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PHASE 2

GEO-ENVIRONMENTAL REPORT

job number	C5255/25/E/8168
date	22.08.2025
site address	The Crescent, Barnsley Road, Cudworth, Barnsley, South Yorkshire, S72 8SY
written by	S. Hale
checked by	I. Sakoor
issued by	S. Hale

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Report on a Phase 2 Geo-environmental Investigation

Location:	The Crescent Barnsley Road, Cudworth, Barnsley, South Yorkshire, S72 8SY
For:	Barnsley Metropolitan Borough Council
Report No.	C5255/25/E/8168 Report date: August 2025

For and on behalf of **Rogers Geotechnical Services Ltd**

	
Steven Hale BSc FGS Geo-environmental Technician	**Imran Sakoor** BEng FGS Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Development	Erection of a new residential block of flats.	1.
Geology	Superficial geology – None indicated. Solid geology – Mexborough Rock.	5.
Strata Conditions	Made ground overlying weathered clay and rock of the Mexborough Rock.	6.
Groundwater	None encountered during investigation.	6.2
Effect of Sulphates	DC-1 concrete.	10.1
Contamination	PAH contamination revealed to the made ground.	11.

[1] This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.

1. Introduction

It is understood that the land at The Crescent is to be developed by the demolition of the existing buildings with subsequent reworking of the site into a soft landscaped public open space. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number C5255/25/E/8066 in August 2025. This report has been used extensively during the current intrusive investigation.

4. Fieldworks

The fieldworks were undertaken on the 22nd July 2025 and included two hand-held windowless sample boreholes. One borehole was undertaken to the eastern side of the service yard to the rear of the site with the second being located within a basement. It should be appreciated that further boreholes are planned to be undertaken to the western side of the site and buildings once they have been acquired by the client.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

4.1 Windowless Sample Boreholes

Two boreholes were sunk using hand-held windowless sampling equipment. The cores were undertaken in 1m lengths and reduced in diameter from approximately 57mm for the first 1m through 47mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

5. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	-	-	None indicated to underlie the site.
Solid Geology	Mexborough Rock-	-	Named sandstone member of the Pennine Middle Coal Measures Formation.

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Encountered**	**Groundwater Strikes** m below ground level
0.05	MADE GROUND (Asphalt)	WS01	None
0.04	Grey CONCRETE	WS02	None
1.20	MADE GROUND (Soft, brown, slightly sandy, slightly gravelly, silty CLAY)	WS01	None
0.14	MADE GROUND (Cream, sandy GRAVEL) SUBBASE	WS02	None
1.65	Firm, brown, sandy, slightly gravelly, silty CLAY [WEATHERED MEXBOROUGH ROCK]	WS01	None
+0.15 – +1.70	Brown SANDSTONE recovered as gravel [WEATHERED MEXBOROUGH ROCK]	Both	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated.

[2] Sources: British Geological Survey (NERC) Map Sheet 87; Barnsley; Solid and Drift Edition, and GeoIndex Onshore Viewer [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

6.1 General Strata

The borehole undertaken to the service yard indicated that beneath of a capping of asphalt, slightly sandy, slightly gravelly, silty clay was recorded to a depth of 1.20m below ground level (begl). Beneath this, sandy, slightly gravelly, silty clay was encountered to a depth of 1.65m, whereupon brown sandstone recovered as gravel was present to refusal depth of 1.70m begl. It is anticipated that this clay and sandstone represent the most weathered fraction of the underlying Mexborough Rock.

Within the basement borehole, the concrete was cored and found to be 0.04m in thickness. Beneath this, subbase consisting of sandy gravel was recovered to a depth of 0.14m begl. Underlying the this material, brown sandstone was recovered as gravel to termination depth of 0.15m begl. It is anticipated that this is the same weathered Mexborough Rock as encountered within WS01.

6.2 Groundwater

No groundwater strikes were observed during the site investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike, moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

7. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- Determination of water content — BS EN ISO 17892-1:2014
- Determination of liquid and plastic limits — BS EN ISO 17892-12:2018
- Soluble sulphate content — BS 1377-3:2018+A1:2021: Pt3: 7.3
- pH value — BS 1377-3:2018+A1:2021: Pt3: 12

The test results are presented in Appendix 3 and are summarised below:

Table 3: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	1	20%		Well below the liquid limit.
Index properties (1 Point)	1	LL PL PI	36% 19% 17%	Clay of intermediate plasticity. Consistency index of 0.9.
Soluble sulphate & pH	1	SO_4 pH	28.9mg/l 8.3	

8. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN^- and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO_4^{2-}.
- Asbestos.

