:50,000 scale geological map of the area indicates the site to be underlain by bedrock strata of the South Wales Middle Coal Measures of the Carboniferous period. These strata typically comprise grey productive coal-bearing mudstones/siltstones, with seatearths and minor sandstones.

The site lies in between two approximately southeast to northwest trending faults. The conjectural position of the Morfa Fault, which downthrows to the northeast, is located approximately 260m to the northeast of the site. The conjectural position of the Giants Grave Fault, which also downthrows to the northeast, is located approximately 900m to the southwest of the site. These faults are not located within an influencing distance of the site boundary. No coal seams are indicated to outcrop within 500m of the site boundary with the nearest conjectural outcrops located beyond the fault line to the northeast of the site.

Superficial Tidal Flat Deposits of the Quaternary period are indicated to overlie the bedrock strata beneath the site. These deposits typically comprise normally consolidated soft organic-rich silty clay, with layers of sand, gravel and peat.

A variable thickness of made ground is anticipated above the superficial deposits across the site due to the historical presence of a row of terraced properties which were demolished circa 1990.

A summary of the anticipated geological succession is given below in Table 1.

Table 1: Summary of Anticipated Site Geology		
Geological unit	Horizon	Description
Recent	Made ground	Various materials
Quaternary	Tidal Flat Deposits	Normally consolidated soft silty clay, with layers of sand, gravel and peat. Highly compressible.
Carboniferous	South Wales Middle Coal Measures	Grey productive coal-bearing mudstones/siltstones, with seatearths and minor sandstones

4.3 RADON

Information with regard to Radon Protective Measures is provided within the Envirocheck Report and the BGS Radon Report as presented in Appendix B. The report states that the site is within a lower probability area, as less than 1% of properties are above action level, and that therefore no radon protective measures would be necessary in the construction of new buildings within the site.

4.4 MINING

A Coal Mining Report for the site has been obtained from the Coal Authority and a copy is included in Appendix C.

The Coal Authority states that the property is not within a surface area that could be affected by past recorded underground coal mining.

The Coal Authority mining report confirms that there are no recorded coal mine entries known to the Coal Authority within, or within 20 metres of, the site boundary.

The Coal Authority states that it is not aware of any damage due to geological faults or other lines of weakness affected by coal mining.

There are no conjectural coal outcrops in the vicinity of the site and the online Coal Authority viewer indicates that the site does not lie within a high-risk development area. The risk from shallow coal mining related issues is considered to be low.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK

The Envirocheck Report indicates the nearest surface water feature to be located 335m to the southeast of the site. The OS Water Network Lines map indicates this to be the River Afan.

The Natural Resources Wales groundwater vulnerability map and aquifer database classifies the bedrock beneath the site as a Secondary 'A' Aquifer. Secondary 'A' Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

The Natural Resources Wales groundwater vulnerability map and aquifer database classifies the superficial deposits beneath the site as a Secondary Aquifer-Undifferentiated. This classification has been assigned in cases where it has not been possible to attribute either category A or B to a strata type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the strata type.

A perched water body is possible within the made ground due to the known presence of the relatively impermeable underlying Tidal Flat Deposits.

It is considered possible that any existing site drainage could act as a pathway for potential surface contaminants.

There are no discharge consents recorded within 250m of the site boundary. The nearest active consent is recorded 280m to the south of the site and is an unspecified Dwr Cymru discharge received by the River Afan.

The Envirocheck Report states that there are no water abstractions recorded within 250m of the site boundary. The nearest abstraction is a surface water abstraction used for impounding recorded 348m to the southeast of the site.

Tables 2 and 3 present a summary of the hydrological features and key hydrogeological nature of the site.

Table 2: Summary of Site Hydrology					
Feature	Distance from site	Flow	Classification	Abstraction	Discharge
River Afan	335m southeast	South Westerly	Tidal River	Yes	Swansea Bay
Surface run-off	On site	Flows into site drainage	N/A	No	Not known
Site Drainage	On site	Not known	N/A	No	Not known

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

Table 3: Summary of Site Hydrogeology				
Geological Unit	Aquifer Classification	Aquifer Characteristics	Source Protection Zone	Groundwater Abstractions
Made ground	Not classified	Highly variable permeability and porosity. Perched water may be present with variable flow directions.	No	None
Tidal Flat Deposits	Secondary Aquifer-Undifferentiated	Variable low to moderate permeability and porosity with intergranular flow possible. High clay content likely to restrict flow.	No	None
South Wales Middle Coal Measures Formation	Secondary A Aquifer	Variable permeability coal bearing mudstones/siltstones and minor sandstones	No	None

The Groundwater Vulnerability map of the area indicates the secondary bedrock aquifer to have a high vulnerability.

The Natural Resources Wales Flood Risk Map as presented within the Envirocheck Report indicates that the site is at risk to extreme flooding from rivers or sea without defences. However, it should be noted that the site is located within an area that is benefitting from flood defences. The BGS Groundwater Flooding Susceptibility map of the area indicates that the site has potential for groundwater flooding to occur at the surface.

4.6 LANDFILL SITES

The Envirocheck Report indicates that there are no BGS recorded, historical or current landfill sites located within 1km of the site boundary. There are no licensed waste management facilities located within 250m of the site boundary.

There are areas of potentially infilled land (water) recorded within 250m of the site boundary. The nearest area is recorded 8m to the northeast at the location of a former surface water feature which was mapped in 1921.

4.7 POTENTIAL CONTAMINATION

Previous Uses

The various activities in the vicinity of the site which may have resulted in ground or water resource contamination on this site are listed below in Tables 4 and 5. A summary of the potential contaminants can be found in the tables.

Table 4: Potential Contaminants		
Land Use: Undeveloped fields until 1899		
Material/Process	Contamination/Hazard	Evidence
Possible agricultural land	No potential contaminants	Historical maps
Land Use: Construction of terraced properties along Julian Terrace by 1899		
Material/Process	Contamination/Hazard	Evidence
Imported made ground/earthworks and general ground disturbance from construction works	Metals, semi metals, non-metals, PAH, asbestos	Historical maps
Land Use: Demolition of terraced properties circa 1990		
Material/Process	Contamination/Hazard	Evidence
Further disturbance of the ground during demolition works with possibility of imported made ground to level the site following demolition	Metals, semi metals, non-metals, PAH, asbestos	Historical maps and current/vacant site use
Possible localised hot spots/areas due to the area being utilised to park cars.	Petroleum hydrocarbons - Fuels/oils	Anecdotal based on current/vacant site use

Existing Uses

No existing potential contaminative site uses have been identified.

4.7 POTENTIAL CONTAMINATION (CONTINUED)

Adjacent Site Uses

Table 5: Potential Contaminants: Adjacent Site Uses		
Potential Contamination Source	Boundary	Associated Contaminants and Hazards
Julian Terrace with residential properties beyond	North eastern	No Potential Contaminants
Existing access road with a children's nursery beyond	North western	No Potential Contaminants
Residential flats/apartments	South western	No Potential Contaminants
Mixed residential and commercial	South eastern	No Potential Contaminants

4.8 OTHER ENVIRONMENTAL ISSUES

Environmentally sensitive land has not been identified within 1km of the site boundary.

The Envirocheck Report indicates that there have been no pollution incidents to controlled waters recorded on site and none within 250m of the site boundary. The nearest incident was recorded 263m to the south of the site and was a Category 2-Significant Incident involving light oil.

There have been no substantiated pollution incidents registered on site or recorded within 250m of the site boundary. The nearest incident was recorded 379m to the east of the site where smoke caused a significant impact on air, a minor impact on land and no impact on water.

There have been no prosecutions relating to controlled waters or to authorised processes recorded on site or within 500m of the site boundary.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 RISK ASSESSMENT FRAMEWORK

In order to be consistent with current UK government policies and legislation, it is necessary to identify, make decisions on, and take appropriate action to deal with land contamination, in accordance with the procedures specified in the Environment Agency document '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 the CLR-11 framework, risk is defined as:

'a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequence of the occurrence'.

The three essential elements to any risk are defined by CLR-11 as follows:

- A contaminant, or hazard, which is in, on, or under the land and has the potential to cause harm (Source)
- A means by which a receptor can be exposed to, or affected by a contaminant or hazard (Pathway)
- A receptor, i.e. something which could be adversely affected by a contaminant or hazard, such as human health or groundwater (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.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

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.

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.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

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.

5.2 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.

5.3 CRITICAL SENSITIVE RECEPTOR – HUMAN HEALTH

The proposed redevelopment of the site is for a mixed commercial and residential end use. The critical sensitive receptor from a human health perspective is an on-site residential receptor.

In accordance with S4UL/C4SL and CLEA guidance for a residential scenario, the critical sensitive receptor 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.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS

Based on the proposed redevelopment of the site for a residential end use, and the findings of the desk study, the critical sensitive receptor from a controlled water perspective is groundwater within the Secondary 'A' Aquifer of the South Wales Middle Coal Measures Formation.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS (CONTINUED)

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.

5.5 POTENTIAL CONTAMINANT SOURCES

As identified in the desk study, a terrace of residential properties was constructed within the site by 1900. This residential terrace was subsequently demolished circa 1990. The site currently comprises a fenced off area of tarmac hardstanding that has been previously used for parking cars.

Considering the historical land uses, potentially contaminated made ground deposits may underlie the site. Within any made ground 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
- Possible localised hot spots/areas of Petroleum Hydrocarbons (VPH/EPH) within the shallow made ground
- Asbestos within the shallow made ground.

5.6 POTENTIAL EXPOSURE PATHWAYS

Due to the nature of the proposed development, home grown produce is not anticipated as a potential pathway. 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
- 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.

5.7 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 6.

Table 6: 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, asbestos	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Metals, semi-metals, inorganics, PAH	Groundwater quality	Leaching from made ground	✓
	Metals, semi-metals, inorganics, PAH	Surface water quality	Transportation within groundwater	✓
Localised hot spots/areas due to former site uses including the parking of cars	Petroleum hydrocarbons	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Petroleum hydrocarbons	Groundwater quality	Localised spillage/leakage	✓
	Petroleum hydrocarbons	Surface water quality	Transportation within groundwater	✓
Made ground of unknown origin and natural ground	pH and water-soluble sulphate	Building Materials Durability	Direct contact	✓
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	✓

6.0 THE SITE INVESTIGATION

6.1 FIELDWORKS

An intrusive site investigation was designed in accordance with BS5930+A2:2010, the Code of Practice for Site Investigations, BS10175:2011, 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 intrusive site investigation was also designed to provide information to support and refine the preliminary conceptual site model/conceptual exposure model.

An intrusive site investigation comprising 5No. machine excavated trial pits was carried out on the 7th February 2020.

The trial pits (referenced TP1 to TP5) were positioned across the site and excavated to a maximum depth of 3.2m below existing ground level using a JCB 3CX backhoe excavator. The purpose of the trial pits was to prove the shallow ground conditions, allow an assessment of the most appropriate foundation type for the proposed development, and obtain shallow soil samples for laboratory analysis.

