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PHASE 2: GROUND INVESTIGATION REPORT

SUENO

PROPOSED COMMERCIAL UNIT

BRETTON STREET

DEWSBURY

WEST YORKSHIRE

WF12 9DB

Project No: 21-775

Prepared By:

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Date: 3rd November 2021

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Date: 3rd November 2021

The information and/or advice contained in this Ground Investigation Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared in order to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and/or sketches contained within the report, and/or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

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APPENDICES

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1.0 Introduction

November 2021

As requested by Parkdesigned on behalf of Sueno and in line with a Phase 1: Desk Top Study Report (Arc Environmental, Ref. 21-775 – October 2021), Ground Investigation works have been carried out on an existing plot of commercial land on Bretton Street in Dewsbury, West Yorkshire. It is understood that the existing structures on site will be demolished to make way for a new commercial unit with associated hardstanding with no areas of soft landscaping envisaged.

The intrusive investigation works comprised the sinking of 11 no. dynamic sampling boreholes (WS01 to WS11) including 3 no. ground gas / groundwater monitoring standpipes (WS03, WS06 & WS09). The positions of the boreholes can be seen on the Investigation Location Plan, a copy of which can be seen in Appendix II. It should be noted that this plan is for orientating purposes only, as the positions shown are approximate and the plan is not to a standard scale.

2.0 Site Details

Table 2.1

N = north, S = south, E = east, W = west

Site Name & Address:	Proposed Commercial Unit, Bretton Street, Dewsbury WF12 9DB.
National Grid Reference:	424850, 420240 (Representative of the central part of the site).
Description of Location:	The site lies in a commercial setting to the south of Dewsbury Town Centre.
Site Shape & Boundaries:	The site is irregular in shape, occupying a total area of c.1.29 Hectares (Ha). N = Commercial units, E = Railway line, W = Bretfield Court with commercial units beyond & S = Bretton Street with commercial units beyond.
Development Details:	Current proposals are for the existing structures on site to be demolished to make way for a new commercial unit with associated hardstanding with no areas of soft landscaping envisaged.
Site Surfacing:	Out with the existing structures on site there are areas of hardstanding cover (concrete and tarmac) with sporadic vegetation and trees noted.
Above Ground Structures:	Two industrial units are present on site. Asbestos Containing Materials (ACM's) may be present within the existing building fabric. The existing structures are to be demolished as part of the redevelopment of the site.
Sub-surface Structures & Services:	The site reconnaissance survey inferred existing drains (manholes, etc.) on site. Other live services are also present beneath the site associated with the current and adjacent development. Relic foundations associated with historical buildings and structures may also be present. A potential below ground fuel tank was / is present adjacent to the western building.

3.0 Scope of Works

Table 3.1

Client:	Sueno.
Architect:	Parkdesigned.
Project type:	Proposed Commercial Development.
Layout plans (existing):	See Appendix I.
Layout plans (proposed):	See Appendix I.
Investigation Works:	11 no. windowless sampling boreholes (WS01 to WS11) accompanied by the installation of 3 no. combined ground gas and groundwater monitoring wells (WS03, WS06 & WS09).
Laboratory Testing:	Geotechnical & Ground Contamination.
CLEA End-Use Classification:	Level 1 GQRA – Commercial.

The information contained in this report is limited to the area of the proposed development, as indicated on the Existing Site Layout Plan shown in Appendix I, and to those areas accessible during the ground investigation. When considering the full scope of the development any features and / or issues not specifically mentioned in this report cannot be assumed to have been covered.

3.0 Scope of Works (Cont'd)

3.1 Investigation Rationale:-

This ground investigation has been designed to provide information on the general ground and groundwater conditions where access would allow, in the area of the proposed development. The boreholes were created primarily for geotechnical purposes to assist in the design of new foundations for the proposed development with contamination screening undertaken to aid in assessing the risks to Human Health, Controlled Waters and for off site disposal.

The rationale behind the location of each exploratory hole is summarised in Table 3.2 below.