This testing was undertaken by i2 Analytical Ltd and the results of all of the chemical testing are presented in Appendix 3 of this report.

9. Discussion of Ground Conditions - Geotechnical

It is understood that the site is to be developed by the demolition of the existing buildings with subsequent reworking of the site into a soft landscaped public open space. At the time of writing this report the precise layout and method of construction is not known, however, it is understood that not structures are to be present. As such, no discussion shall take place based on foundation design.

Attention should be given to the presence of the existing basements to the terraces present to site. These will either have to be removed during site works or infilled with a competent material. Cognisance should also be given to the basement floors that, should they be left in situ, will have to be perforated to ensure that water does not accumulate. This could be enabled by holes being drilled at intervals along the lengths of the basement floors to allow water to percolate through and into the bedrock beneath.

9.1 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2[4], which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1[5], which can be found in Part D, *Specifying concrete for general cast-in-situ use,* of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

[4] Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*
[5] Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

10. Discussion of Ground Conditions - Environmental

10.1 Discussion of Test Results

It is understood that the site is to be developed by the demolition of the existing buildings with subsequent reworking of the site into a soft landscaped public open space. Consequently, the site may be classified as public open space.

10.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the sample tested was found to be 2.5%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website[6] and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 3. These results indicate the following:

Table 4: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Public Open Space)
WS01	0.20	PAHs: Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)anthracene & Benzo(g,h,i)perylene.

Concentrations of cadmium chromium^{VI}, mercury, selenium, free cyanide, phenols (total) and total petroleum hydrocarbons (aliphatic C5 to C35; aromatic C5 to C10) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soils samples tested.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion[7]. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 5: Summary of Areas Contaminated by PAHs & TPHs

Location	Depth (m)	Contaminants found to be exceeding SSVs (Public Open Space)
WS01	0.20	PAHs: Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-c,d)Pyrene & Dibenz(a,h)anthracene.

[6] http://www.atrisksoil.co.uk/pages/general/subscribers.asp
[7] Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Public open space land use, 23.06.17.

On the basis of the above information, the results of the investigation have concluded that the site is contaminated. Indeed, PAH contamination has been observed to exceed the appropriate screening values within multiple determinands.

10.2 Site Specific Risk Assessment

10.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency[8] advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.[9] This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed, DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'[10]

10.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 6. Sources of contamination include the following:

On-site – Made Ground (PAHs).

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

N/A - A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.

Low - A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.

Moderate - The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary

High - The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

The results of the risk assessment are presented in Table 6.

[8] R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.
[9] The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.
[10] See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

Table 6: Conceptual Site Model and Site-Specific Risk Assessment [Contamination: PAHs]				
Conceptual Site Model			**Site Specific Risk Assessment**	
Pathways	**Receptor**	**Linkage Present?**	**Risk Rating**	**Notes**
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contamination found to be present at the site and contact with soil likely during works.	High	Some contamination is present in the soils underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, as the site is anticipated to be secured during the development phase, contamination is not anticipated to affect neighbours.
	End User	Yes – contamination found to be present at the site and site to be developed into a soft landscaped public open space area.	High	
	Neighbours	Yes – contamination found to be present at the site and a populated residential and commercial area surrounds the site.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from contaminated soils.	High	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways.
	End User	Yes – dust may be derived from contaminated soils.	High	
	Neighbours	Yes – contamination found to be present at the site and residential and commercial properties located within 250m radius of the site and possible inhalation of dust during the works.	High	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, the contamination at the site is considered to be of limited mobility, therefore the likelihood of contamination affecting neighbouring gardens is considered low risk.
	End User	Yes – contamination found to be present at the site and site to be developed into a soft landscaped public open space area.	Moderate	
	Neighbours	Yes – contamination found to be present at the site and residential area adjoins the site.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	No – no enclosed spaces are included within the proposed developments. Any ground gas will vent to atmosphere.	N/A	No further action required.
	End User		N/A	
	Neighbours	No – no structures directly adjoin the site, therefore gases migrating from the site would vent to atmosphere before reaching neighbouring structures.	N/A	

