GEOLOGICAL
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GEOENVIRONMENTAL
DATA ACQUISITION
CONSULTANCY

Phase 2 Intrusive Site Investigation Report

LOCATION	1 & 1A Sparks Road, Huddersfield, HD3 4BX
ISSUE DATE	December 2024
FOR	Oakes Manor Construction Ltd
CLIENT REF.	
OUR REF.	G24326

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1. Introduction

In accordance with your instruction, Geoinvestigate Limited has carried out an intrusive site investigation at 1 & 1A Sparks Road, Huddersfield, HD3 4BX.

A Phase 1 Desk Study has previously been completed by Geoinvestigate Limited (G24277, August 2024). The most pertinent findings of the desk study comprised the following:

Main Historical Features	**Onsite:** Dwellings. **Surrounding Area:** Mill ponds, ground workings and allotment gardens
Geology / Hydrogeology	**Artificial:** No BGS recorded artificial. **Superficial:** No BGS recorded superficial. **Bedrock:** Soft Bed Flags - Sandstone
Landfills / Infilled Ground	No recorded landfills. Potentially infilled ground identified.

Site Suitability	Desk Study Finding	Preliminary Assessment
Normal Foundations	Bedrock potentially present at shallow depth with possible thin drift deposits. A potential for made/infilled ground has been identified.	Unclear
Soakaways	Sandstone bedrock unlikely to offer sufficient permeability.	Unlikely to be suitable

Potential Risks	Desk Study Finding	Preliminary Risk Assessment
Radon Gas	Less than 1% of properties affected.	Negligible
Chemical Contamination	Historical nearby and on-site land uses potentially giving rise to a range of inorganic and organic contaminants including asbestos, metals/metalloids, PAHs and petroleum hydrocarbons.	Low
Hazardous Gas	Potential for hazardous gas to be generated in made/infilled ground deposits.	Low to Moderate
Ground Instability / subsidence	Potential for vegetation influence on shrink-swell clays which may be present, including risk of soil heave. Potential for significant deposits of compressible made/infilled ground.	Low
Ground Instability / subsidence	Potential for unrecorded shallow coal mining.	Very low

NB. Arbitrary potential hazard assessment: High (Red), Moderate (Amber), Low (Yellow), Very Low (Green), Negligible (uncoloured)

It is proposed to construct four new dwellings comprising of two semi-detached residential units whilst retaining the existing building at the site with associated soft landscaping (including private gardens) and hardstanding access roads and parking. The boundary of the current study area and the proposed developmental layout are presented on the site plan included within Appendix 1 of this report.

The purpose of this Phase 2 investigation has been to establish the true nature of the ground conditions at the site with regard to the potential contamination and hazardous gas that have been identified during preliminary research, and to determine appropriate solutions for the proposed new structure.

2. Scope of Phase 2 Investigation

2.1 Scope of Works

Given the above, the following investigation was carried out to assess the potential risks to the proposed development:

- Three (3) boreholes (ref. BH1 to BH3) were undertaken at the site to depths of between 1.00m and 2.40m below ground level (mbgl) with associated soil sampling, logging and supervision of the works by a suitably qualified geo-environmental engineer. The boreholes were commenced using windowless sampling techniques with a Dando Terrier 2002 mini drilling rig.

- Three (3) hand excavated trial pits (re. TPA to TPC) to provide additional information on near-surface ground conditions, and to collect additional samples for contamination analysis, including from proposed soft landscaping and/or garden areas and locations inaccessible to the drilling rig.

- The installation of three (3) ground gas monitoring wells in boreholes BH1, BH2 and BH3 with allowance for up to six (6) gas monitoring visits over a period of up to three (3) months (if appropriate), including readings below 1000mb and where possible following a sharp drop in atmospheric pressure.

- Contamination analyses of four (4) samples of topsoil, made ground and natural subsoil recovered at depths of between 0.20mbgl and 0.60mbgl. Analysis was variably undertaken for a general suite of potential metal/metalloid contaminants, polycyclic aromatic hydrocarbons (PAHs), asbestos, PCBs (polychlorinated biphenyls), and petroleum hydrocarbons. Chemical analyses were based on the attending engineer's assessment of soils and ground conditions at the site together with desk study findings. Leachate from one (1) of these samples was tested to check the mobility of potential contaminants given the likely presence of permeable strata and shallow groundwater.

- Provision of an interpretative report including site plan, borehole logs, trial pit logs, contamination soil analysis results, ground gas monitoring results, advice on the contamination and advice regarding any remediation and validation works that may be necessary.

The trial pit and borehole positions are shown on the plan provided in Appendix 1.

The excavations were sampled and logged at site by a geoenvironmental engineer and the ground conditions encountered are described on the trial pit and borehole logs also provided in Appendix 1.

The results of the contamination testing are included in Appendix 3 (I2 Analytical Ltd. report no. 24-052213).

2.2 Sampling Rationale

The borehole positions were chosen to give an indication of the ground conditions generally throughout the site, in terms of assessment of soil contamination. The soils encountered in the boreholes are considered to be broadly representative of soils throughout the site. The hand excavated trial pit positions were specifically chosen to target proposed areas of soft landscaping or gardens.

Where possible, boreholes and trial pits were positioned in areas where gardens or soft landscaping are proposed to maximise the relevance of contamination analyses (i.e. locations where human-soil contact will be most likely in the proposed development).