Table 3.2

<u>Potential issue</u>	<u>Exploratory Hole</u>
Determine the nature of the underlying ground conditions, including shallow groundwater.	WS01 to WS11
Determine the sites ground gas regime.	WS03, WS06 & WS09
Determine the levels of contamination present within the initial deposits with a view to determining the risks posed towards the future site end-users and Controlled Waters and for possible off site removal.	WS01 to WS11

3.2 Sampling & Site Protocols:-

All works associated with this ground contamination assessment and investigations have generally been completed in accordance with BS10175:2011+A2:2017: Investigation of potentially contaminated sites – Code of practice & Land Contamination Risk Management (LCRM: October 2020) which has replaced CLR11: Model Procedures for the Management of Land Contamination, with the following precautions specific to this project.

3.2.1 Contamination Sampling:-

Samples were recovered by a representative of ARC Environmental Ltd. during the intrusive investigation works. All samples were stored at approximately c.2°C to c.8°C using cool boxes and ice packs prior to delivery to a UKAS / MCERTS accredited laboratory. Sampling was carried out in accordance with 'Technical Policy Statement 63: UKAS Policy on Deviating Samples'.

3.2.2 Onsite Health & Safety Requirements:-

All site representatives wore relevant and appropriate PPE including (where appropriate) safety footwear, high visibility jacket/vest, hard hat, eye protection and overalls. In addition, disposable latex gloves were used when handling any potentially contaminated materials and when rinsing all sampling tools. Each site vehicle contained a suitable First Aid kit with hand wash station/cleansing products (i.e. sanitary wipes).

3.2.3 Avoiding Cross-Contamination between Sample Locations:-

To avoid cross-contamination of materials between soil horizons, drill casing was used to seal off the made ground. In addition, disposable plastic liners were used to collect samples from the windowless sampling boreholes carried out.

4.0 Ground Conditions

For an accurate description of the ground conditions encountered at each investigation position, reference should be made to the borehole logs in Appendix II. It should be noted that there is always the possibility of variation in the ground conditions around and between the excavation locations.

4.0 Ground Conditions (Cont'd)

4.1 Soil Profile:-

A summary of the soil profile for this site can be found in Table 4.1 below.

Table 4.1

<u>Type of Strata</u>	<u>Depths Recorded (BGL)</u>	<u>Description & General Comments</u>
MADE GROUND:	From 0.00m up to c.0.30m and c.1.00m	Tarmac and vegetation over limestone sub-base, sandy gravel of brick and ash and firm sandy gravelly clay.
DRIFT DEPOSITS:	From c.0.30m and c.1.00m to c.>5.45	Firm and stiff (medium and high strength) sandy gravelly CLAY interbedded with loose, medium dense and dense clayey SAND generally below c.3.00m.
SOLID GEOLOGY: (Lower Coal Measures)	Not encountered	~

bgl = Below ground level

As anticipated, made ground materials were encountered across the site to a depth of between c.0.30m and c.1.00m. There was no visual or olfactory evidence of made ground or significant or 'gross' contamination (fuel, oils or asbestos) noted on or below the remainder of the site during the ground investigation works.

4.2 Groundwater and Stability:-

During the investigation works, no water strikes were encountered within the boreholes.

Notwithstanding, it would be prudent to allow for the introduction of adequate groundwater control techniques, to take care of any surface water, water ingresses and pockets of trapped surface drainage within the made ground and natural deposits during the construction period, especially during the wetter periods of the year.

Owing to the nature of the natural deposits present across the development area, adequate lateral trench support will be required for excavations, to prevent trench wall collapse or over excavations, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time. Reference to CIRIA 97 'Trenching Practice' would be beneficial to establish a suitable means of support or battering of excavation sides during construction.

5.0 Insitu Testing

5.1 Insitu Standard Penetration Tests:-

Insitu standard penetration tests (SPT's) were carried out on the natural drift deposits encountered within the boreholes, in order to determine their relative strength using a normal split spoon sampler. The results are shown as uncorrected 'N' values on the graphic borehole record sheets, adjacent to the appropriate sample level and are also summarised in Tables 5.1 below.

Table 5.1

<u>Type of Strata</u>	<u>Range of SPT 'N' Values</u>	<u>Comments</u>
DRIFT DEPOSITS:	8 – 50 and 75 blows for limited penetration	Indicative of loose to dense and firm to stiff deposits.