Spillage/loss/run off direct to receiving water	Controlled Waters	No – there are no controlled waters within 250m of the site.	N/A	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways. Old services to be removed or capped.
Migration via permeable unsaturated strata	Controlled Waters	Yes – a Secondary A aquifer is present beneath the site. However, the site is underlain by cohesive soils of likely low permeability. Contamination by PAHs is not anticipated to be significantly mobile.	Moderate	
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. However, the site is underlain by cohesive soils of low permeability. Contamination by PAHs is not anticipated to be significantly mobile.	Low	
Direct contact with contaminated soils	Plants	Yes – contamination present at the site which may affect plants.	Moderate	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways.
Uptake via root system			Moderate	
Direct contact with contaminated soils	Building Materials	Yes – PAH contamination revealed at the site may represent a significant risk to building materials or plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Moderate (plastic services) Low (buried concrete)	Please see section 11.3.3 for information on good building practice.
Direct contact with contaminated groundwater				
Exposure to Radon	Operative	No – while the site is present in a low risk radon affected area, no enclosed spaces are included within the proposed developments. Radon will vent to atmosphere.	N/A	No further action required.
	End User			
UXO Risk	Operative	No – it is considered that the activities of the end users are unlikely to affect any UXO devices that may be present below the site.	Low	No further action required.
	End User			

10.3 Indicative Remediation Strategy

In view of the site-specific risk assessment it is considered that remediation will be required at this site. Such a strategy should include the following main elements.

10.3.1 Remediation Objectives

Based on the site-specific risk assessment the object of the remediation is likely to be as follows.

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust.
- To protect neighbours from the inhalation and ingestion dust during the construction process.
- To protect operatives, end users and neighbours from the ingestion of contaminated fruit and vegetables.
- To protect plants from direct contact with contamination and prevent uptake via root system.
- To ensure that contamination cannot reach controlled waters via surface run-off or permeable strata.
- To ensure that contamination cannot enter the former services occupying the site which may return to controlled waters.
- To protect plastic services from being penetrated by, or degrading due to the presence of, contamination in the soil or groundwaters.

10.3.2 Development Requirements

Whilst the precise nature of this development has not been finalised it is understood that it is to be developed by the demolition of the existing buildings with subsequent reworking of the site into a soft landscaped public open space. In view of the above a site-specific remediation strategy should be undertaken after the proposed development has been finalised. However, for preliminary design and costing the following remediation proposals are offered.

10.3.3 Outline Strategy

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore, the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site-specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the hazards of working with contaminated soils.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- In order for contaminated soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. However, further determinand specification contamination testing may be necessary.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.

Landscaped Areas

It is understood that soft landscaped areas will make up much of the proposed development that will likely be planted with mixed vegetation including grasses, shrubs and trees. In view of this and the potential contamination on site, it is considered that landscaped areas will require some remediation. This could include the provision of a clean cover system including a capping layer of say 500mm of inert material, which will put the contaminated ground out of the end users' dig range. At the base of this layer, a granular capillary break of say 100mm of free draining granular soil should be placed in order to prevent mobile contamination rising upward. This expedient should also provide a suitable root barrier to isolate the plants from the underlying contaminated ground.

10.4 Fill Materials

It should also be appreciated that any fill material, either site-won or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882 (2015)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG[11] documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 7: Validation Sampling and Testing

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m^3	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m^3 and 1 per 250m^3	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6	Standard metals/ metalloids (as above), PAH (16 USEPA

[11] *YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V4 .1* Appendix 1a, June 2021

	Dependent on source and receptor, between 1 per 50m^3 and 1 per 100m^3	speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

Table 8: Fill Screening Values

Contaminant	Screening Value (Public Open Space) (mg/kg)		Reference
	1% SOM	6% SOM	
As	168	168	Atrisk^{SOIL} SSVs
Cd	882	882	Atrisk^{SOIL} SSVs
Cr(VI)	132 | 251	132 | 251	Atrisk^{SOIL} SSVs
Cu	45200	45200	Atrisk^{SOIL} SSVs
Hg	94.3	96.9	Atrisk^{SOIL} SSVs
Ni	804	804	Atrisk^{SOIL} SSVs
Pb	1340	1340	Atrisk^{SOIL} SSVs
V	7490	7490	Atrisk^{SOIL} SSVs
Zn	201000	201000	Atrisk^{SOIL} SSVs

Please see summary sheet within Appendix 4 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.