3. Phase 2 Investigation Findings

3.1 Ground Conditions

3.1.1 Windowless Sample Boreholes

The ground conditions were relatively uniform across the site and comprised topsoil to a depth of between 0.20m to 0.30m underlain by natural strata predominantly comprising sand and gravel with occasional cobbles. Weak sandstone rock commenced below depths of between 0.90m and 2.20m in the boreholes.

The initial topsoil comprised sandy gravelly clay and sandy gravel with gravel constituents of sandstone, brick and coal.

Below the topsoil the natural ground comprised predominately medium dense to dense granular strata of clayey sandy gravel containing gravel constituents of sandstone. Weak sandstone rock was encountered below depths of 0.90mbgl to 2.20mbgl. This extended to between 1.00mbgl and 2.40mgbl where the boreholes were terminated or met refusal.

No ground water was recorded during the works. No significant roots were recovered.

3.1.2 Hand Excavated Trial Pits

Trial pits TPA to TPC each encountered broadly similar conditions to the boreholes. In TPA and TPC the initial topsoil extended to depths of 0.25m and 0.20m respectively and was underlain by natural clayey sandy gravel. TPB found initial topsoil underlain by made ground comprising sandy gravel with brick, pot and tiles with some cobbles noted.

The trial pits each remained stable and dry on completion. No significant roots were recovered.

4. Contamination Testing

As mentioned in Section 1, the use of the study site itself and construction works within the site might comprise the most viable potential sources of contamination at the site.

The soils most likely to contain contamination were expected to be the topsoil or occasional made ground deposit, encoutered in the boreholes and trial pits to a maximum depth of 0.70m.

Soils close to surface would be the most relevant regarding human health risk assessment though analysis of deeper underlying natural subsoils and/or leachate from the made ground was also considered appropriate to ensure no risk to local ground and surface waters exists through potential contaminant leaching and mobilisation.

Other than the presence of occasional brick, pot and tile, the topsoil and made ground showed no obvious visual or olfactory evidence of potential contamination or contaminative materials. However, given the site's history and its proximity to potential sources of contamination, the potential for contamination to have affected the site could not be ruled out without soil analyses.

To ensure representation and characterisation of all relevant soil types, the analyses included:

- Samples of topsoil from BH1 and TPA.
- Samples of the largely granular near-surface made ground stratum from TPB.
- A sample of natural undisturbed subsoil from TPC.

Based on the findings of the site works, four (4) samples of topsoil, made ground and natural subsoil from depths of between 0.20m and 0.60m recovered from across the site were tested for a range of substances. These samples were tested for a range of substances, depending on their origin, the requirements of the investigation, and the assessment of the attending engineer. Test suites variably included metals/metalloids, PAHs, asbestos, and petroleum hydrocarbons. Leachate from one (1) of the sample was analysed also to determine if there might be any risk of mobile contamination, with testing including TPH where appropriate.

The results of the contamination testing are included in Appendix 3 of this report (I2 Analytical Ltd. Report 24-052213)

4.1 Method

Geoinvestigate Ltd. uses a combination of assessment criterion provided by the Environment Agency, DEFRA and by the Chartered Institute of Environmental Health in order to assess the presence of potentially harmful chemicals within soils and water. These include: Environment Agency Environmental Quality Standards (EQSs), Site Specific Assessment Criteria (SSAC) generated using CLEA software version 1.06 site specific risk assessment modelling, DEFRA Category 4 Screening Levels (C4SLs), and Land Quality Management / Chartered Institute of Environmental Health (LQM/CIEH) Safe for Use Levels (S4ULs).

As the site is to be developed as residential dwellings, it falls within the residential end-use category. As it is possible that persons living on the site may cultivate vegetables / fruit for consumption, consideration to this end is also necessary.

No site-specific assessment criteria (SSAC) have been created for the site as no unusual circumstances (i.e., occupation periods etc.) are considered to be present/likely at the site that would render the generic residential assessment criteria unsuitable.

The results of the contamination testing that has been carried out have been compared to the soil quality values from the above sources. Where they fall below these limit values, they have been deemed safe for a residential end use.

An appraisal of the chemical results and relevant limits is set out in the Contamination Risk Assessment that follows.

4.2 Contamination Risk to Sensitive Receptors

4.2.1 Human Health

Made ground was an isolated occurrence in the boreholes and was encountered to a maximum depth of 0.70m, found within TPB.

Save for the presence of brick, pot and tile little visual and/or olfactory evidence of contamination was found in any of the encountered soils, including no visible evidence of asbestos contamination.

As discussed earlier in the report, levels of determinands have been compared to the soil assessment criteria for residential end-use, as published by DEFRA and LQM/CIEH, with DEFRA C4SLs taking priority where more than one target value exists due to their “more pragmatic whist still strongly precautionary” nature (quote from SP1010 C4SL Policy companion Document).

A mean Total Organic Carbon Content (TOC) of 1.3% and mean Soil Organic Matter Content (SOM) of 3.8% (estimated from the TOC) were returned from the soil analyses. Therefore, the LQM/CIEH GAC for PAHs and other hydrocarbons were chosen using the highest Soil Organic Matter (SOM) option of 6.0%, which is considered the most representative (and a conservative) value for the samples returned.

A summary of the results is shown in Table 1 on the following page.