5.0 Insitu Testing (Cont'd)

5.2 Insitu Gas & Water Monitoring:-

Ground gas & water monitoring standpipes were installed within WS03, WS06 and WS09, primarily to check for the possible presence of hazardous ground gases, and to monitor any shallow water levels. A standard 50mm diameter HDPE standpipe, with gravel and geo-wrap surround, bentonite seal, gas valve cap and security cover, was installed within each borehole, and ground gas and water levels were allowed to reach equilibrium, prior to the first monitoring visit. Monitoring was undertaken using a Gas Data GFM series soil gas analysers, with integral flow meter, and a Geotechnical Instruments electronic dipmeter. The response zones were designed to target any ground gas from on and off site sources.

Based on the findings of the intrusive investigation works, in accordance with CIRIA Report C665, November 2007, Report Edition No. 04, March 2007 and BS8485:2015+A1 2019 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, it is felt that an adequate risk assessment can be undertaken based on the following limiting factors:

- The development has been considered as **low sensitivity** i.e. commercial development (Tables 5.5a & 5.5b – Typical/Idealised frequency and period of monitoring, after Wilson et al, 2005).
- The risk associated with the generation potential of a source is considered as **very low** (Based on the findings of intrusive works).
- Monitoring over a **minimum of one month** with **four recorded** readings (Tables 5.5a & 5.5b – Typical /idealised frequency and period of monitoring after Wilson et al, 2005).
- **Negligible** flow rates are recorded during the monitoring period (Table 8.5 – Modified Wilson & Card classification).
- A targeted and phased programme of gas monitoring will be completed, which will obtain gas monitoring readings during varying atmospheric conditions, which covers the ‘worst case’ scenario for ground gas emissions to occur, particularly during rapid falls in atmospheric pressure (i.e. from c.1020mb and c.1010mb), and also during low atmospheric pressure events (i.e. c.1000mb and below).

For this site, the monitoring visits undertaken to date were taken during a high, low, rising and falling atmospheric pressure trend. Monitoring of the weather conditions and predicated atmospheric pressures (Met Office Surface Pressure Charts) will be carried out up to 72 hours in advance of proposed monitoring visits, in order that a reasonable period of data is obtained to determine atmospheric trends, and also to target the ‘worst case’ scenario.

A summary of the results for the visit undertaken to date, compared with the ‘inert’ background gas levels is presented in Table 5.2 below, whilst a copy of the monitoring certificate is attached in Appendix IV. A further two monitoring visits have been scheduled and the results along with the final recommendations will be issued as an addendum report.

Table 5.2

Position	Date	Atmospheric Pressure (mbar)	Water (m bgl)	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	O2 (%v/v)	Flow Rate (l/hr)
Background				0	0	0	21.0	<0.1
WS03	07/10/21	998	1.47	0.0	0.0	1.5	18.6	<0.1
WS06		996	4.77	0.0	0.0	4.7	15.4	<0.1
WS09		998	4.37	23.7	>>>>	2.3	18.8	<0.1
3 no. outstanding visits to be completed – results to follow as Addendum Letter Report.								

* Note – Atmospheric trend taken from www.weatheronline.co.uk for Huddersfield

5.0 Insitu Testing (Cont'd)

5.2 Insitu Gas & Water Monitoring (Cont'd):-

From the results undertaken to date, detectible concentrations of Methane (CH₄) and Carbon Dioxide (CO₂) have been recorded, up to a maximum recorded level of 23.7% v/v and 4.7% v/v with associated oxygen (O₂) concentrations (minimum 15.4% v/v). A negligible flow rate of <0.1l/hr has been recorded during the monitoring period undertaken.

Based on the results undertaken to date, in accordance with CIRIA Report C665, an initial risk assessment has been completed for this site, by converting the results in Table 5.2 above to a gas screening value (GSV), calculated by multiplying the typical maximum gas concentrations with the recorded maximum positive flow rates (after Wilson & Card). Using the maximum values recorded, the GSV for Methane and Carbon Dioxide has been calculated, the results of which are shown below:

$$\begin{aligned}\text{Methane GSV} &= 0.237 (23.7\%) \times 0.1 = 0.0237 \text{ l/hr} \\ \text{Carbon Dioxide GSV} &= 0.047 (4.7\%) \times 0.1 = 0.0047 \text{ l/hr}\end{aligned}$$

When considering these results, in accordance with CIRIA C665, the GSV for CH₄ and CO₂ would fall below the lower target concentration of 0.07l/hr and would equate to a Characteristic Situation 1 (CS1) site classification, resulting in no gas protective measures being required for the proposed development.