Soil infiltration testing was carried out within 2No. of the trial pits (TP1 and TP2) in order to assess the likely infiltration potential of the natural ground beneath the site.

Representative soil samples were taken from the trial pits 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 prepared their detailed engineering logs in accordance with the requirements of BS5930+A2: 2010. The engineering logs provide descriptions of the materials encountered in accordance with BSEN ISO 14688-1 (2002) and 14689-1 (2003) for soils and rocks respectively.

The approximate locations of the trial pits are shown on Figure 2, while their logs are presented in Appendix D. The results of the soil infiltration tests are presented in Appendix E.

6.2 FIELD OBSERVATIONS

A mild hydrocarbon odour was noted within the shallow made ground at TP3 (0.3m to 0.6m depth). No free hydrocarbon product was observed.

No other visual or olfactory evidence of any contamination was observed during the excavation of the trial pits.

6.3 LABORATORY CHEMICAL TESTING

Representative soil samples were taken from the trial pits across the site, stored at the appropriate temperature and dispatched to the UKAS and MCERTS accredited 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 soil testing carried out is given below:

Beryllium	Cadmium
Total Chromium	Hexavalent Chromium (VI)
Copper	Lead
Mercury	Nickel
Vanadium	Zinc
Arsenic	Boron
Selenium	Elemental Sulphur
Total Cyanide	Total Sulphate
Sulphide	Water Soluble Sulphate
pH	Monohydric Phenol
Polycyclic Aromatic Hydrocarbons (PAH)	Asbestos Screen

The sample of made ground from TP3 was tested for the presence of petroleum hydrocarbons.

The results of the soil testing are presented in Appendix F.

6.4 LABORATORY GEOTECHNICAL TESTING

Representative soil samples taken from the trial pits were dispatched to the UKAS accredited laboratories of i2 Analytical and tested for Atterberg Limits and moisture content.

The results of the geotechnical testing are presented in Appendix G.

7.0 GROUND CONDITIONS

A summary of the ground conditions encountered across the site is presented below in Table 7.

Table 7: Summary of Ground Conditions		
Depth (m)		Stratum
From	To	
0.00	0.20/0.80	MADE GROUND: Tarmac (approx. 0.03m thick) over (loose) grey and black sandy fine to coarse GRAVEL of angular sandstone, brick, clinker.
0.20/0.80	0.70/1.00	MADE GROUND: Soft, soft to firm or firm, dark grey dark grey or black silty CLAY.
0.70/1.00	1.10/1.30	Soft or soft to firm blue grey with frequent organic matter.
1.10/1.30	2.80/>3.20	Very soft blue grey CLAY with frequent organic matter
2.80	3.20	(Loose) brown and grey slightly silty fine to coarse SAND. <i>Encountered at TP3 only.</i>

The trial pit sides were observed to remain generally stable during the duration of excavations. However, slight overbreak and spalling was noted within the shallow made ground deposits at TP1 and running sand conditions were observed within the loose sand deposits below 2.8m bgl within TP3.

7.1 MADE GROUND

Made ground deposits were encountered immediately below the surface hardstanding within all trial pits. The made ground typically comprised a layer of more recent granular soils over cohesive deposits with variable quantities of man-made constituents including brick and clinker. The base of the made ground deposits was recorded to vary between approximately 0.70m and 1.00m bgl.

It should be noted that a redundant 4-inch diameter plastic pipe was encountered within the shallow made ground at a depth of approximately 0.4m bgl within TP3. The shallow made ground at this location was also recorded to have a mild hydrocarbon odour. No free hydrocarbon product was observed.

7.2 TIDAL FLAT DEPOSITS

Superficial soils comprising Tidal Flat Deposits underlie the made ground beneath the site. These soils typically comprise soft or soft to firm, rapidly becoming very soft (typically from depths ranging between 1.1m and 1.3m bgl) blue grey clay with frequent organic matter.

Hand shear vane testing recorded undrained shear strength values within these deposits ranging between approximately 10 and 40kPa.

Redundant drainage pipes were encountered within the shallow clay deposits at TP2 and TP4 at depths of approximately 1.0m bgl

The base of the very soft organic-rich clay deposits was not proven within TP1, TP2, TP4 and TP5. At TP3, the very soft organic-clay deposits were recorded to be underlain by loose sand deposits encountered at approximately 2.8m bgl. Fast groundwater influx and running sand conditions were observed below this depth.

7.3 GROUNDWATER

A fast groundwater influx and associated running sand conditions were observed below 2.8m bgl within TP3.

Water influx was also recorded from a redundant 6-inch clay pipe at approximately 1.0m bgl within TP4.

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.

7.4 SOIL INFILTRATION TESTS

Soil infiltration testing was undertaken at 2 No. trial pit locations (TP1 and TP2).

No infiltration was recorded at each of the testing locations. As such, it has not been possible to calculate any soil infiltration rates. The results are presented in Appendix E.

Note that the soil infiltration test results are specific to the locations and depths of the tests undertaken.

8.0 CONTAMINATION

8.1 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, a site wide averaging area has been determined according to the proposed residential and commercial end-use.

8.2 SOIL CONTAMINATION

The Suitable 4 Use Levels (S4ULs) derived by LQM for a residential end-use (without the consumption of homegrown produce) have been adopted as critical concentrations against which soil contaminant concentrations can be compared. In the absence of additional published S4ULs for lead and cyanide, the Category 4 Screening Levels (C4SLs) derived by DEFRA and Soil Screening Values (SSVs) derived by Atkins ATRISK^{soil} for a residential (without consumption of homegrown produce) end use have been adopted, respectively.

A total of 4No. soil samples of made ground were tested for contamination.

The soil test results for the made ground have been summarised and are shown in Appendix H.

The results have been compared to the respective guidelines, where applicable, for 1% soil organic matter content (SOM), this being the most conservative.

The results indicate that most of the analysed chemical elements and compounds are present at concentrations below the appropriate thresholds. However, the initial screening has recorded elevated concentrations of arsenic, beryllium and dibenzo(ah)anthracene.

Elevated concentrations of arsenic were detected within two tested samples of made ground from TP1 (0.3m bgl) and TP2 (0.3m bgl). The recorded concentrations of 53mg/kg and 44mg/kg respectively exceed the guideline concentration of 40mg/kg (S4UL).

A single elevated concentration of beryllium was detected within a tested sample of made ground from TP2 (0.3m bgl). The recorded concentration of 2.5mg/kg exceeds the guideline concentration of 1.7mg/kg (S4UL).

8.2 SOIL CONTAMINATION (CONTINUED)

A single elevated concentration of dibenzo(ah)anthracene was detected within a tested sample of made ground from TP2 (0.3m bgl). The recorded concentration of 0.42mg/kg exceeds the guideline concentration of 0.3mg/kg (S4UL).

Asbestos was not detected in any of the tested soil samples.

No elevated concentrations of petroleum hydrocarbons were recorded within the tested sample of made ground from TP3.

9.0 REVISED CONCEPTUAL EXPOSURE MODEL

The preliminary conceptual exposure model has been reviewed and revised to reflect the findings of the intrusive site investigation and the results of the laboratory testing of soils. Pathways identified as a relevant pollutant linkage require appropriate risk assessment or mitigation measures (see Section 10).

Table 8: Revised Conceptual Exposure Model						
Source		Receptor	Pathway	Preliminary Active Pathway? (see Sect. 5.8)	Relevant Pollutant Linkage	Justification/ Mitigation
Origin	Contaminant					
Made ground of unknown origin and historical land uses	Metals, semi-metals, non-metals, PAH, asbestos	Resident – human health	Dermal Contact with made ground/dust	✓	✓	Elevated concentrations of arsenic, beryllium, and dibenzo(ah) anthracene identified within the made ground – risk assess.
			Ingestion of soil	✓	✓	
			Inhalation of dust	✓	✓	
			Inhalation of vapours – indoor/outdoor	✓	X	
	Metals, semi-metals, inorganics, PAH	Groundwater quality	Leaching from made ground	✓	X	No significantly elevated soil concentrations identified.
	Metals, semi-metals, inorganics, PAH	Surface water quality	Transportation within groundwater	✓	X	
Localised hot spots/areas due to former site uses including the parking of cars	Petroleum hydrocarbons	Resident – human health	Dermal Contact with made ground/dust	✓	X	No significantly elevated soil concentrations identified.
			Ingestion of soil	✓	X	
			Inhalation of dust	✓	X	
			Inhalation of vapours – indoor/outdoor	✓	X	

9.0 REVISED CONCEPTUAL EXPOSURE MODEL (CONTINUED)

Source		Receptor	Pathway	Preliminary Active Pathway?	Relevant Pollutant Linkage	Justification/ Mitigation
Origin	Contaminant					
	Petroleum hydrocarbons	Groundwater quality	Localised spillage/leakage	✓	✓	Petroleum hydrocarbon concentrations recorded above detectable limits at TP3 – risk assess.
	Petroleum hydrocarbons	Surface water quality	Transportation within groundwater	✓	✓	
Made ground of unknown origin and natural ground	pH and water-soluble sulphate	Building Materials Durability	Direct contact	✓	✓	Building materials will be in contact with made ground – risk assess.
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 – risk assess.

10.0 RISK ASSESSMENT

10.1 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.

10.2 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 intrusive site investigation, allowing for the ground conditions encountered and the results of laboratory testing of soil. 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.

10.3 HUMAN HEALTH RISK ASSESSMENT

10.3.1 *Site in its Present Condition*

The site does not pose any risks to casual visitors or trespassers. The site is covered by tarmacadam and is securely fenced off.

10.3 HUMAN HEALTH RISK ASSESSMENT (CONTINUED)

10.3.2 Future Site Users

The contamination test results have recorded elevated concentration levels (i.e. elevated above the adopted generic assessment criteria (GACs) for a proposed residential end use without consumption of homegrown produce) in the made ground of arsenic, beryllium and dibenzo(ah)anthracene only. Note that all recorded contaminant concentrations are below the appropriate GACs for a proposed commercial end use.

Given that the site is to be developed for mixed commercial and residential end use, 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
- Inhalation of soil bourn dust.

The inhalation of vapours pathways (indoor and outdoor air) are not considered to be active since the contaminants of concern identified are not sufficiently volatile.

It is considered necessary to protect future residential end users from the elevated contaminant concentrations recorded in the made ground. It is considered necessary to break the above listed relevant pollutant linkages in order to remove the potential risk.

The following remedial mitigation measures are advised:

- It is recommended that a capping layer, of a minimum thickness of 600mm, of clean imported subsoil and topsoil is placed above the made ground deposits in any proposed soft finished residential garden areas.
- If gardens are not proposed, consideration could be given to a reduced capping thickness in areas of soft landscaping of 300mm if an underlying his-visibility geotextile separation membrane was placed at the base of the clean capping soils. The acceptability of a reduced capping thickness should be confirmed with the Local Authority Environmental Health Department.
- Alternatively, hard finish (e.g. paving) could be considered for any proposed residential garden areas.