10.5 Verification Report

In order to demonstrate that the remedial works and provision of clean cover has been sufficiently carried out where applicable, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- The assessment of the extents of any contamination identified including the details of sampling points, such as location and descriptive logs, and the results of any chemical testing.
- The extents of any areas where made ground has been wholly removed.
- Characterisation of the suitability of the clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.
- Photographic and logged evidence the clean material has been handled on site and placed in a sufficient thickness over areas where made ground remains. This may be either at the time of placement or after placement by means of hand excavated trialpits. Photographs should include visual site references or reference boards to prove the location and date taken. A measurement reference should be visible in the photographs to substantiate the thickness of material placed. Please note that it may also be necessary to undertake a topographical survey and the requirement for which should be checked with any statutory authorities.

The report detailed above should be produced by a suitably qualified engineer. The number of verification areas for the development should be confirmed with any statutory authorities for the site.

11. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Completion and reporting of recommended additional site investigation.
- Discussions with ground work contractors in relation to the requirement for testing of materials to be disposed off-site (Waste Acceptance Criteria) and the suitability of imported materials.
- Discussions with service providers regarding suitable materials for pipe work given the nature of chemical determinands found within the soils on site.
- Produce a validation report to demonstrate that the geo-environmental risks discussed in this report have been mitigated.
- Detailed design of the site.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.

12. References

- British Geological Survey (NERC) (2025), BGS, Keyworth.
  - GeoIndex Onshore Viewer:
  - (*https://www.bgs.ac.uk/)*
  - Lexicon of Named Rock Units:
  - (*http://www.bgs.ac.uk/lexicon/)*

- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes,* B.S.I., London.

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Appendix 1

Site Plan

Notes:

RGS Environmental Geotechnical Specialists

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:
Barnsley Metropolitan Borough Council

Job Number:
C5255/25/E/8168

Project Details:
The Crescent, Barnsley Road, Cudworth, Barnsley, South Yorkshire, S72 8SY

Scale:	Not to scale - reference only

Appendix 2

Borehole Records

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **WS01**

Sheet 1 of 1

Project Name: The Crescent	Project No. C5255/25/E/8168	Co-ords:	Hole Type WLS
Location: Barnsley Road, Cudworth, Barnsley, S72 8NB		Level:	Scale 1:25
Client: Barnsley Metropolitan Borough Council		Dates: 22/07/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
				57	80		0.05			MADE GROUND (Asphalt).
										MADE GROUND (Soft, brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is sub-angular and fine to medium of ash, brick, concrete, limestone and sandstone).
				47	80		1.20			Firm, brown, sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is sub-angular and fine to coarse of sandstone. [WEATHERED MEXBOROUGH ROCK]
		1.50	D				1.65			Brown SANDSTONE recovered as gravel. [WEATHERED MEXOROUGH ROCK]
							1.70			End of Borehole at 1.70m

Remarks

AGS

Borehole Log

Borehole No. **WS02**

Sheet 1 of 1

Project Name: The Crescent	Project No. C5255/25/E/8168	Co-ords:	Hole Type WLS
Location: Barnsley Road, Cudworth, Barnsley, S72 8NB		Level:	Scale 1:25
Client: Barnsley Metropolitan Borough Council		Dates: 22/07/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.04			Grey CONCRETE.
							0.14			MADE GROUND (Cream, sandy, angular to sub-angular and fine to medium GRAVEL of limestone. Sand is fine to coarse). [SUBBASE]
							0.15			Brown SANDSTONE recovered as gravel. [WEATHERED MEXBOROUGH ROCK]
										End of Borehole at 0.15m

1 2 3 4 5

Remarks

Appendix 3

Laboratory Testing

UKAS TESTING
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LABORATORY REPORT

job number	C/5255/25/E/8168
date	11/08/2025

site address	The Crescent Barnsley Road, Barnsley, South Yorkshire, S72 8SY

date scheduled	28/07/2025
date issued	11/08/2025

issued by	H J Letch

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Schedule of UKAS Accredited Laboratory Tests