Table 1: Summary of Chemical Determinands in Soil

Determinand	Units	Limits of Detection	Total Samples	Returned Concentrations		Threshold Ranges S4UL / C4SL	
				Min	Max	Min	Max
pH	pH Unit	N/a	4	6	8	-	-
Water Soluble Sulphate as SO4 (2:1)	mg/l	<1.25	4	23.2	81.9	-	-
Moisture Content	%	< 0.01	4	13	18	-	-
Organic Matter	%	< 0.1	4	1.3	3.8	-	-
Metals							
Arsenic	mg/kg	<1	4	3.5	24	37	37
Boron (Water Soluble)	mg/kg	< 1	4	0.3	1	290	290
Cadmium	mg/kg	< 0.2	4	<0.2	1	11	11
Copper	mg/kg	< 4	4	8.5	83	2400	2400
Chromium III	mg/kg	< 2	4	13	40	910	910
Hexavalent Chromium	mg/kg	< 1.8	4	<1.8	< 1.8	6	6
Free Cyanide	mg/kg	< 1	4	<1	< 1	140	140
Total Cyanide	mg/kg	< 1	4	<1	< 1	140	140
Lead	mg/kg	< 1	4	32	110	200	200
Mercury (Aqua regia extractable)	mg/kg	< 0.3	4	<0.3	0	410	410
Nickel	mg/kg	< 1	4	7.2	18	120	180
Selenium	mg/kg	< 1	4	<1	< 1	250	250
Zinc	mg/kg	< 1	4	53	120	3700	3700
Asbestos Screen	-	-	2	Not Detected		Detection	
Organics							
Total Phenols (Monohydric)	mg/kg	< 1	4	<1	< 1	120	200
Naphthalene	mg/kg	< 0.05	4	0.06	0.4	2.3	5.6
Acenaphthylene	mg/kg	< 0.05	4	<0.05	< 0.05	170	420
Acenaphthene	mg/kg	< 0.05	4	<0.05	0.56	210	510
Fluorene	mg/kg	< 0.05	4	<0.05	0.37	170	400
Phenanthrene	mg/kg	< 0.05	4	0.28	4	95	220
Anthracene	mg/kg	< 0.05	4	0.07	1.1	2400	5400
Fluoranthene	mg/kg	< 0.05	4	0.77	7.8	280	560
Pyrene	mg/kg	< 0.05	4	0.63	6.6	620	1200
Benzo(a)anthracene	mg/kg	< 0.05	4	0.29	3.5	7.2	11
Chrysene	mg/kg	< 0.05	4	0.36	3.4	15	22
Benzo(b)fluoranthene	mg/kg	< 0.05	4	0.38	4.5	2.6	3.3
Benzo(k)fluoranthene	mg/kg	< 0.05	4	0.14	1.6	77	93
Benzo(a)pyrene	mg/kg	< 0.05	4	0.29	3.7	5	5
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.05	4	0.18	1.7	27	36
Dibenz(a,h)anthracene	mg/kg	< 0.05	4	<0.05	0.4	0.24	0.28
Benzo(ghi)perylene	mg/kg	< 0.05	4	0.15	1.9	320	340
Speciated Total EPA-16 PAHs	mg/kg	< 0.08	4	3.65	41.4	-	-
Ali >C5-C6	mg/kg	< 0.02	1	<0.01	< 0.02	42	78
Ali >C6-C8	mg/kg	< 0.02	1	<0.01	< 0.02	100	230
Ali >C8-C10	mg/kg	< 0.05	1	<0.01	< 0.05	27	65
Ali >C10-C12	mg/kg	< 1	1	<1	< 1	130	330
Ali >C12-C16	mg/kg	< 2	1	<2	< 2	1100	2400
Ali >C16-C21	mg/kg	< 8	1	<8	< 8	65000	92000
Ali >C21-C35	mg/kg	< 8	1	<8	< 8	65000	92000
Ali >C35-C44	mg/kg	< 8.4	0	0	< 8.4	65000	92000
Ali >C5-44	mg/kg	< 10	0	0	< 10	-	-
Aro >C5-C7	mg/kg	< 0.01	1	<0.01	< 0.01	70	140
Aro >C7-C8	mg/kg	< 0.01	1	<0.01	< 0.01	130	290
Aro >C8-C10	mg/kg	< 1	1	<0.02	< 1	34	83
Aro >C10-C12	mg/kg	< 1	1	<1	< 1	74	180
Aro >C12-C16	mg/kg	< 2	1	<2	< 2	140	330
Aro >C16-C21	mg/kg	< 10	1	<10	< 10	260	540
Aro >C21-C35	mg/kg	< 10	1	<8	< 10	1100	1500
Aro >C35-C44	mg/kg	< 8.4	0	0	< 8.4	1100	1500
Aro >C5-44	mg/kg	< 10	0	0	< 10	-	-

*For “commercial” use, at 1% organic matter where relevant.

**Estimates soil saturation limit above which potential for free phase contamination *might* exist

The analyses have shown significantly elevated concentrations of two number of determinands.

A summary of the exceedances determined during laboratory testing and subsequent assessment are shown in table 2 below.

Table 2: Soil Threshold Exceedances and Locations

Location	Depth (mbgl)	Determinand(s)	Threshold (mg/kg)	Observed Concentration (mg/kg)
BH1	0.20	Benzo(b)fluoranthene	3.30	4.50
BH1	0.20	Dibenz(a,h)anthracene	0.28	0.40

**Value in parentheses denotes estimated soil saturation limit above which a possibility of free-phase contamination *might* exist in soil.