10.3 HUMAN HEALTH RISK ASSESSMENT (CONTINUED)

The above measures would break all the above listed pollutant linkages and remove the potential risk to future residential end users.

No further remedial mitigation measures with respect to the protection of future residential end users from site sourced soil contamination are considered necessary.

Note that no remedial mitigation measures with respect to the protection of future commercial end users from site sourced soil contamination are considered necessary.

10.3.3 Construction Workers

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

All excavations should be regularly checked for safe atmospheres.

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.

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.

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.

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.

10.4 RISKS TO VEGETATION

The concentration of lead in the shallow made ground 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. If soft finish gardens are proposed, they will require the provision of a minimum 600mm thick capping layer of clean, imported subsoil and topsoil materials. If soft finish gardens are not proposed, consideration could be given to a reduced capping thickness in areas of soft landscaping of 300mm if an underlying his-visibility geotextile separation membrane was placed at the base of the clean capping soils, subject to regulatory approval.

Alternatively, raised planters on top of hard finish could be considered.

10.5 GROUNDWATER RISK ASSESSMENT

The encountered ground conditions and the results of the laboratory contamination testing of soil do not indicate evidence of significant contamination at the site. Additionally, the recorded history of the site does not indicate any potentially significant contaminative uses.

It is noted that a mild olfactory odour of potential petroleum hydrocarbon contamination was locally recorded within the shallow made ground at TP3, and the results of the chemical testing on a tested sample of this material indicate petroleum hydrocarbons above detectable limits. However, it should also be noted that no free hydrocarbon product was observed.

Furthermore, no visual or olfactory evidence of potential petroleum hydrocarbon contamination was encountered within any of the other trial pits excavated across the site.

The recorded petroleum hydrocarbon concentrations were generally limited to carbon band ranges Aliphatic C12-C16, Aliphatic C16-C35, Aromatic C12-C16 and Aromatic C16-C21. The majority of which are of low aqueous solubility and are considered to have an overall risk rating of 'low' when considering risks to groundwater, in accordance with published Environment Agency guidance – Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrogeological Risk Assessment, 2009.

Considering the above and the lack of observed free phase hydrocarbon product, and considering the low environmental sensitivity of the site (i.e. the site is not underlain by a principle aquifer or in a SPZ, there are no recorded groundwater abstractions within 1000m and there are no surface water features in close proximity), the overall risk posed to groundwater and other controlled waters from the contamination recorded on site is considered to be low.

10.5 GROUNDWATER RISK ASSESSMENT (CONTINUED)

It should also be noted that the development proposals are such that the vast majority of the site will be covered by a building footprint and will include a managed drainage system which will greatly limit the potential for rainwater percolation into the made ground and therefore the generation of any future leachate which could migrate to groundwater.

10.6 GROUND GAS RISK ASSESSMENT

The site is underlain by made ground over organic-rich Tidal Flat Deposits. Both of which could present a potential source of ground gas.

It is recommended that a programme of ground gas monitoring for methane and carbon dioxide is undertaken at the site in order to quantify the potential ground gas risk to the proposed development.

10.7 RISKS TO BUILDINGS AND MATERIALS DURABILITY

10.7.1 Concrete Classification

A summary of the laboratory test results for pH and water-soluble sulphate, which may adversely affect the durability of building materials, is presented in Appendix F.

Evidence to date does not indicate any specifically aggressive conditions, but it would be reasonable to expect a degree of sulphate and acidic aggressiveness from the made ground.

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 (adopting the highest test results) for water soluble sulphate of 360mg/l within the made ground and 65mg/l within the natural ground.

Using Table C2 of BRE Digest SD1:2005, these characteristic values correspond to Design Sulphate Class DS-1 for the made ground and natural ground

The groundwater regime of the site has been assessed as 'mobile' and a characteristic pH value (adopting the lowest test results) of 7.2 for the made ground and 7.1 for the natural ground. The Design Sulphate Class has been modified to give a site ACEC class of AC-1 for the made ground and natural ground.

10.7 RISKS TO BUILDINGS AND MATERIALS DURABILITY (CONTINUED)

10.7.2 Water Services

Water supply pipes will need to be protected from any contamination present within the ground. In particular, the presence of organic contaminants (such as PAH and TPH) should be addressed when selecting pipe materials. Measures to protect the pipes will include clean backfill to trenches and possibly alternative material selection. 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.

In order to comply with the UKWIR guidance, specific sampling and testing along the actual line of the proposed water supply route may need to be carried out once this has been established.

10.8 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.

Based on the data obtained from the intrusive site investigation works, waste materials comprising of the existing made ground are likely to be classified as a mixture of non-hazardous and hazardous waste. The HazWasteOnline™ Waste Classification Report for the made ground deposits is presented in Appendix I.

Any waste materials comprising the existing natural ground will likely be classified as non-hazardous waste.

10.8 WASTE DISPOSAL (CONTINUED)

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.

Any asbestos containing materials (ACM) will be classified as hazardous 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, further 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.

10.9 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.

The near-surface drainage patterns have not been fully established.

11.0 ENGINEERING CONSIDERATIONS AND RECOMMENDATIONS

11.1 DETAILS OF PROPOSED DEVELOPMENT

The proposed development comprises the construction of a mixed commercial and residential unit. The building will be designed with two shop units on the ground floor with residential flats above. Parking areas will also be provided as part of the development.

11.2 SITE PREPARATION

Any services within the site area should be identified and either diverted or protected. 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.

The existing tarmac should be planed off and the materials set aside for appropriate re-use or off-site disposal at an appropriate waste landfill.

All sub-formations should be visually inspected for potential asbestos containing materials (ACM).

Any reduced levels should be brought up to the required levels with well compacted site won or imported granular materials. Department of Transport (DTp) Type 1 subbase or similar approved, could be used, and should be compacted in layers, in accordance with the current DTp Specification for Highway Works.

Exposed formations should be protected from site traffic and inclement weather in order to preserve their integrity. Any soft spots/areas should be removed and replaced with well compacted site won or imported granular fill material.

Additionally, a system should be established by which any 'unusual' materials or potential hotspots of contamination 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.

11.3 FOUNDATIONS AND FLOOR SLABS

Due to the presence of highly compressible, organic-rich, Tidal Flat Deposits at shallow depths, the use of conventional shallow foundations is not considered feasible due to the potential for unacceptable total and differential settlements.

Subject to vibration and noise issues, pre-cast concrete or steel tube driven piles, driven to an appropriate set within sufficiently dense natural strata could be considered.

It is recommended that a series of supplementary shell and auger boreholes are drilled across the site in order to confirm the depth to a suitable bearing stratum and to inform the pile design.

The advice of the specialist piling contractor should be sought regarding the specific design and load bearing capacity of the piles.

Allowances should also be made for negative skin friction generated within any made ground or soft in-situ soils.

Allowances should be made by the piling contractor for carrying out suitable pile testing.

The piling contractor should also allow for the potential presence of buried obstructions associated with the developed history of the site. Such obstructions should be removed by excavation plant, or it may be possible to reposition the piles to avoid obstructions.

Note that the adopted piling system will need to consider any potential vibration and noise issues in relation of the adjacent buildings/structures. If noise and/or vibration issues preclude the use of driven piles, then a bored piling system could be considered.

It is recommended that the advice of a specialist piling contractor is sought in order to confirm the most appropriate piling technique and for the detailed pile design.

Floor slabs should be designed and constructed as suspended.

Prior to the commencement of the piling operations, it is recommended that a detailed structural condition survey of adjacent buildings are undertaken by a suitably qualified structural engineer. The structural survey should be updated on a regular basis during and after the construction works.

11.4 EXCAVATIONS AND FORMATIONS

Most excavations 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, should any be encountered.

From the intrusive site investigation findings, excavations up to a depth of approximately 2.0m are unlikely to encounter significant groundwater inflows. However, inflows of water from any encountered redundant drainage runs/pipework should be anticipated. Any groundwater inflows and rainfall infiltrations should be dealt with by conventional pumping techniques.

Allowances should be made for overbreak in the sides of the excavations and for their possible backfilling either with granular materials or mass concrete.

The sides of excavations deeper than 1.0m should be supported by trench boxes.

The exposed formations within the near surface cohesive in-situ materials will be extremely susceptible to damage, softening and deterioration by wet weather and site traffic. They should therefore be protected by blinding concrete or a 100mm thick layer of hardcore immediately after exposure.

11.5 ACCESS ROADS AND CAR PARKING AREAS

Following site strip there are likely to be variations in the strength of the materials at the formation levels. We recommend that for design purposes a California Bearing Ratio (CBR) value of <2% is assumed for the made ground. A CBR value of 2% could be assumed for the underlying in-situ natural soils, subject to confirmatory in-situ testing.

Such formations within cohesive deposits should be regarded as frost susceptible.

After proof rolling the formations, all the 'soft spots/areas' and any obstructions that could create hard-spots should be removed and replaced with well compacted imported granular materials. Such materials should be to the approval of the local highway authority and should be compacted in layers, in accordance with the DTp Specification for Highway Works.

Field CBR tests should be carried out to confirm the above assumptions.

11.6 DRAINAGE

Soil infiltration testing was undertaken at 2 No. trial pit locations (TP1 and TP2).

No infiltration was recorded at each of the testing locations. As such, it has not been possible to calculate any soil infiltration rates. Note that the soil infiltration test results are specific to the locations and depths of the tests undertaken.

11.7 RECOMMENDED FURTHER WORKS

Piled foundations are recommended for the proposed building. It is recommended that two shell and auger boreholes are drilled across the site in order to confirm the depth to a suitable bearing stratum and inform the pile design.

It is recommended that a programme of ground gas monitoring for methane and carbon dioxide is undertaken at the site in order to quantify the potential ground gas risk to the proposed development. The results of the ground gas monitoring will inform the requirement for any potential ground gas protective measures that may need to be incorporated into the proposed building design.

APPENDIX A

ENVIROCHECK REPORT

APPENDIX B

BGS RADON REPORT



**British
Geological Survey**
Expert | Impartial | Innovative

GeoReports

**Laura Pullin
Integral Geotechnique (Wales) Limited
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Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS_306645/8837*

Client reference: Julian Terrace, Port Talbot

Search location



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Search location indicated in red

*This report describes a site located at National Grid Reference 275890, 190079.
Note that for sites of irregular shape, this point may lie outside the site boundary.
Where the client has submitted a site plan the assessment will be based on the area given.*



Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2015 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2015 edition) Radon: Guidance on protective measures for new buildings?