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1. CLASSIFICATION OF SOIL	BS 1377-2:2022	BS EN ISO 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2	BS EN ISO 17892-1:2014+A1:2022	A	
ii. Saturation m/c of chalk	Pt 2 :			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2	**BS EN ISO 17892-12 2018+A2:2022**	A	
ii. Plastic limit	Pt 2	**BS EN ISO 17892-12 2018+A2:2022**	A	
iii. Shrinkage limit	:			U
iv. Linear shrinkage	Pt 2		A	
1.3 Particle Density				
i. Gas jar	Pt 2 :		A	
ii. Large pyknometer	Pt 2			U
iii. Small pyknometer		BS EN SIO 17892-3:2015	A	
1.4 Density Tests				
i. Linear measurement	Pt 2	BS EN ISO 17892-2:2014	A	
ii. Immersion in water	Pt 2	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9			U
v. Core cutter	Pt 9			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2	BS EN ISO 17892-4:2016	A	
ii. Wet Sieve	Pt 2	BS EN ISO 17892-4:2016	A	
iii. Sedimentation by pipette	Pt 2	BS EN ISO 17892-4:2016	A	
iv. Sedimentation by hydrometer	Pt 2			U
2. CHEMICAL TESTS	**BS 1377-3:2018**			
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS	**BS 1377-2:2022**			
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 2		A	
- CBR mould	Pt 2		A	
ii. 4.5kg rammer – 1 litre mould	Pt 2		A	
- CBR mould	Pt 2		A	
3.2 Moisture Condition Value				
i. Single point test	Pt 2			U
ii. MCV/moisture content relationship	Pt 2			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 2		A	
ii. Recompacted sample	Pt 2		A	
iii. Soaked, inc measurement of swell	Pt 2		A	
4. COMPRESSIBILITY OF SOIL	**BS 1377-2:2022**			
i. One dimensional consolidation	Pt 2	BS EN ISO 17892-5:2017	A	
ii. Swelling pressure test	Pt 2			U
5. SHEAR STRENGTH OF SOIL	**BS 1377-2:2022**			
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 2	BS EN ISO 17892-8:2018	A	
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U

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Disclaimer

The results reported herein relate only to the material supplied to the laboratory.

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GEOTECHNICAL TESTING RESULTS

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Rogers Geotechnical Services Ltd
Offices 1 & 2 Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU
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Summary of Classification Test Results

Project No.	Project Name
C5255/25/E/8168	The Crescent

Hole No.	Sample				Soil Description	Density bulk Mg/m^3	Density dry Mg/m^3	*w* %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m^3	1pt/4pt	Date	Increase/Decrease
	Ref	Top	Base	Type												
WS01	1	1.50		D	Soft to firm brown slightly sandy gravelly CLAY.			20	50	36	19	17		4pt	23-Jul	Increase