Levels of two (2) PAH species have been detected above their corresponding target values in one (1) sample recovered from a depth of 0.20m in BH1. These are; benzo(b)fluoranthene and dibenzo(a,h)anthracene.

No asbestos was detected in any of the two samples inspected.

These exceedances appear to be restricted to only the dark brown topsoil present in the southeast of the site. As such, a localised remediation exercise will be required to address this issue before the site can be deemed suitable for residential use.

For the time being, and in the absence of further information, it should be assumed that the area around BH1 (around proposed Plot 3 and 4) comprises a hotspot of contaminated soils which requires remediation. The spatial extent of any required remedial works is unclear but are likely to be confined to near-surface topsoil.

4.2.2 Controlled Waters

Given the possible historical contamination sources, the presence of relatively shallow groundwater, and permeable deposits below the site, leachate/water was analysed from one (1) sample to investigate possible contaminant mobility. This sample was obtained from TPC 0.60mbgl.

The leaching test is an aggressive test (de-ionised water) and is not in aqueous equilibrium (steady state) with the solid sample, this may cause overestimation of the aqueous phase concentrations compared to groundwater in contact with the same contaminated soils and therefore may not give results that are an accurate representation of the groundwater risk on site. Further to this, the leaching test was actually developed for inorganic constituents, with the leaching of organics being poorly understood, and again may not be representative of their presence. The main risk is expected to be from organic/inorganic contaminants.

Levels for domestic water supply, or the protection of aquatic life levels, as published by the Environment Agency are presented as the assessment criteria, but these are not strictly target values. They are not directly applicable to leachates because these standards would represent the total concentration in the receiving water bodies following mixing and attenuation of the leached contaminants. As such, the

standards are included as an example of good water quality for consideration of how leachable contamination might affect such waters.

A Summary of the leachate testing is shown in table 3 below.

Table 3: Chemical Determinands in Leachate

Determinands	Returned maximum Concentrations (µg/l)	UK Standard for Surface Waters intended for Drinking Water Abstraction* (DW) and/or protection of Aquatic Life in surface waters* (Aq) (µg/l)
Inorganic Chemicals		
Arsenic	1.0	**50** (DW, range: 50-100) (No Aq standard)
Boron	22	**1000** (DW & Aq)
Cadmium	0.08	**5** (DW & Aq)
Chromium	1	**50** (DW) / **5-250** (Aq, range: 5-250)
Copper	**20**	**50** (DW) / **5-112** (Aq, range: 5-112)
Lead	1.0	**50** (DW) / **4-250** (Aq, range: 4-250
Mercury (elemental Hg)	0.5	**1** (DW & Aq)
Nickel	0.4	**20**** (DW) / **50-200** (Aq, range: 50-200)
Selenium	4.0	**10** (DW) (No Aq standard)
Zinc	15	**3000** (DW, range: 3000-5000) / **30-2000** (Aq, range: 30-2000)
pH	6.2	**Range 5.5 to 10** (UK drinking water standards)
Organic Chemicals		
Cyanide	<20 (all 3)	**50** (DW) / **5** (Aq)
Phenols	<10 (all 3)	**50****(DW) / **300** (Aq)
PAHs (total)	<1.6***	0.2 (DW, range: 0.2-1.0) (No Aq standard)
Individual PAH species – **none** above detectible concentrations		

*sourced from Environment Agency database at http://evidence.environment-agency.gov.uk/ChemicalStandards/home.aspx.
If more than one option is available (dependant on other water properties or environmental setting) applicability is discussed later.
**Standard for water supply as no standard available for surface water abstraction for drinking water.
***Sum of USEPA 16, each at Lower Limit of Detection of <0.1

A summary of potential risks determined during laboratory testing and subsequent assessment are shown in table 4 below.

As can be seen from Table 3 and the detailed results presented in Chemtech Environmental Ltd. report 24-052213 (Appendix 3) results returned concentrations within acceptable limits, with only a single exception of copper at 20(µg/l).

The leachate returned elevated copper concentrations which exceed the lowest threshold of the range of assessment criteria options for aquatic life. No data has been collected regarding the calcium carbonate contact of local waters and underlying groundwater, the low concentrations and consequently extremely minor nature of any possible exceedances of lower target values suggests that these results do not represent any noteworthy risk to underground or surface waters.

When considering attenuation during migration and dilution in receiving water bodies it is highly unlikely that even the total leachable quantity of contaminants would have any measurable effect on receiving water bodies.

4.3 Hazardous Gas / Ground Gas

4.3.1 Gas Regime

Given the made ground at the site, the potential presence of the potential for deep infilled ground at nearby sites, a ground gas monitoring exercise has been undertaken at the site to quantify the risk in this regard. Gas monitoring wells were installed in boreholes BH1, BH2 and BH3.

The results of four (4) initial gas monitoring visit at the site are presented in Table 5 below. A further set of up to two measurements may be required to complete the gas risk assessment at the site.