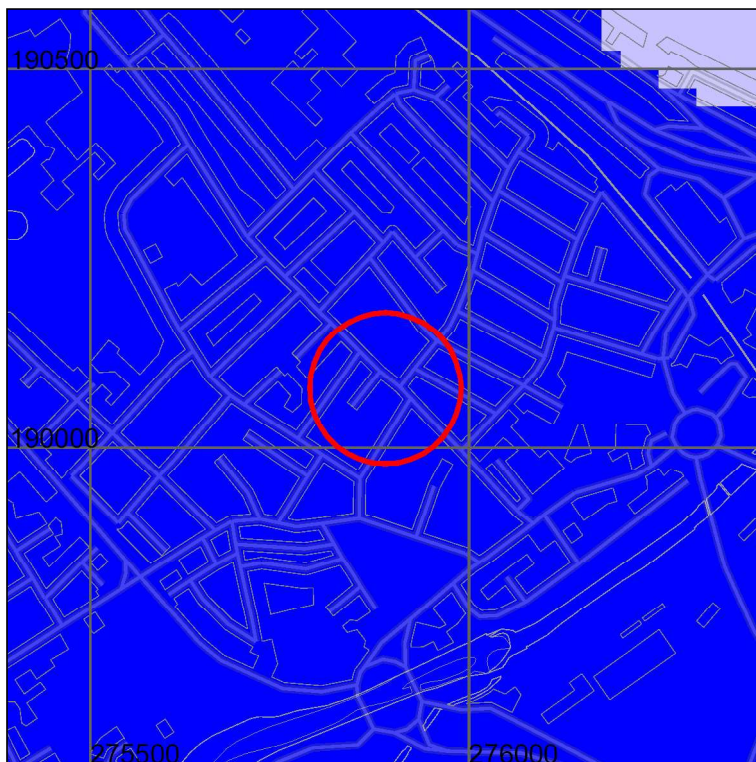
NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2015 Edition)*. Additional information and guidance is available from the Building Research Establishment website (<http://www.bre.co.uk/radon/>).

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The PHE provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



	% Homes estimated to be at or above the action level
Blue	0-1%
Light Blue	1-3%
Light Blue	3-5%
Light Red	5-10%
Light Red	10-30%
Red	30-100%

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Scale: 1:10 000 (1cm = 100 m)

Search area indicated in red

Is the property in a radon Affected Area as defined by Public Health England (PHE) and if so what percentage of homes are estimated to be above the Action Level? **NO**

Additional Information

THE PROPERTY IS IN AN AREA WHERE LESS THAN 1% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL. THE PROPERTY IS NOT IN A RADON AFFECTED AREA.

PHE recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to exceed the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a radon problem in the property; the only way to find out whether the radon level is above or below the Action Level is to carry out a radon measurement.



PHE advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels above the Action Level (200 Bq m⁻³) should be remediated. Householders with levels between the Target Level (100 Bq m⁻³) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. PHE provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by PHE. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from PHE at www.ukradon.org.



What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level exceeds the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com



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General Terms & Conditions

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- Detail, which is clearly defined and accurately depicted on large-scale maps, may be lost when small-scale maps are derived from them.
- Although samples and records are maintained with all reasonable care, there may be some deterioration in the long term.
- The most appropriate techniques for copying original records are used, but there may be some loss of detail and dimensional distortion when such records are copied.
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**Report issued by
BGS Enquiry Service**

APPENDIX C

COAL AUTHORITY MINING REPORT



The Coal
Authority

CON29M

coal mining report

JULIAN TERRACE, PORT TALBOT, NEATH PORT TALBOT, SA12 6UE



Known or potential coal mining risks

Future underground coal mining

Page 3



Further action

No further reports from the Coal Authority are required. Further information on any next steps can be found in our Professional opinion.

For more information on our reports please visit
www.groundstability.com



Professional opinion

According to the official mining information records held by the Coal Authority at the time of this search, evidence of, or the potential for, coal mining related features have been identified. It is unlikely that these features will impact on the stability of the enquiry boundary.

Your reference: **231801806_2**
Our reference: **51002225862001**
Date: **24 January 2020**

Client name:
**LANDMARK INFORMATION
GROUP LIMITED**

If you require any further assistance please
contact our experts on:
0345 762 6848
groundstability@coal.gov.uk



The Law
Society

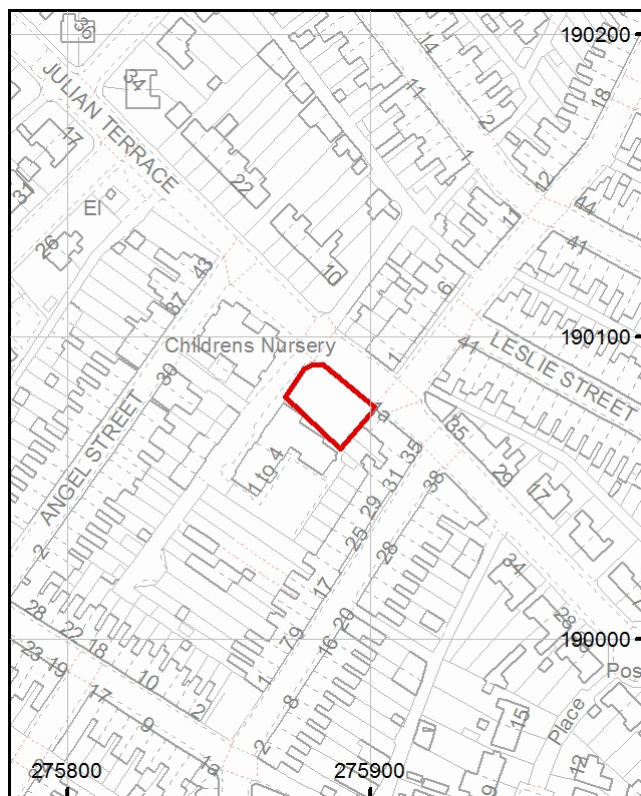
Enquiry boundary

Key

Approximate position of enquiry boundary shown



We can confirm that the location is
on the coalfield



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This report is prepared in accordance with the latest Law Society's Guidance Notes 2018, the User Guide 2018 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.



Accessibility

If you would like this information in an alternative format, please contact our communications team on 0345 762 6848 or email communications@coal.gov.uk.

Detailed findings

Information provided by the Coal Authority in this report is compiled in response to the Law Society's CON29M Coal Mining enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL.

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1 Past underground coal mining

The property is not within a surface area that could be affected by any past recorded underground coal mining.

2 Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3 Future underground coal mining

The property is not in an area where the Coal Authority has received an application for, and is currently considering whether to grant a licence to remove or work coal by underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4 Mine entries

There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the boundary of the property.

5 Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6 Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7 Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8 Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9 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.

10 Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11 Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Coal Authority, under its Emergency Surface Hazard Call Out procedures.

12 Withdrawal of support

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.

13 Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14 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.

Statutory cover



Coal mining subsidence

In the unlikely event of any coal mining related subsidence damage, the Coal Authority or the mine operator has a duty to take remedial action in respect of subsidence caused by the withdrawal of support from land or property in connection with lawful coal mining operations.

When the works are the responsibility of the Coal Authority, our dedicated public safety and subsidence team will manage the claim. The house or land owner ("the owner") is covered for these works under the terms of the Coal Mining Subsidence Act 1991 (as amended by the Coal Industry Act 1994). Please note, this Act does not apply where coal was worked or gotten by virtue of the grant of a gale in the Forest of Dean, or any other part of the Hundred of St. Briavels in the county of Gloucester.

If you believe your land or property is suffering from coal mining subsidence damage and you need more information on what to do next, please use the following link to our website which sets out what your rights are and what you need to consider before making a claim.

www.gov.uk/government/publications/coal-mining-subsidence-damage-notice-form



Coal mining hazards

Our public safety and subsidence team provide a 24 hour a day, 7 days a week hazard reporting service, to help protect the public from hazards caused by past coal workings, such as a mine shaft or shallow working collapse. To report any hazards please call **01623 646 333**. Further information can be found on our website: www.gov.uk/coalauthority.

Glossary



Key terms

adit - horizontal or sloped entrance to a mine

coal mining subsidence - ground movement caused by the removal of coal by underground mining

Coal Mining Subsidence Act 1991 - the Act setting out the duties of the Coal Authority to repair damage caused by coal mining subsidence

coal mining subsidence damage - damage to land, buildings or structures caused by the removal of coal by underground mining

coal seams - bed of coal of varying thickness

future opencast coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal from the surface

future underground coal mining - a licence granted, or licence application received, by the Coal Authority to excavate coal underground. Although it is unlikely, remaining coal reserves could create a possibility for future mining, which would be licensed by the Coal Authority

mine entries - collective name for shafts and adits

payments to owners of former copyhold land - historically, copyhold land gave rights to coal to the copyholder. Legislation was set up to allow others to work this coal, but they had to issue a notice and pay compensation if a copyholder came forward

shaft - vertical entry into a mine

site investigation - investigations of coal mining risks carried out with the Coal Authority's permission

stop notice - a delay to repairs because further coal mining subsidence damage may occur and it would be unwise to carry out permanent repairs

subsidence claim - a formal notice of subsidence damage to the Coal Authority since it was established on 31 October 1994

withdrawal of support - a historic notice informing landowners that the coal beneath their property was going to be worked

working facilities orders - a court order which gave permission, restricted or prevented coal mine workings

APPENDIX D

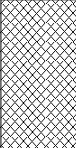
TRIAL PIT LOGS

 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com			Project Name: Land at Julian Terrace			Project No.: 12603		Trial Pit No.: TP1 Sheet 1 of 1	
Location: Port Talbot			Client: Mullai Group Ltd.			Logged By: JJ		Scale 1:25	
Equipment: JCB 3CX			Coordinates:			Dimensions 2.00m			
Date Excavated: 07/02/2020			Level:			Depth : 2.50m 0.70m			
Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
Depth (m)	Type	Results							
0.30	ES		0.02			Tarmac.			
			0.10			MADE GROUND: (Loose) light grey sandy fine to coarse GRAVEL of angular sandstone [sub base].			
			0.20			MADE GROUND: (Loose) red slightly silty sandy fine to coarse GRAVEL of angular brick, clinker and sandstone.			
						MADE GROUND: Soft to firm dark grey silty CLAY with high cobble content of sub-angular sandstone. With occasional brick.			
1.20	D		1.00			Soft to firm blue grey CLAY with frequent organic matter. - Cu@1.0m bgl = 40kPa			
			1.30			Very soft blue grey CLAY with frequent organic matter. - Cu@1.5m bgl = 15kPa			
			2.50			End of Trialpit at 2.50 m			
Remarks: - Trial pit excavation terminated at 2.5m bgl in order to undertake soakaway test.			Groundwater: No groundwater encountered.			Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample			
			Stability: Slight overbreak of excavation sides within made ground deposits.						