However, since the maximum Methane concentration has reached the action trigger level of 1%, the CIRIA C665 guidance recommends considering an increase in the characteristic situation by an order of 1 to take into account the higher gas concentrations recorded. Therefore, it is felt that an appropriate determination for this site, would be to place the site within Characteristic Situation 2 (CS2), therefore ground gas protection measures are required.

Further reference can be made to BS8485: 2015 + A1: 2019 Code of practice for the design of protective measures: for methane and carbon dioxide ground gases for new buildings and BRE414:2001: Protective measures for housing on gas contaminated land for further design specifications and details of the protective measures required.

Following completion of the remaining three gas monitoring visits, a final assessment of these results and recommendations will follow as an addendum to this report.

Water levels have been recorded within the wells installed between c.1.47m and c.4.77m during the monitoring visit undertaken to date, and is likely to be associated with trapped surface water within the monitoring wells rather than part of a continuous shallow groundwater surface.

It is therefore considered prudent to allow for the introduction of temporary groundwater control techniques (i.e. pumping equipment), in order to take care of any localised ingresses of surface water which may occur, during the construction period, especially if construction takes place during the wetter periods of the year.

6.0 Laboratory Testing

All geotechnical testing was carried out in accordance with BS1377:1990: Parts 1-9 by PSL of Doncaster (UKAS accredited). Ground contamination was undertaken by Chemtech Environmental of Stanley, Co. Durham (UKAS & MCERTS accredited).

6.0 Laboratory Testing (Cont'd)

6.1 Determination of pH & SO₄:-

Twelve samples including samples of the made ground and natural material recovered from the investigation were tested to determine their pH value and soluble sulphate (SO₄) levels. The results are shown in Table 6.1 below and are also contained in the Chemtech Environmental Limited Analytical Report (Ref. 100892), a copy of which can be seen in Appendix III.

Table 6.1

Position	Depth (m)	Strata	SO ₄ (mg/l)	pH value	Design SO ₄ Class	ACEC Class
WS01	0.30-0.40	MG	76	8.8	DS-1	AC-1
WS01	0.60-0.80	NS	109	5.7	DS-1	AC-1
WS02	1.40-1.60	NS	54	6.2	DS-1	AC-1
WS03	0.00-0.30	MG	54	10.6	DS-1	AC-1
WS03	0.80-1.00	NS	64	7.9	DS-1	AC-1
WS04	0.20-0.50	MG	37	8.0	DS-1	AC-1
WS04	1.40-1.60	NS	41	7.8	DS-1	AC-1
WS06	0.10-0.30	MG	52	8.5	DS-1	AC-1
WS07	0.10-0.30	MG	165	8.5	DS-1	AC-1
WS08	0.00-0.60	MG	16	11.6	DS-1	AC-1
WS09	0.70-1.00	MG	96	7.2	DS-1	AC-1
WS11	0.30-0.50	MG	43	8.2	DS-1	AC-1

MG = Made Ground, NS = Natural Strata, ACEC = Aggressive Chemical Environment for Concrete site classification

Based on the results obtained, the site should be given a classification of Class DS-1, in accordance with BRE Special Digest 1: 2005 (3rd Edition) and the procedures for determining Sulphate Classification for brownfield locations. When considering the pH values of the materials tested, and assuming potentially mobile groundwater, the assessment of the Aggressive Chemical Environment for Concrete (ACEC) for the site is AC-1.

6.2 Determination of Liquid & Plastic Limits: -

Representative samples (5 no.) of the natural clays recovered from the site were tested to determine their liquid and plastic limits, so that these materials could be classified. The results are summarised in Table 6.2 below and are also contained in the PSL Analytical Report (Ref. PSL21/7736), a copy of which is contained in Appendix III.

Table 6.2

Position	Depth(m)	M/C (%)	LL	PL	PI	Class	% Passing 425µm Sieve
WS01	1.40-1.60	10	29	14	15	CL	80
WS02	0.60-0.80	15	28	16	12	CL	79
WS03	0.80-1.00	24	38	22	16	CI	100
WS04	1.40-1.60	14	35	18	17	CI	85
WS08	1.20-1.40	23	36	17	19	CI	100

M/C = Moisture Content, LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index, CL = Clay Low, CI = Clay Intermediate.