Table 5: Summary of Gas Monitoring Data

Borehole	Number of Visits	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow Rate (l/hr)	Atmospheric Pressure (mb)
BH1	4	<0.1 (all)	0.7-2.2	18.8-20.5	<0.1 (all)	1000 (rising) to 1034 (falling)
BH2		<0.1 (all)	0.8-1.9	17.3-19.8		
BH3		<0.1 (all)	0.7-1.4	18.7-20.1		

The gas monitoring visit carried out to date at atmospheric pressures of 1000mb to 1034mb returned:

- Low and marginally elevated concentrations of CO_2.
- Consistently negligible levels of CH_4.
- Near-normal oxygen levels.
- Consistently negligible H_2S and CO levels below detectable limits (<1ppm).
- Consistently negligible flow rates below detectable limits (<0.1 l/hr).

Historical weather records have been consulted to gain an indication of barometric pressure trends. These appear to have been rising on the first, third and fourth monitoring visits and falling on the second. No correlation between the elevated CO_2 and atmospheric pressure trends is apparent with the elevated CO_2 levels being returned on days of both rising and falling pressure.

The returned gas monitoring results have consistently fallen within the limits for Characteristic Situation 1 (CS1) classifications*. With a maximum GSV of 0.0112l/hr and CO_2/CH_4 levels consistently below trigger levels (5% and 1% respectively), no ground gas protection will be required in the proposed structure(s).

*Modified Wilson and Card Classification, CIRIA C665.

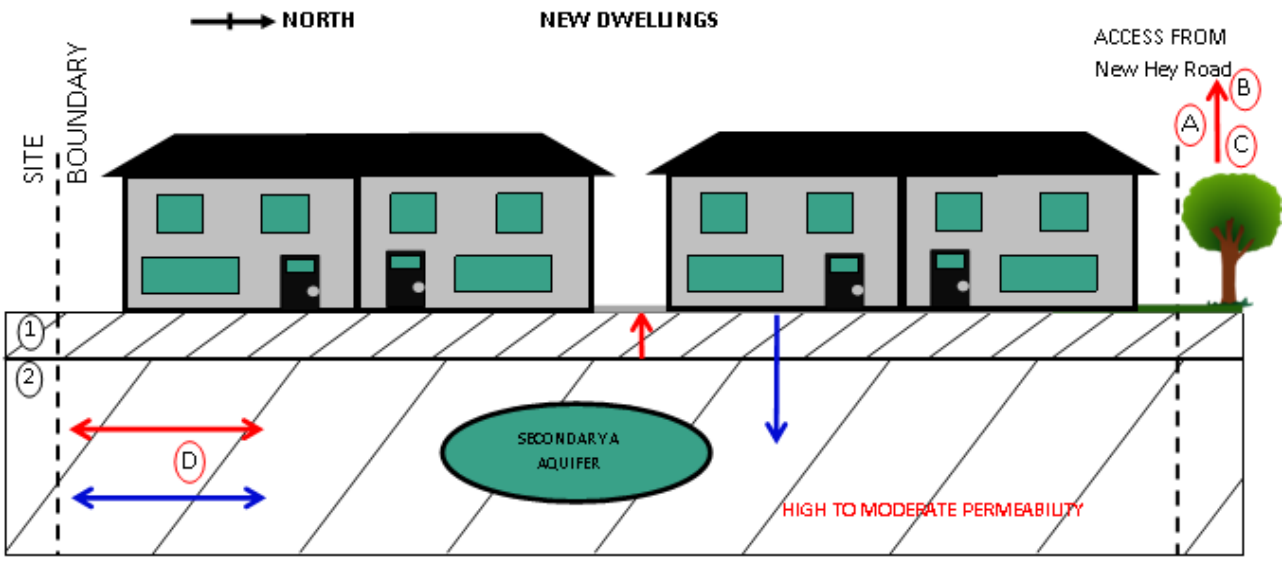
4.3.2 Radon Gas

As confirmed by the phase 1 desk study report for the site the site in an area where just <1%/ of properties are above the radon action level. Therefore, no radon protection measures will be required in the new structure(s).

5. Conceptual Ground Hazard Model (CGHM)

The conceptual ground hazard model (CGHM) presented on the following page shows the potential hazards and pollutant linkages which have been considered at the site and those which may still be complete, or would be complete, if the site were to be developed as a residential unit in its current condition.

Figure 1: CGHM – Conceptual cross section of site including a Source, Pathway and Receptor Model



1 SURFACE —TOPSOIL AND POTENTIAL MADE GROUND PRESENT.

2 BEDROCK GEOLOGY—SOFT BED FLAGS (SANDSTONE).

IDENTIFIED HAZARDS Including Potential CONTAMINATION SOURCES

-Possible presence of made ground and historical contamination thereof by past land use and development and/or demolition works at the site.

-Potentially contaminative historical land uses on nearby/adjacent sites including; mills and waste oil burners.

-Potential for made or infilled ground to generate hazardous gases either within the study site or on adjacent/nearby sites.

-Potential ground stability issues associated with; vegetation influence and shrink-swell clays, potentially weak and compressible made ground, compressible natural deposits.

IDENTIFIED RECEPTORS and ASSOCIATED PATHWAY

A— End Users through Direct Contact / Inhalation / Ingestion. Buildings and hard standing will encompass some of the site, removing any pathway to end users through direct contact in these areas.

B— Plants and Trees through uptake, likely given the intended end use and proposed development layout.

C— End Users through cultivation and consumption of vegetables / fruit. Considered possible given the intended end use and proposed development layout.