 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com			Project Name: Land at Julian Terrace			Project No.: 12603		Trial Pit No.: TP2 Sheet 1 of 1	
Location: Port Talbot			Client: Mullai Group Ltd.			Logged By: JJ		Scale 1:25	
Equipment: JCB 3CX			Coordinates:			Dimensions 2.00m			
Date Excavated: 07/02/2020			Level:			Depth : 2.30m 0.70m			
Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
Depth (m)	Type	Results							
0.30	ES		0.04			Tarmac.			
			0.30			MADE GROUND: (Loose) light grey sandy fine to coarse GRAVEL of angular sandstone [sub base].			
			0.40			MADE GROUND: (Loose) red slightly silty sandy fine to coarse GRAVEL of angular brick, clinker and sandstone.			
						MADE GROUND: Soft to firm dark grey and black silty CLAY.			
			1.00			Soft grey CLAY with frequent organic matter. - 6 inch clay pipe encountered at 1.0m bgl.			
			1.30			Very soft grey CLAY with frequent organic matter. - Cu@1.2m bgl = 30kPa			
			2.30			End of Trialpit at 2.30 m			
Remarks: - Trial pit excavation terminated at 2.3m bgl in order to undertake soakaway test.			Groundwater: No groundwater encountered.			Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample			
			Stability: Sides stable.						

 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com			Project Name: Land at Julian Terrace			Project No.: 12603		Trial Pit No.: TP3 Sheet 1 of 1	
Location: Port Talbot			Client: Mullai Group Ltd.			Logged By: JJ		Scale 1:25	
Equipment: JCB 3CX			Coordinates:			Dimensions 2.50m			
Date Excavated: 07/02/2020			Level:			Depth : 3.20m 0.70m			
Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
Depth (m)	Type	Results							
0.20	ES		0.03			Tarmac.			
0.40	ES		0.30			MADE GROUND: (Loose) light grey sandy fine to coarse GRAVEL of angular sandstone and brick [sub base].			
			0.60			MADE GROUND: (Loose) black slightly silty sandy fine to coarse GRAVEL of sub-angular and angular sandstone. With rare brick.			
			0.70			MADE GROUND: Soft black silty CLAY.			
1.10	D		1.30			Soft grey mottled brown CLAY with frequent organic matter.			
						- Cu@1.0m bgl = 30kPa			
						Very soft grey CLAY with frequent organic matter.			
						- Cu@1.5m bgl = 10kPa			
			2.80			(Loose) brown and grey slightly silty fine to coarse SAND.			
			3.20			- running sand conditions observed.			
						End of Trialpit at 3.20 m			
Remarks:						Groundwater: Fast groundwater inflow below 2.8m bgl.			
- Trial pit excavation terminated at 3.2m bgl.						Stability: Running sand conditions (and associated groundwater inflow) below 2.8m bgl.			
						Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample			
									

Intégral Géotechnique Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com			Project Name: Land at Julian Terrace			Project No.: 12603		Trial Pit No.: TP4 Sheet 1 of 1	
Location: Port Talbot			Client: Mullai Group Ltd.			Logged By: JJ		Scale 1:25	
Equipment: JCB 3CX			Coordinates:			Dimensions 2.50m			
Date Excavated: 07/02/2020			Level:			Depth : 3.20m 0.70m			
Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
Depth (m)	Type	Results							
0.50	ES		0.03			Tarmac. MADE GROUND: (Loose) light grey sandy fine to coarse GRAVEL of angular sandstone [sub base].			
			0.30			MADE GROUND: (Loose) red slightly silty sandy fine to coarse GRAVEL of angular brick, clinker and sandstone. MADE GROUND: Soft to firm brown slightly gravelly silty CLAY. Gravel is fine to coarse sub-angular of sandstone. With occasional brick and ceramic fragments.			
			0.40						
1.20	D		0.90			Firm grey mottled brown CLAY with frequent organic matter. <u>- 6 inch clay pipe encountered at 1.0m bgl.</u>			
			1.10			Very soft grey CLAY with frequent organic matter.			
			3.20			End of Trialpit at 3.20 m			
Remarks: - Trial pit excavation terminated at 3.2m bgl.			Groundwater: Water ingress from old 6 inch clay pipe encountered at 1.0m bgl.			Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample			
			Stability: Sides stable.						

 Intégral House, 7 Beddau Way Castlegate Business Park Caerphilly CF83 2AX Tel. 029 20807991 Fax. 029 20862176 mail@integralgeotec.com			Project Name: Land at Julian Terrace			Project No.: 12603		Trial Pit No.: TP5 Sheet 1 of 1	
Location: Port Talbot			Client: Mullai Group Ltd.			Logged By: JJ		Scale 1:25	
Equipment: JCB 3CX			Coordinates:			Dimensions 2.20m			
Date Excavated: 07/02/2020			Level:			Depth : 2.50m 0.70m			
Samples & In-situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description			
Depth (m)	Type	Results							
			0.03			Tarmac.			
			0.30			MADE GROUND: (Loose) light grey sandy fine to coarse GRAVEL of angular sandstone [sub base].			
			0.80			Firm dark grey and black silty CLAY.			
			1.00			Soft grey mottled brown CLAY with frequent organic matter.			
			1.30			Very soft grey CLAY with frequent organic matter.			
			2.50		End of Trialpit at 2.50 m				
Remarks: - Trial pit excavation terminated at 2.5m bgl.			Groundwater: No groundwater encountered.			Key: D - Small disturbed sample B - Bulk disturbed sample ES - Environmental soil sample W - Water sample			
			Stability: Sides stable.						

APPENDIX E

SOIL INFILTRATION TEST RESULTS

12603 Julian Terrace, Port Talbot

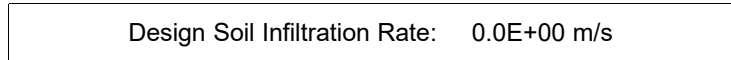
Remarks
No infiltration observed. Unable to calculate a soil infiltration rate.

Final Excavation Depth (m)	Cycle 1	Cycle 2	Cycle 3
At end of testing cycle	2.50		
Water Depths (m)			
Water depth at start of test	1.10		
Water depth at end of test	1.10		
Effective depth (measured)	0.00		
% Effective storage depth	0.00		
Effective Storage Depths (m)			
Effective storage depth (100%)	1.40		
Effective storage depth (75%)	1.05		
Effective storage depth (50%)	0.70		
Effective storage depth (25%)	0.35		
Outflow Time (min)			
Time for measured outflow	202		
Time for 100% outflow	n/a		
Time for 75-25% outflow	n/a		
Volume of Outflow (m³)			
Over measured effective depth	0.00		
Over 100% effective depth	1.96		
From 75% - 25% effective depth	0.98		
Surface Area (m²)			
For 100% effective storage	8.96		
For 50% effective storage	5.18		
Over measured depth	1.40		
Soil Infiltration Rate (m/s)	Cycle 1	Cycle 2	Cycle 3
Over 100% effective depth	n/a		
Over measured depth	n/a		
Over 75% - 25% effective depth	n/a		



12603 Julian Terrace, Port Talbot

Remarks
No infiltration observed. Unable to calculate a soil infiltration rate.

[illegible]

APPENDIX F

LABORATORY CHEMICAL TEST RESULTS

**Jack Jones**

Integral Geotechnique
Integral House
7 Beddau Way
Castlegate Business Park
CF83 2AX

t: 02920807991
f: 02920862176
e: jack@integralgeotec.com

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

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 20-85942

Project / Site name:	Julian Terrace	Samples received on:	11/02/2020
Your job number:	12603	Samples instructed on:	11/02/2020
Your order number:		Analysis completed by:	19/02/2020
Report Issue Number:	1	Report issued on:	19/02/2020
Samples Analysed:	4 soil samples		

Signed:

Zina Abdul Razzak
Senior Quality 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

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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.

Analytical Report Number: 20-85942

Project / Site name: Julian Terrace

Lab Sample Number				1437578	1437579	1437580	1437581	
Sample Reference				TP1	TP2	TP3	TP4	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				0.30	0.30	0.40	0.50	
Date Sampled				07/02/2020	07/02/2020	07/02/2020	07/02/2020	
Time Taken				0930	1000	1030	1100	
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		
Stone Content				%	0.1	NONE	< 0.1	-
Moisture Content				%	N/A	NONE	23	20
Total mass of sample received				kg	0.001	NONE	0.50	0.60

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

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.2	8.0	-	-	
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	-	
Total Sulphate as SO ₄	mg/kg	50	MCERTS	1200	2300	-	-	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.36	0.063	-	-	
Sulphide	mg/kg	1	MCERTS	16	8.1	-	-	
Total Sulphur	mg/kg	50	MCERTS	2700	1100	-	-	
Total Organic Carbon (TOC)	%	0.1	MCERTS	4.5	3.4	-	-	
Loss on Ignition @ 450°C	%	0.2	MCERTS	14.1	11.8	-	-	

Total Phenols

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

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	-	
Phenanthrene	mg/kg	0.05	MCERTS	0.48	1.3	-	-	
Anthracene	mg/kg	0.05	MCERTS	0.10	0.25	-	-	
Fluoranthene	mg/kg	0.05	MCERTS	0.59	2.6	-	-	
Pyrene	mg/kg	0.05	MCERTS	0.49	2.0	-	-	
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.54	1.8	-	-	
Chrysene	mg/kg	0.05	MCERTS	0.49	1.8	-	-	
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.47	2.2	-	-	
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.29	0.88	-	-	
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.39	1.4	-	-	
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.24	0.93	-	-	
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.42	-	-	
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.25	1.1	-	-	

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	4.33	16.5	-	-	
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Analytical Report Number: 20-85942

Project / Site name: Julian Terrace

Lab Sample Number	1437578	1437579	1437580	1437581	
Sample Reference	TP1	TP2	TP3	TP4	
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)	0.30	0.30	0.40	0.50	
Date Sampled	07/02/2020	07/02/2020	07/02/2020	07/02/2020	
Time Taken	0930	1000	1030	1100	
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	53	44	-	-	
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.4	2.5	-	-	
Boron (water soluble)	mg/kg	0.2	MCERTS	2.6	0.7	-	-	
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	-	-	
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	-	
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	35	-	-	
Copper (aqua regia extractable)	mg/kg	1	MCERTS	110	160	-	-	
Lead (aqua regia extractable)	mg/kg	1	MCERTS	94	130	-	-	
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	-	
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	33	65	-	-	
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	-	
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	40	62	-	-	
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	320	-	-	

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	48	-	
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	1100	-	
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	1400	-	
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	340	-	
TPH-CWG - Aliphatic >EC16 - EC35	mg/kg	10	MCERTS	-	-	1700	-	
TPH-CWG - Aliphatic > EC35 - EC44	mg/kg	8.4	NONE	-	-	< 8.4	-	
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	2900	-	
TPH-CWG - Aliphatic (EC5 - EC44)	mg/kg	10	NONE	-	-	2900	-	

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	< 0.001	-	
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	14	-	
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	740	-	
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	1300	-	
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	350	-	
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	-	-	< 10	-	
TPH-CWG - Aromatic > EC35 - EC44	mg/kg	8.4	NONE	-	-	< 8.4	-	
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	2400	-	
TPH-CWG - Aromatic (EC5 - EC44)	mg/kg	10	NONE	-	-	2400	-	

TPH Total C5 - C44	mg/kg	10	NONE	-	-	5300	-	
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Analytical Report Number : 20-85942

Project / Site name: Julian Terrace

* 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 *
1437578	TP1	None Supplied	0.30	Brown sandy clay.
1437579	TP2	None Supplied	0.30	Red sand with gravel.
1437580	TP3	None Supplied	0.40	Grey clay and sand with gravel.
1437581	TP4	None Supplied	0.50	-

Analytical Report Number : 20-85942

Project / Site name: Julian Terrace

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (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
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
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. 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
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
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 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 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
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
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE

Iss No 20-85942-1 Julian Terrace 12603

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The results included within the report are representative of the samples submitted for analysis.