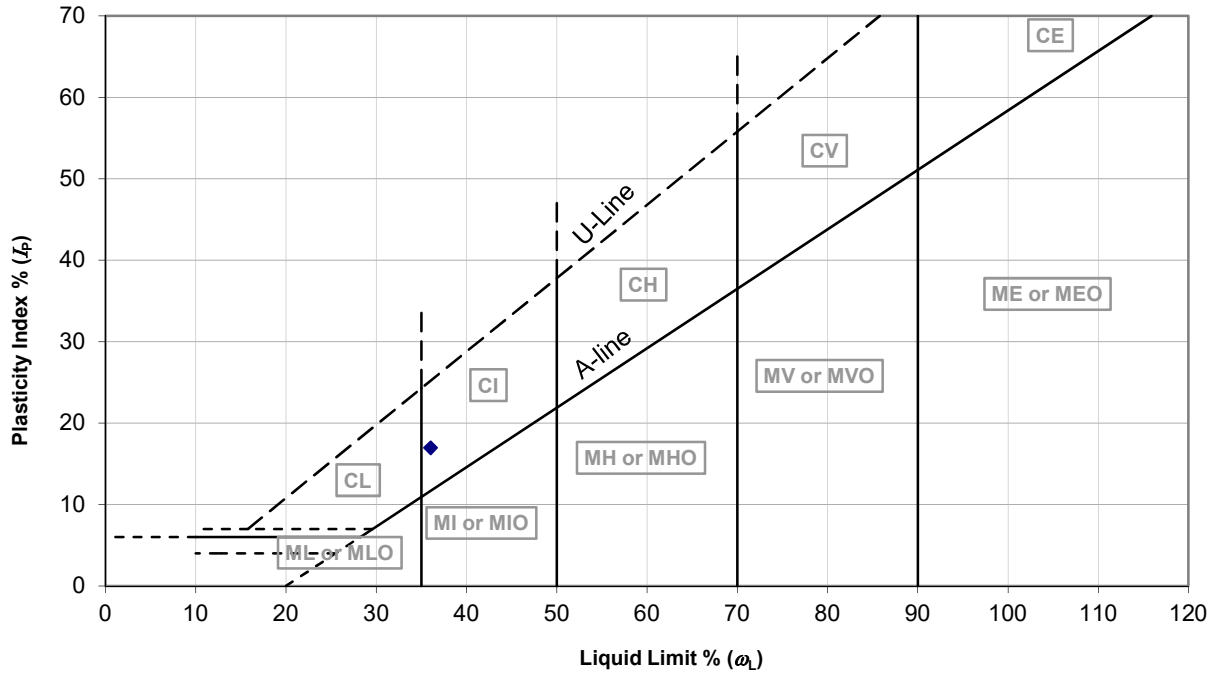
All Water Content Tests perfromed to BS EN ISO 17892-1:2014+A1:2022 Unless specified Otherwise
All Index Property testing preformed to BS EN ISO 17892-12 2018+A2:2022 Unless Specified Otherwise
All Liquid Limit Tests performed on a 80g/30 Degree Cone unless specified otherwise

Key			Date Printed	Approved By	Table
Density test	Liquid Limit	Particle density			
Linear measurement unless :	4pt cone unless :	sp - small pyknometer	30/07/2025		1
wd - water displacement	cas - Casagrande method	gj - gas jar			sheet
wi - immersion in water	1pt - single point test			Harry	1

Rogers Geotechnical Services Ltd. Offices 1&2, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU	**Classification of Index Properties**	**C5255/25/E/8168**
Project Name: The Crescent	**BS EN ISO 17892-12 2018+A2:2022**	Fig. 2 / Sheet. 1
Location:		Input By: Harry
Client: Barnsley Metropolitan Borough Council		Check By: EC

Location	Depth (m)	Water Content (ω) (%)	Liquid Limit (ω_L) (%)	Plastic Limit (ω_P) (%)	Plasticity Index (I_P) (%)	Retained by 0.425mm (%)	Modified (ω) (ω') (%)	Modified (I_P) (I_P') (%)	Liquidity/ Consistency (I_L) (%)	Liquidity/ Consistency (I_C) (%)	Casagrande Class	N.H.B.C Class (%)
WS01	1.50	20	36	19	17	50	40	9	0.1	0.9	C I	*

Interpretation graph based on BS EN ISO 14688-2:2018 any interpretations are expressed outside of our UKAS Accreditation.



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Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

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

Analytical Report Number : 25-039658

Project / Site name:	The Crescent	**Samples received on:**	25/07/2025
Your job number:	C 5255 25 E 8168	**Samples instructed on/ Analysis started on:**	25/07/2025
Your order number:	PO 3465	**Analysis completed by:**	04/08/2025
Report Issue Number:	1	**Report issued on:**	04/08/2025
Samples Analysed:	1 soil sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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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: 25-039658
Project / Site name: The Crescent
Your Order No: PO 3465

Lab Sample Number				627105
Sample Reference				WS01
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.20
Date Sampled				23/07/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	14
Total mass of sample received	kg	0.1	NONE	0.8
Asbestos				
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM
Analysis completed	N/A	N/A	N/A	30/07/2025
General Inorganics				
pH (L099)	pH Units	N/A	MCERTS	8.3
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	0.052
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	58
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	28.9
Organic Matter (automated)	%	0.1	MCERTS	2.5
Total Phenols				
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	6.5
Acenaphthylene	mg/kg	0.05	MCERTS	0.47
Acenaphthene	mg/kg	0.05	MCERTS	18
Fluorene	mg/kg	0.05	MCERTS	16
Phenanthrene	mg/kg	0.05	MCERTS	110
Anthracene	mg/kg	0.05	MCERTS	32
Fluoranthene	mg/kg	0.05	MCERTS	110
Pyrene	mg/kg	0.05	MCERTS	93
Benzo(a)anthracene	mg/kg	0.05	MCERTS	42
Chrysene	mg/kg	0.05	MCERTS	33
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	38
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	14
Benzo(a)pyrene	mg/kg	0.05	MCERTS	37
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	16
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	3
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	17
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	580