Linkages A-C considered to be potentially complete due to elevated levels of PAHs in near-surface made ground analysed from the site. Remedial works required.

D— Neighbouring Sites through lateral migration (in soil and water, including surface water run off).

E— Groundwater through leaching of sub-soil.

Linkages D & E considered disproven due to negligible contaminant levels in leachates, absence of any nearby surface water features, and absence of asbestos in soils (re. risk of airborne fibres).

F— Buildings and services through direct contact.

Linkages A-F considered disproven due to absence of any noteworthy contaminant levels.

G— End users and buildings through ground gas migration.

Ground gas monitoring exercise ongoing. No significant risk identified to date.

6. Conclusions

6.1 Soil & Water Contamination

Soil and leachate analysis results suggest that most soils at the site are uncontaminated and suitable for use in a residential context.

However, the sample analysed from BH1 at 0.20m contained elevated concentrations of two PAH species which may by indicative of a localised contamination issue. This may be an anomalous result, but further investigation would be required to confirm that hypothesis.

It is recommended that an additional sampling and analysis exercise be carried out to determine whether there is in fact a contamination issue in this area and, if so, to better establish the extent of the affected area.

No contamination risk to ground/surface waters has been identified.

Following the additional sampling and testing, the local planning authority will most likely require a remediation and validation strategy report for review prior to commencement of any remedial works.

No contamination risk to ground/surface waters has been identified.

Given the limited quantity and depth of affected soils in BH1 at depth of 0.20mbgl it is likely that simple excavation, removal and replacement of the implicated soils with proven uncontaminated materials will comprise the most cost-effective and appropriate method of remediation. Due to the limited area and depth of the soils which are above the threshold it is suggests the topsoil should be excavated to natural.

Though unlikely, if the development plan were to change significantly, or obvious evidence were uncovered during groundworks of potential contamination that has hitherto not been encountered, then both Geoinvestigate Ltd. and the local planning authority should be notified and, if appropriate, redevelopment works halted/postponed while further assessment and/or remediation work is undertaken.

6.2 Hazardous Gas / Ground Gas

Ground gas monitoring is ongoing at the site with four of a potential six monitoring visits having been undertaken to date. The monitoring undertaken to date has returned no significantly elevated levels of hazardous gas and negligible gas flow rates (below detectable limits).

Based the data gathered to date, the site is expected fall into Characteristic situation 1 (CS1) of the Modified Wilson and Card classification or “Green” of the NHBC Traffic Light System for low rise housing with a ventilated under-floor void (min 150mm) (CIRIA C665). If the continued monitoring returns comparable data, no gas protection will be required in the new building(s). No final decision should be made without further monitoring, however.

No radon protection measures will be required for the new development.

Note that these conclusions are provisional and that the gas monitoring exercise is not yet completed, with only four of a possible six sets of readings gathered to date. Final recommendations regarding gas protection will be issued in due course in a Gas Monitoring Addendum Report following completion of the gas monitoring exercise.

END OF REPORT

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APPENDIX 1

Site Plan

and

Exploratory Hole Logs

GEOINVESTIGATE Ltd.

OUR REF: G24326	YOUR REF:	SITE PLAN (NOT TO SCALE)
DATE: 01/11/24	LOCATION: 1 & 1A Sparks Road, Huddersfield HD3 4BX	

Key

BH3 — Windowless sample borehole location with gas monitoring well

TP1 — Hand excavated trial pit location

GEO INVESTIGATE

Borehole Log

Client Ref:
Our Ref: G24326
Date: 01/11/2024
Location: 1 - 1a Sparks Road, Huddersfield, HD3 4BX
Comments:

BH 1

Sheet No 1 of 1

Logged by: A.M

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
	TOPSOIL. Loose dark brown sandy gravelly clay. Gravel is fine to coarse of	300			O	Cv kN/m^2			0.25
0.30	sandstone, brick and occasional coal.								
	Firm/loose orange and grey very sandy gravelly CLAY/clayey gravelly SAND. Gravel is fine to coarse of sandstone. Occasional cobbles noted.				O				0.50
									0.75
		1300			O				1.00
	Slightly moist from 1.20m.								1.25
1.60					O				1.50
	Dense orange clayey sandy GRAVEL. Gravel is fine to coarse of sandstone. Many cobbles noted.	600			O				1.75
2.20									2.00
	Weak orange SANDSTONE.	200							2.25
2.40					O				
	Borehole terminated at 2.40m due to refusal.								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 2.40 mbgl
Borehole remained dry on completion
Gas well installed to 2.40m with gas bung and cover

Key:

	Slotted Pipe	**O**	Disturbed sample
	Plain Pipe	**Cv**	Shear vane
	Bentonite	**W**	Water sample
	Gravel Filter	**S**	Standard Penetration Test

BH 1

GEO INVESTIGATE

Borehole Log

Client Ref:
Our Ref: G24326
Date: 01/11/2024
Location:
Comments:

BH 2

Sheet No 1 of 1

Logged by: A.M

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.25	TOPSOIL. Loose dark brown slightly clayey gravelly sand/sandy gravel. Gravel is fine to coarse of sandstone and occasional brick.	250			O	Cv kN/m^2			0.25
	Medium dense/firm in places orange and grey slightly clayey sandy GRAVEL. Gravel is fine to coarse of sandstone. Cobbles noted.	850			O				0.50
									0.75
1.10					O				1.00
1.20	Weak orange SANDSTONE.	100			O				
	Borehole terminated at 1.20m due to refusal.								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 1.20 mbgl
Borehole remained dry on completion
Gas well installed to 1.20m with gas bung and cover