Page 5 of 6

Analytical Report Number : 20-85942

Project / Site name: Julian Terrace

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

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

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

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

**Jack Jones**

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Analytical Report Number : 20-86109

Project / Site name:	Julian Terrace	Samples received on:	11/02/2020
Your job number:	12603	Samples instructed on:	11/02/2020
Your order number:		Analysis completed by:	24/02/2020
Report Issue Number:	1	Report issued on:	24/02/2020
Samples Analysed:	2 soil samples		

Signed: *Karolina Marek*

Karolina Marek
Technical Reviewer (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.

Analytical Report Number: 20-86109

Project / Site name: Julian Terrace

Lab Sample Number				1438530	1438531			
Sample Reference				TP1	TP4			
Sample Number				None Supplied	None Supplied			
Depth (m)				1.2	1.2			
Date Sampled				10/01/2020	10/01/2020			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	28	32			
Total mass of sample received	kg	0.001	NONE	0.70	0.70			

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.3	7.1			
Water Soluble Sulphate as SO ₃ (2:1)	g/l	0.005	NONE	0.012	0.065			



Analytical Report Number : 20-86109

Project / Site name: Julian Terrace

* 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 *
1438530	TP1	None Supplied	1.2	Grey clay.
1438531	TP4	None Supplied	1.2	Grey clay.

Analytical Report Number : 20-86109

Project / Site name: Julian Terrace

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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
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
Sulphate, water soluble, in soil	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	NONE

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

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

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

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP1		S	20-86109	1438530	c	pH in soil (automated)	L099-PL	c
TP4		S	20-86109	1438531	c	pH in soil (automated)	L099-PL	c

APPENDIX G

LABORATORY GEOTECHNICAL TEST RESULTS



TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Integral Geotechnique
Client Address: Integral House, 7 Beddau Way,
Castlegate Business Park, CF83 2AX

Client Reference: 12603
Job Number: 20-86106
Date Sampled: 10/01/2020
Date Received: 11/02/2020
Date Tested: 19/02/2020
Sampled By: JJ

Contact: Jack Jones
Site Address: Julian Terrace

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

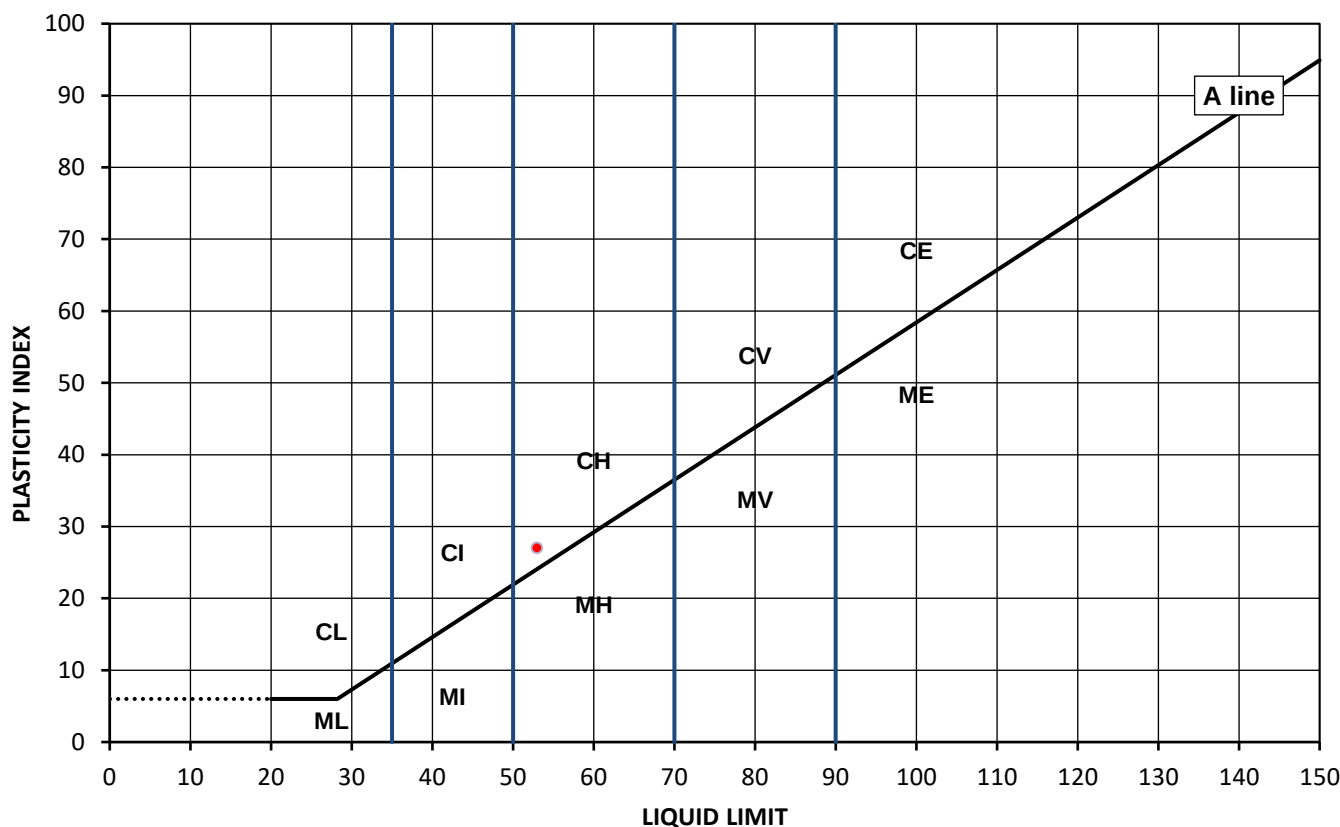
Test Results:

Laboratory Reference: 1438525
Hole No.: TP1
Sample Reference: Not Given
Soil Description: Greyish brown slightly sandy CLAY

Depth Top [m]: 1.20
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
44*	53	26	27	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	Low
		I	Medium
		H	High
		V	Very high
		E	Extremely high
			below 35
			35 to 50
			50 to 70
			70 to 90
			exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks: *Sample is wet

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Signed:

Piotrowski

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Integral Geotechnique
Client Address: Integral House, 7 Beddau Way,
Castlegate Business Park, CF83 2AX

Client Reference: 12603
Job Number: 20-86106
Date Sampled: 10/01/2020
Date Received: 11/02/2020
Date Tested: 19/02/2020
Sampled By: JJ

Contact: Jack Jones
Site Address: Julian Terrace

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

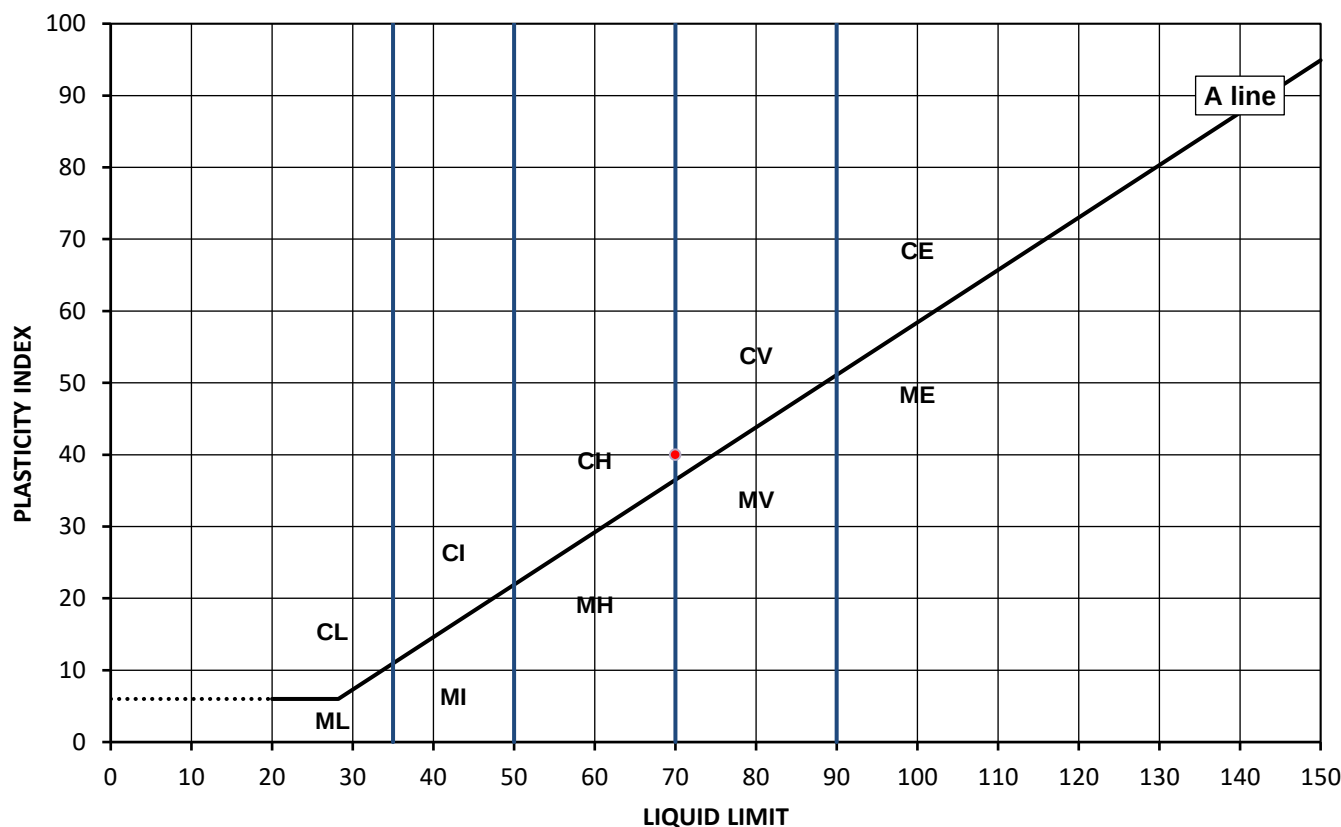
Test Results:

Laboratory Reference: 1438528
Hole No.: TP4
Sample Reference: Not Given
Soil Description: Greyish brown CLAY

Depth Top [m]: 1.20
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
55*	70	30	40	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	Low
		I	Medium
		H	High
		V	Very high
		E	Extremely high
			below 35
			35 to 50
			50 to 70
			70 to 90
			exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks: *Sample is wet