From these results, the samples tested, when plotted on the plasticity chart, fall within the low to intermediate plasticity range, and from the resulting plasticity indices, have a low to moderate volume change potential, when taking into account the amount passing the 425µm sieve.

Therefore, the clay deposits tested may undergo significant changes in volume, if large changes in their natural moisture content were to occur due to seasonal variations or the like and if new foundations were to be based within these materials, they would need to be taken down to a minimum depth of 0.90m below finished ground levels.

6.0 Laboratory Testing (Cont'd)

6.3 Contamination Screening / Screening Strategy:-

Representative samples (8 no.) of the made ground materials encountered within the boreholes were passed onto Chemtech Environmental Ltd of Stanley, Co. Durham so that soil contamination screening could be carried out. The results of all the testing can be found in the Chemtech Analytical Report (Ref: 100892), a copy of which can be found in Appendix III.

Representative samples were screened using a standard generic contamination suite (based on the historical CLEA SGV listed analytes with additions) which is used to assess typical made ground (disturbed natural strata mixed with anthropogenic debris) of an unknown source.

For completeness, speciated PAH, speciated TPH, BTEX and asbestos testing was also undertaken.

The total analysis carried out is summarised below:

- 8 no. soil samples and 2 no. leachate samples screened for a generic (metals and inorganics) soil suite which includes the following determinants; Arsenic, Cadmium, Chromium (III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide, pH, and Total Organic Carbon (TOC).
- 8 no. soil samples and 2 no. leachate samples screened for Speciated Polycyclic Aromatic Hydrocarbons (PAH's) – based on the current USEPA 16 PAH's + Benzo(j)fluoranthene.
- 8 no. soil samples and 2 no. leachate samples screened for speciated *Total Petroleum Hydrocarbons (TPH's)* – Full equivalent carbon banding Aliphatic & Aromatic Spilt (TPHCWG), with BTEX.
- 8 no. soil samples targeted for the presence of Asbestos (ACM's & fibres).

The contamination results have been used to carryout Level 1 Quantitative Human Health and Controlled Waters Risk Assessment for the ground contamination present and are discussed in Section 7.0.

7.0 Ground Contamination Risk Assessment

7.1 Methodology:-

Following completion of the contamination screening undertaken on various samples from the boreholes, a Level 1 quantitative ground contamination risk assessment has been undertaken, generally in accordance with Land Contamination: Risk Management (LCRM: October 2020, EA), which replaces CLR11: Model Procedures for the Management of Land Contamination. This quantitative ground contamination risk assessment uses the current UK practice for assessing the risks from land contamination, which is based on the established *source-pathway-receptor* pollutant linkage methodology and 'suitable for use' approach (Part IIA, EPA 1990 - inserted through Section 57 EA 1995).

Based on the Conceptual Site Model (CSM) undertaken within the Phase 1 Desk Top Study Report for this site, a site specific screening strategy for the site has been developed (see Section 6.3) and the risks from potential contaminants has been assessed for Human Health and Controlled Waters. The results of the risk assessments can be found in Sections 7.2 (Human Health) and 7.3 (Controlled Waters).

7.2 Level 1 Generic Quantitative Risk Assessment - Human Health:-

The soil screening results from across the site have been assessed by comparing the maximum values recorded for each analyte to the critical concentration values adopted for this site i.e. based on a commercial end use. The results of the testing are contained in Appendix III, and the risk assessment has been summarised in Table 7.1 on the following page.