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH 2

GEO INVESTIGATE

Borehole Log

Client Ref:
Our Ref: G24326
Date: 01/11/2024
Location:
Comments:

BH 3

Sheet No 1 of 1

Logged by: A.M

Depth (m)	Description of Strata	Thick -ness	Legend	Gas Well	Sample	Test Type Result	SPT N Value (Depth)	Depth to Water	Depth (m)
0.20	TOPSOIL. Loose dark brown slightly clayey gravelly sand/sandy gravel. Gravel is fine to coarse of sandstone and occasional brick.	200			O	Cv kN/m^2			0.25
0.90	Dense orange sandy GRAVEL. Gravel is fine to coarse of sandstone. Cobbles noted.	700			O				0.50 0.75
1.00	Weak orange SANDSTONE.	100			O				1.00
	Borehole terminated at 1.00m due to refusal.								

Remarks:
Casing to 1.00m
Dynamic windowless sampling by Terrier Rig to 1.00 mbgl
Borehole remained dry on completion
Gas well installed to 1.00m with gas bung and cover

Key:
Slotted Pipe
Plain Pipe
Bentonite
Gravel Filter

O Disturbed sample
Cv Shear vane
W Water sample
S Standard Penetration Test

BH 3

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G24326 **TP No.A** **Sheet No. 1 of 1**

Location: 1 - 1a Sparks Road, Huddersfield, HD3 4BX **DATE**: 01/11/24

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.25	TOPSOIL. Loose dark brown slightly clayey gravelly sand/sandy gravel. Gravel is fine to coarse of sandstone and occasional brick. Many roots noted.	250		O				0.25
0.50	Medium dense/firm in places orange and grey slightly clayey sandy GRAVEL. Gravel is fine to coarse of sandstone. Many cobbles noted.	250		O				0.50
	Trial pit terminated at 0.50m.							

Remarks: Hand excavated to 0.50m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G24326 **TP No.B** **Sheet No. 1 of 1**

Location: 1 - 1a Sparks Road, Huddersfield, HD3 4BX **DATE**: 01/11/24

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.30	TOPSOIL. Loose dark brown slightly clayey gravelly sand/sandy gravel. Gravel is fine to coarse of sandstone and occasional brick. Many roots noted.	300		O	Cv kN/m^2			0.25
0.70	MADE GROUND. Compact brown sandy gravel. Gravel is fine to coarse of sandstone, brick, pot and tile. Many cobbles noted.	400		O				0.50
	Trial pit terminated at 0.70m.							

Remarks: Hand excavated to 0.70m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

GEOINVESTIGATE Ltd.

Your Ref. **Our Ref**. G24326 **TP No.C** **Sheet No. 1 of 1**

Location: 1 - 1a Sparks Road, Huddersfield, HD3 4BX **DATE**: 01/11/24

Depth (m)	Description of Strata	Thick -ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth (m)
0.20	TOPSOIL. Loose dark brown slightly clayey gravelly sand/sandy gravel. Gravel is fine to coarse of sandstone and occasional brick. Many roots noted.	200		O	Cv kN/m^2			0.25
0.50	Firm orange and grey very sandy gravelly CLAY. Gravel is fine to coarse of sandstone.	300		O				0.50
	Trial pit terminated at 0.50m.							

Remarks: Hand excavated to 0.50m
Trial pit remained stable and dry on completion

Key: **O** Disturbed sample
Cv Shear vane
W Water sample

APPENDIX 2

Chemtech Analytical Test Report

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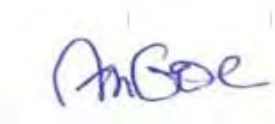
Analytical Report Number : 24-052213

Project / Site name:	Sparks Road, Huddersfield HD3 4BX	Samples received on:	06/11/2024
Your job number:	G24326	Samples instructed on/ Analysis started on:	06/11/2024
Your order number:	G24326	Analysis completed by:	13/11/2024
Report Issue Number:	1	Report issued on:	15/11/2024
Samples Analysed:	4 soil samples - 1 leachate sample		



Signed:

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

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

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

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

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX
Your Order No: G24326

Lab Sample Number				370883	370884	370885	370886
Sample Reference				TPA	TPB	TPC	BH1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.60	0.50	0.20
Date Sampled				01/11/2024	01/11/2024	01/11/2024	01/11/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status				
Stone Content	%	0.1	NONE	40	29.9	< 0.1	11.6
Moisture Content	%	0.01	NONE	13	16	17	18
Total mass of sample received	kg	0.1	NONE	0.6	0.5	0.4	0.6
Asbestos							
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	-	Not-detected	-
Asbestos Analyst ID	N/A	N/A	N/A	KJK	-	KJK	-
General Inorganics							
pH (L099)	pH Units	N/A	MCERTS	7.4	7.8	5.5	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Thiocyanate as SCN	mg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	46	61	66	160
Water Soluble SO_4 16hr extraction (2:1)	mg/l	1.25	MCERTS	23.2	30.4	33.2	81.9
Sulphide	mg/kg	1	MCERTS	< 1.0	1.3	1.5	11
Organic Matter (automated)	%	0.1	MCERTS	2.5	2.1	1.3	3.8
Total Phenols							
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	0.13	0.06	0.06	0.4
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.56
Fluorene	mg/kg	0.05	MCERTS	0.05	< 0.05	< 0.05	0.37
Phenanthrene	mg/kg	0.05	MCERTS	0.54	0.28	0.31	4
Anthracene	mg/kg	0.05	MCERTS	0.12	0.07	0.08	1.1
Fluoranthene	mg/kg	0.05	MCERTS	0.88	0.86	0.77	7.8
Pyrene	mg/kg	0.05	MCERTS	0.76	0.72	0.63	6.6
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.43	0.37	0.29	3.5
Chrysene	mg/kg	0.05	MCERTS	0.49	0.42	0.36	3.4
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.52	0.4	0.38	4.5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.2	0.24	0.14	1.6
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.4	0.37	0.29	3.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.21	0.18	0.18	1.7
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.4
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.25	0.22	0.15	1.9
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	4.99	4.18	3.65	41.4