Analytical Report Number: 25-039658
Project / Site name: The Crescent
Your Order No: PO 3465

Lab Sample Number				627105
Sample Reference				WS01
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.20
Date Sampled				23/07/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14
Copper (aqua regia extractable)	mg/kg	1	MCERTS	26
Lead (aqua regia extractable)	mg/kg	1	MCERTS	84
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	16
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	50
Petroleum Hydrocarbons				
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	8.4
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	94
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	440
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	460
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	1000
VOCs				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 25-039658
Project / Site name: The Crescent

* 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 *
627105	WS01	None Supplied	0.2	Brown clay and sand with gravel

Analytical Report Number : 25-039658
Project / Site name: The Crescent

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID with carbon banding aliphatic and aromatic	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-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

Analytical Report Number : 25-039658
Project / Site name: The Crescent

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

End of Report

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Appendix 4

Fill Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Public Open Space Landuse

Tox Data Report No.	Compound	Public Open Space Landuse (mg/kg)				Reference
	Metals	**SOM: 1%**		**SOM: 6%**		
3	Cadmium	882		882		C
4	Chromium VI	132	251	132	251	B/C
	Copper	45200		45200		A+
7	Mercury	94.30		96.90		A/D
8	Nickel	804		804		A+
	Lead	1340		1340		C
	Zinc	201000		201000		A+
	Vanadium	7490		7490		A+
	Semi and Non Metals					
1	Arsenic	168		168		C
10	Selenium	2550		2550		A
	Free Cyanide	34		34		A
9	Phenols (total)	685		3170		A
	Poly Aromatic Hydrocarbons	Free product	No free product	Free product	No free product	
20	Napthalene	75.04	623	2280		A+
	Acenaphthene	28600		30100		A+
	Fluorene	19600		20200		A+
	Anthracene	150000		152000		A+
	Fluoranthene	20200		20300		A+
	Pyrene	15100		15200		A+
	Benzo(a)anthracene	1.71	9.52	10.3	12.2	A
2	Chrysene	0.44	993	2.64	1160	A
2	Benzo(b)fluoranthene	1.22	11.5	7.29	13	A
2	Benzo(k)fluoranthene	0.686	123	4.12	137	A
2	Benzo(a)pyrene	8.6	21.4	8.99	21.4	B/C
2	Dibenzo(a,h)anthracene	0.0614	11.2	3.68	12.7	A*
2	Indeno(1,2,3-cd)pyrene	0.00393	1.27	0.236	1.42	A
2	Benzo(g,h,i)perylene	0.0187	143	0.112	154	A
	Petroleum Hydrocarbons					
	Aliphatic C5-C6	327	109000	1098	3400	A+
	Aliphatic C6-C8	157	163000	768	54200	A+
	Aliphatic C8-C10	82.4	9720	475	22700	A+
	Aliphatic C10-C12	49.9	17700	297	27800	A+
	Aliphatic C12-C16	20.9	23800	126	30000	A+
	Aliphatic C16-C21	86400		86400		A+
	Aliphatic C21-C35	86400		86400		A+
	Aromatic C5-C7 (Benzene)	139		231		A+
	Aromatic C7-C8 (Toluene)	835	69900	4350	101000	A+
	Aromatic C8-C10	613	5140	3604	10094	A+
	Aromatic C10-C12	369	8260	11600	11600	A+
	Aromatic C12-C16	155	10600	12200	10600	A+
	Aromatic C16-C21	7870		7870		A+
	Aromatic C21-C35	7870		7870		A+
	Others					
	Asbestos Not Detected					
	A+ = Values update June 2017.					
	A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.					
	B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).					
	C = Catergory 4 Screening Levels (C4SLs).					
	D = SSV provided is for Methyl Mercury.					