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Signed:

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd



SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Tested in Accordance with:

Client: Integral Geotechnique
Client Address: Integral House, 7 Beddau Way,
Castlegate Business Park, CF83 2AX

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg
by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990:
Clause 8.2

Client Reference: 12603
Job Number: 20-86106
Date Sampled: 10/01/2020
Date Received: 11/02/2020
Date Tested: 19/02/2020
Sampled By: JJ

Contact: Jack Jones
Site Address: Julian Terrace

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	LL	PL	PI	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
1438525	TP1	Not Given	1.20	Not Given	D	Greyish brown slightly sandy CLAY	Atterberg 4 Point	44*		100	53	26	27						
1438528	TP4	Not Given	1.20	Not Given	D	Greyish brown CLAY	Atterberg 4 Point	55*		100	70	30	40						

Note: # Non accredited; NP - Non plastic

Comments: *Sample is wet

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Signed:

Dariusz Piotrowski
PL Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

APPENDIX H

SUMMARY OF CHEMICAL TEST RESULTS

SUMMARY OF LABORATORY SOIL TEST RESULTS

METALS AND SEMI-METALS

Job No.: 12603
Site: Julian Terrace, Port Talbot
Soil Type: Made Ground
Soil Organic Matter: 1%

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	TP1	0.30	53	2.6	1.4	< 0.2	23	< 4.0	110	94	< 0.3	33	< 1.0	40	140
2	TP2	0.30	44	0.7	2.5	< 0.2	35	< 4.0	160	130	< 0.3	65	< 1.0	62	320
3	TP3	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-
4	TP4	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-
Screening Criteria Value			40.0	11000.0	1.7	85.0	-	6.0	7100.0	310.0	1.2	180.0	430.0	1200.0	40000.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	-	S4UL	S4UL	C4SL	S4UL	S4UL	S4UL	S4UL	S4UL



SUMMARY OF LABORATORY SOIL TEST RESULTS

INORGANIC CHEMICALS & OTHERS

Job No.: 12603
 Site: Julian Terrace, Port Talbot
 Soil Type: Made Ground
 Soil Organic Matter: 1%

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	TP1	0.30	< 1	14.1	23	< 1.0	7.2	0.36	1200	16	2700	4.5	7.74	Not-detected	#N/A
2	TP2	0.30	< 1	11.8	22	< 1.0	8.0	0.063	2300	8.1	1100	3.4	5.85	Not-detected	#N/A
3	TP3	0.40	-	-	20	-	-	-	-	-	-	-	<0.1	Not-detected	#N/A
4	TP4	0.50	-	-	-	-	-	-	-	-	-	-	<0.1	Not-detected	#N/A
Screening Criteria Value			34.0	-	-	750.0	-	-	-	-	-	-	-	-	0.001
Source of Screening Criteria Value			ATRISK	-	-	S4UL	-	-	-	-	-	-	-	-	IOM

SUMMARY OF LABORATORY SOIL TEST RESULTS

POLYAROMATIC HYDROCARBONS (PAH)

Job No.: 12603
 Site: Julian Terrace, Port Talbot
 Soil Type: Made Ground
 Soil Organic Matter: 1%

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	TP1	0.30	< 0.05	< 0.05	0.10	0.54	0.39	0.47	0.25	0.29	0.49	< 0.05	0.59	< 0.05	0.24	< 0.05	0.48	0.49
2	TP2	0.30	< 0.05	< 0.05	0.25	1.8	1.4	2.2	1.1	0.88	1.8	0.42	2.6	< 0.05	0.93	< 0.05	1.3	2.0
3	TP3	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	TP4	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Screening Criteria Value			3000.0	2900.0	31000.0	11.0	3.2	3.9	360.0	110.0	30.0	0.3	1500.0	2800.0	45.0	2.3	1300.0	3700.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL



SUMMARY OF LABORATORY SOIL TEST RESULTS

PETROLEUM HYDROCARBONS

Job No.: 12603
 Site: Julian Terrace, Port Talbot
 Soil Type: Made Ground
 Soil Organic Matter: 1%

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	TP1	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	TP2	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	TP3	0.40	< 0.001	< 0.001	< 0.001	46	1100	1700	< 8.4	< 0.001	< 0.001	< 0.001	14	740	1300	350	< 8.4
4	TP4	0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Screening Criteria Value			42.0	100.0	27.0	130.0	1100.0	65000.0	65000.0	0.4	880.0	47.0	250.0	1800.0	1900.0	1900.0	1900.0
Source of Screening Criteria Value			S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL	S4UL

APPENDIX I

HAZWASTEONLINE™ WASTE CLASSIFICATION REPORT

Waste Classification Report



K5XP4-GXUUJ-RJEJ4

Job name

Julian Terrace

Description/Comments

Made Ground Deposits

Project

Julian Terrace, Port Talbot

Site

Julian Terrace, Port Talbot

Related Documents

#	Name	Description
None		

Waste Stream Template

Made Ground

Classified by

Name: Jack Jones	Company: Integral Geotechnique (Wales) Limited	HazWasteOnline™ Training Record:	
Date: 18 Mar 2020 09:28 GMT	Integral House	Course	Date
Telephone: 02920 807991	7 Beddau Way, Castlegate Business Park	Hazardous Waste Classification	06 Dec 2017
	Caerphilly	Advanced Hazardous Waste Classification	-
	CF83 2AX		

Report

Created by: Jack Jones
Created date: 18 Mar 2020 09:28 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	TP1	0.30	Non Hazardous		2
2	TP2	0.30	Non Hazardous		4
3	TP3	0.40	Hazardous	HP 7, HP 11	6

Appendices	Page
Appendix A: Classifier defined and non CLP determinands	8
Appendix B: Rationale for selection of metal species	9
Appendix C: Version	10

Classification of sample: TP1

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	LoW Code:
TP1	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.30 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
23%	
(no correction)	

Hazard properties

None identified

Determinands

Moisture content: 23% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	acenaphthene	201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
2	acenaphthylene	205-917-1	208-96-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
3	anthracene	204-371-1	120-12-7		0.1 mg/kg		0.1 mg/kg	0.00001 %			
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3	53 mg/kg	1.32	69.977 mg/kg	0.007 %			
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.54 mg/kg		0.54 mg/kg	0.000054 %			
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.39 mg/kg		0.39 mg/kg	0.000039 %			
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.47 mg/kg		0.47 mg/kg	0.000047 %			
8	benzo[ghi]perylene	205-883-8	191-24-2		0.25 mg/kg		0.25 mg/kg	0.000025 %			
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.29 mg/kg		0.29 mg/kg	0.000029 %			
10	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9	1.4 mg/kg	2.775	3.885 mg/kg	0.000389 %			
11	boron { boron tribromide/trichloride/trifluoride (combined) }		10294-33-4, 10294-34-5, 7637-07-2		2.6 mg/kg	13.43	34.918 mg/kg	0.00349 %			
12	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	<0.2 mg/kg	1.285	<0.257 mg/kg	<0.00002 %			<LOD
13	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		23 mg/kg	1.462	33.616 mg/kg	0.00336 %			

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
14	chromium in chromium(VI) compounds { chromium(VI) oxide }				<4 mg/kg	1.923	<7.692 mg/kg	<0.000769 %			<LOD
	024-001-00-0	215-607-8	1333-82-0								
15	chrysene				0.49 mg/kg		0.49 mg/kg	0.000049 %			
	601-048-00-0	205-923-4	218-01-9								
16	copper { dicopper oxide; copper (I) oxide }				110 mg/kg	1.126	123.848 mg/kg	0.0124 %			
	029-002-00-X	215-270-7	1317-39-1								
17	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %			<LOD
	006-007-00-5										
18	dibenz[a,h]anthracene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
	601-041-00-2	200-181-8	53-70-3								
19	fluoranthene				0.59 mg/kg		0.59 mg/kg	0.000059 %			
		205-912-4	206-44-0								
20	fluorene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
		201-695-5	86-73-7								
21	indeno[123-cd]pyrene				0.24 mg/kg		0.24 mg/kg	0.000024 %			
		205-893-2	193-39-5								
22	lead { lead chromate }			1	94 mg/kg	1.56	146.623 mg/kg	0.0094 %			
	082-004-00-2	231-846-0	7758-97-6								
23	mercury { mercury dichloride }				<0.3 mg/kg	1.353	<0.406 mg/kg	<0.0000406 %			<LOD
	080-010-00-X	231-299-8	7487-94-7								
24	naphthalene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
25	nickel { nickel dihydroxide }				33 mg/kg	1.579	52.123 mg/kg	0.00521 %			
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
26	pH				7.2 pH		7.2 pH	7.2 pH			
			PH								
27	phenanthrene				0.48 mg/kg		0.48 mg/kg	0.000048 %			
		201-581-5	85-01-8								
28	phenol				<1 mg/kg		<1 mg/kg	<0.0001 %			<LOD
	604-001-00-2	203-632-7	108-95-2								
29	pyrene				0.49 mg/kg		0.49 mg/kg	0.000049 %			
		204-927-3	129-00-0								
30	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %			<LOD
	034-002-00-8										
31	zinc { zinc chromate }				140 mg/kg	2.774	388.381 mg/kg	0.0388 %			
	024-007-00-3										
Total:									0.0819 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD** Below limit of detection
- ND** Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Classification of sample: TP2

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:	TP2	LoW Code:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	0.30 m	Chapter:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
Moisture content:	22%	Entry:	
	(no correction)		

Hazard properties

None identified

Determinands

Moisture content: 22% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
1	acenaphthene	201-469-6	83-32-9		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
2	acenaphthylene	205-917-1	208-96-8		<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
3	anthracene	204-371-1	120-12-7		0.25 mg/kg		0.25 mg/kg	0.000025 %			
4	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3	44 mg/kg	1.32	58.094 mg/kg	0.00581 %			
5	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	1.8 mg/kg		1.8 mg/kg	0.00018 %			
6	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	1.4 mg/kg		1.4 mg/kg	0.00014 %			
7	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	2.2 mg/kg		2.2 mg/kg	0.00022 %			
8	benzo[ghi]perylene	205-883-8	191-24-2		1.1 mg/kg		1.1 mg/kg	0.00011 %			
9	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.88 mg/kg		0.88 mg/kg	0.000088 %			
10	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9	2.5 mg/kg	2.775	6.938 mg/kg	0.000694 %			
11	boron { boron tribromide/trichloride/trifluoride (combined) }		10294-33-4, 10294-34-5, 7637-07-2		0.7 mg/kg	13.43	9.401 mg/kg	0.00094 %			
12	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	<0.2 mg/kg	1.285	<0.257 mg/kg	<0.00002 %			<LOD
13	chromium in chromium(III) compounds { chromium(III) oxide }	215-160-9	1308-38-9		35 mg/kg	1.462	51.154 mg/kg	0.00512 %			