Analytical Report Number: 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX
Your Order No: G24326

Lab Sample Number				370883	370884	370885	370886
Sample Reference				TPA	TPB	TPC	BH1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.60	0.50	0.20
Date Sampled				01/11/2024	01/11/2024	01/11/2024	01/11/2024
Time Taken				None Supplied	None Supplied	None Supplied	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	24	10	3.5	15
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.7	1	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.6
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	16	13	16	40
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16	14	17	41
Copper (aqua regia extractable)	mg/kg	1	MCERTS	83	19	8.5	38
Lead (aqua regia extractable)	mg/kg	1	MCERTS	110	96	32	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	9.4	7.2	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	59	53	65	120
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	-	-	< 1.0	-
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	-	-	< 2.0	-
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	< 10	-
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	-	-	< 10	-
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	-	-	< 10	-
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: 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX

Your Order No: G24326

Lab Sample Number				370885
Sample Reference				TPC
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				01/11/2024
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	Units	Test Limit of detection	Test Accreditation Status	
General Inorganics				
pH (automated)	pH Units	N/A	ISO 17025	6.2
Total Cyanide	µg/l	10	ISO 17025	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10
Thiocyanate as SCN	µg/l	200	ISO 17025	< 200
Sulphate as SO_4	mg/l	0.045	ISO 17025	4.56
Total Sulphur	mg/l	0.015	NONE	1.52
Sulphide	µg/l	5	NONE	< 5.0
Total Phenols				
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10
Speciated PAHs				
Naphthalene	µg/l	0.01	NONE	< 0.01 #
Acenaphthylene	µg/l	0.01	NONE	< 0.01
Acenaphthene	µg/l	0.01	NONE	< 0.01
Fluorene	µg/l	0.01	NONE	< 0.01
Phenanthrene	µg/l	0.01	NONE	< 0.01
Anthracene	µg/l	0.01	NONE	< 0.01
Fluoranthene	µg/l	0.01	NONE	< 0.01
Pyrene	µg/l	0.01	NONE	< 0.01
Benzo(a)anthracene	µg/l	0.01	NONE	< 0.01
Chrysene	µg/l	0.01	NONE	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01
Total PAH				
Total EPA-16 PAHs	µg/l	0.16	NONE	< 0.16
Heavy Metals / Metalloids				
Arsenic (dissolved)	µg/l	1	ISO 17025	< 1.0
Boron (dissolved)	µg/l	10	ISO 17025	22
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	1
Copper (dissolved)	µg/l	0.7	ISO 17025	20
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	0.4
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	15

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

Analytical Report Number : 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX

* 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 *
370883	TPA	None Supplied	0.2	Brown loam and sand with vegetation and stones
370884	TPB	None Supplied	0.6	Brown sand with vegetation and stones
370885	TPC	None Supplied	0.5	Brown clay and loam with vegetation
370886	BH1	None Supplied	0.2	Brown sand with vegetation and stones

Analytical Report Number : 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
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
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
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
Sulphide in leachate	Determination of sulphide in leachate by ion selective electrode	In-house method	L029-PL	W	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
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088-PL	D/W	MCERTS
Chromium III in soil	In-house method by calculation from total Cr and Cr VI	In-house method by calculation	L080-PL/L130B	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

Analytical Report Number : 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Free cyanide in leachate	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	ISO 17025
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 leachate	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
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 cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Thiocyanate in soil	Determination of thiocyanate in soil by extraction in water followed by acidification followed by addition of ferric nitrate followed by discrete analyser (spectrophotometer)	In-house method	L082B	D	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
pH at 20°C in leachate (automated)	Determination of pH in leachate by electrometric measurement	In-house method	L099-PL	W	ISO 17025
Speciated PAHs and/or Semi-volatile organic compounds in leachate	SVOCs and PAHs in leachate	In-house method	L102B		NONE
Thiocyanate in leachate	Determination of thiocyanate in water by discrete analyser (colorimetry)	In-house method based on SMWW 4500-CN-M	L082B	W	ISO 17025

Analytical Report Number : 24-052213
Project / Site name: Sparks Road, Huddersfield HD3 4BX

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total Sulphur in leachates	Determination of total sulphur in leachates by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	NONE

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

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

- Quality control parameter failure associated with this result; other checks applied prior to reporting the data have been accepted. The result should be considered as deviating and should be interpreted with caution. The result is not accredited.