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number								
14	chromium in chromium(VI) compounds { chromium(VI) oxide }				<4 mg/kg	1.923	<7.692 mg/kg	<0.000769 %			<LOD
	024-001-00-0	215-607-8	1333-82-0								
15	chrysene				1.8 mg/kg		1.8 mg/kg	0.00018 %			
	601-048-00-0	205-923-4	218-01-9								
16	copper { dicopper oxide; copper (I) oxide }				160 mg/kg	1.126	180.142 mg/kg	0.018 %			
	029-002-00-X	215-270-7	1317-39-1								
17	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %			<LOD
	006-007-00-5										
18	dibenz[a,h]anthracene				0.42 mg/kg		0.42 mg/kg	0.000042 %			
	601-041-00-2	200-181-8	53-70-3								
19	fluoranthene				2.6 mg/kg		2.6 mg/kg	0.00026 %			
		205-912-4	206-44-0								
20	fluorene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
		201-695-5	86-73-7								
21	indeno[123-cd]pyrene				0.93 mg/kg		0.93 mg/kg	0.000093 %			
		205-893-2	193-39-5								
22	lead { lead chromate }			1	130 mg/kg	1.56	202.776 mg/kg	0.013 %			
	082-004-00-2	231-846-0	7758-97-6								
23	mercury { mercury dichloride }				<0.3 mg/kg	1.353	<0.406 mg/kg	<0.0000406 %			<LOD
	080-010-00-X	231-299-8	7487-94-7								
24	naphthalene				<0.05 mg/kg		<0.05 mg/kg	<0.000005 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
25	nickel { nickel dihydroxide }				65 mg/kg	1.579	102.667 mg/kg	0.0103 %			
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
26	pH				8 pH		8 pH	8pH			
			PH								
27	phenanthrene				1.3 mg/kg		1.3 mg/kg	0.00013 %			
		201-581-5	85-01-8								
28	phenol				<1 mg/kg		<1 mg/kg	<0.0001 %			<LOD
	604-001-00-2	203-632-7	108-95-2								
29	pyrene				2 mg/kg		2 mg/kg	0.0002 %			
		204-927-3	129-00-0								
30	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	2.554	<2.554 mg/kg	<0.000255 %			<LOD
	034-002-00-8										
31	zinc { zinc chromate }				320 mg/kg	2.774	887.727 mg/kg	0.0888 %			
	024-007-00-3										
Total:									0.146 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- <LOD** Below limit of detection
- ND** Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Classification of sample: TP3

 **Hazardous Waste**
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample Name:	LoW Code:
TP3	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 03 * (Soil and stones containing hazardous substances)
0.40 m	
Moisture content:	
20%	
(no correction)	

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1B; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.53%)

HP 11: Mutagenic "waste which may cause a mutation, that is a permanent change in the amount or structure of the genetic material in a cell"

Hazard Statements hit:

Muta. 1B; H340 "May cause genetic defects [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.53%)

Determinands

Moisture content: **20% No Moisture Correction applied (MC)**

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	CLP index number	EC Number	CAS Number									
1	TPH (C6 to C40) petroleum group				5300	mg/kg		5300	mg/kg	0.53 %		
			TPH									
Total:										0.53 %		

Key

	User supplied data
	Hazardous result
●	Determinand defined or amended by HazWasteOnline (see Appendix A)

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and ≤ 75°C"

Force this Hazardous property to non hazardous because No free hydrocarbon product observed.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.53%)

Appendix A: Classifier defined and non CLP determinands

• **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Aquatic Chronic 2 H411, Repr. 2 H361d, Carc. 1B H350, Muta. 1B H340, STOT RE 2 H373, Asp. Tox. 1 H304, Flam. Liq. 3 H226

• **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Aquatic Chronic 2 H411, Aquatic Chronic 1 H410, Aquatic Acute 1 H400, Skin Irrit. 2 H315, STOT SE 3 H335, Eye Irrit. 2 H319

• **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Skin Irrit. 2 H315, STOT SE 3 H335, Eye Irrit. 2 H319, Acute Tox. 1 H310, Acute Tox. 1 H330, Acute Tox. 4 H302

• **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Aquatic Chronic 1 H410, Aquatic Acute 1 H400, Skin Sens. 1 H317, Skin Irrit. 2 H315, STOT SE 3 H335, Eye Irrit. 2 H319

• **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 23 Jul 2015

Hazard Statements: Aquatic Chronic 1 H410, Aquatic Acute 1 H400

• **boron tribromide/trichloride/trifluoride (combined)** (CAS Number: 10294-33-4, 10294-34-5, 7637-07-2)

Conversion factor: 13.43

Description/Comments: Combines the hazard statements and the average of the conversion factors for boron tribromide, boron trichloride and boron trifluoride

Data source: N/A

Data source date: 06 Aug 2015

Hazard Statements: Skin Corr. 1B H314, Skin Corr. 1A H314, Acute Tox. 2 H300, Acute Tox. 2 H330, EUH014

• **chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Aquatic Chronic 1 H410, Aquatic Acute 1 H400, Repr. 1B H360FD, Skin Sens. 1 H317, Resp. Sens. 1 H334, Skin Irrit. 2 H315, STOT SE 3 H335, Eye Irrit. 2 H319, Acute Tox. 4 H302, Acute Tox. 4 H332

• **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

CLP index number: 006-007-00-5

Description/Comments: Conversion factor based on a worst case compound: sodium cyanide

Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)

Additional Hazard Statement(s): EUH032 >= 0.2 %

Reason for additional Hazards Statement(s):

14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

• **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Aquatic Chronic 1 H410, Aquatic Acute 1 H400, Acute Tox. 4 H302

▪ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400

▪ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

▪ **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

▪ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , Skin Sens. 1 H317 , Carc. 2 H351 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Acute Tox. 4 H302

▪ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Aquatic Chronic 1 H410 , Aquatic Acute 1 H400 , STOT SE 3 H335 , Eye Irrit. 2 H319 , Skin Irrit. 2 H315

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

beryllium {beryllium oxide}

Worst case species based on hazard statements

boron {boron tribromide/trichloride/trifluoride (combined)}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

chromium in chromium(III) compounds {chromium(III) oxide}

Worst case species based on hazard statements

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Worst case species

lead {lead chromate}

Worst case species based on hazard statements

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on hazard statements

zinc {zinc chromate}

Worst case species based on hazard statements

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.1, May 2018**

HazWasteOnline Classification Engine Version: 2020.52.4178.8324 (21 Feb 2020)

HazWasteOnline Database: 2020.52.4178.8324 (21 Feb 2020)

This classification utilises the following guidance and legislation:

WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004

1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010

2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

FIGURES

SITE LOCATION

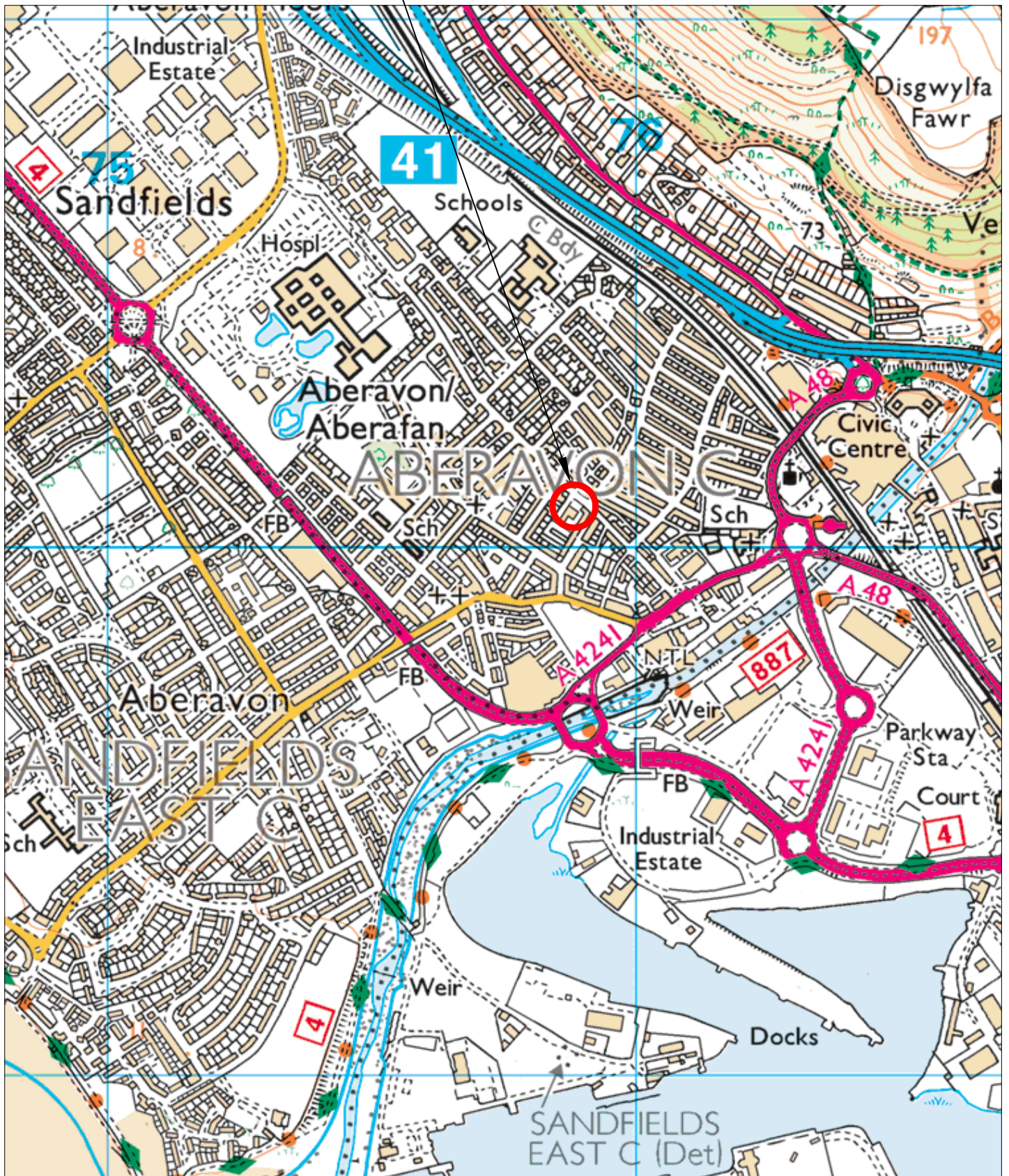


Figure 1: Site Location

Project: Land at Julian Terrace, Port Talbot

Job no.: 12603

Client: Mullai Group Ltd

Scale: 1:10,000 at A4

Intégral
Géotechnique

Integral House,
7 Beddau Way,
Castlegate Business Park,
Caerphilly,
CF83 2AX.
Tel: 029 2080 7991



Figure 2: Exploratory Hole Location Plan

Project: Land at Julian Terrace, Port Talbot

Client: Mullai Group Ltd

Job No.: 12603

Scale: NTS

Intégral
Géotechnique

Integral House,
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