7.0 Ground Contamination Risk Assessment (Cont'd)

7.2 Level 1 Generic Quantitative Risk Assessment - Human Health (Cont'd):-

Table 7.1

Analyte	Critical Conc. (C _c)	No. of Samples Screened	Max. Conc. (C _M) Recorded	No. of Samples > C _c
Arsenic	640 ⁽¹⁾	8	34	0
Cadmium	190 ⁽¹⁾	8	0.5	0
Chromium III	8600 ⁽¹⁾	8	116	0
Chromium VI	33 ⁽¹⁾	8	<1	0
Copper	68000 ⁽¹⁾	8	72	0
Lead	2330 ⁽²⁾	8	88	0
Mercury	1100 ⁽¹⁾	8	<0.5	0
Nickel	980 ⁽¹⁾	8	58	0
Selenium	12000 ⁽¹⁾	8	1.8	0
Zinc	730000 ⁽¹⁾	8	71	0
Cyanide	34 ⁽³⁾	8	<1	0
Speciated PAH's				
Acenaphthene	84000 ⁽¹⁾	8	1.07	0
Acenaphthylene	83000 ⁽¹⁾	8	0.19	0
Anthracene	520000 ⁽¹⁾	8	3.60	0
Benzo(a)anthracene	170 ⁽¹⁾	8	8.47	0
Benzo(a)pyrene	35 ⁽¹⁾	8	7.56	0
Benzo(b)fluoranthene	44 ⁽¹⁾	8	8.31	0
Benzo(ghi)perylene	3900 ⁽¹⁾	8	4.30	0
Benzo(k)fluoranthene	1200 ⁽¹⁾	8	3.68	0
Chrysene	350 ⁽¹⁾	8	7.72	0
Dibenz(ah)anthracene	3.5 ⁽¹⁾	8	1.02	0
Fluoranthene	23000 ⁽¹⁾	8	22.15	0
Fluorene	63000 ⁽¹⁾	8	0.70	0
Indeno(123cd)pyrene	500 ⁽¹⁾	8	5.00	0
Naphthalene	190 ⁽¹⁾	8	4.63	0
Phenanthrene	22000 ⁽¹⁾	8	9.75	0
Pyrene	54000 ⁽¹⁾	8	19.09	0
Speciated TPH's				
VPH Aliphatic (>C5-C6)	3200 ⁽¹⁾	8	<0.1	0
VPH Aliphatic (>C6-C8)	7800 ⁽¹⁾	8	<0.1	0
VPH Aliphatic (>C8-C10)	2000 ⁽¹⁾	8	<0.1	0
EPH Aliphatic (>C10-C12)	9700 ⁽¹⁾	8	42	0
EPH Aliphatic (>C12-C16)	59000 ⁽¹⁾	8	66	0
EPH Aliphatic (>C16-C35)	1600000 ⁽¹⁾	8	476	0
EPH Aliphatic (>C35-C44)	1600000 ⁽¹⁾	8	673	0
VPH Aromatic (>EC5-EC7)	26000 ⁽¹⁾	8	<0.01	0
VPH Aromatic (>EC7-EC8)	56000 ⁽¹⁾	8	<0.01	0
VPH Aromatic (>EC8-EC10)	3500 ⁽¹⁾	8	<0.01	0
EPH Aromatic (>EC10-EC12)	16000 ⁽¹⁾	8	6	0
EPH Aromatic (>EC12-EC16)	36000 ⁽¹⁾	8	2	0
EPH Aromatic (>EC16-EC21)	28000 ⁽¹⁾	8	56	0
EPH Aromatic (>EC21-EC35)	28000 ⁽¹⁾	8	43	0
EPH Aromatic (>EC35-EC44)	28000 ⁽¹⁾	8	5	0
BTEX				
Benzene	27 ⁽¹⁾	8	<0.01	0
Toluene	56000 ⁽¹⁾	8	<0.01	0
Ethylbenzene	5700 ⁽¹⁾	8	<0.01	0
m & p-Xylene	5900 ⁽¹⁾	8	<0.02	0
o-Xylene	6600 ⁽¹⁾	8	<0.01	0
Asbestos	Presence	8	NAD	0

⁽¹⁾ = LQM CIBH Suitable 4 Use Levels (S4UL Nov 2014 (Revised August 2015)) – Commercial 1% SOM, ⁽²⁾ = C4SL Values (Commercial), ⁽³⁾ = ATRISK^{soil} SSV, **Bold** = result exceeds critical concentration, Note = All units are mg/kg

7.0 Ground Contamination Risk Assessment (Cont'd)

7.2 Level 1 Generic Quantitative Risk Assessment - Human Health (Cont'd):-

The results have identified the following:

- None of the C_M values for any of the generic metals, metalloids, inorganics, speciated PAH's, speciated TPH's, BTEX or asbestos exceed the C_C values taken for the site.

The results of the contamination screening and analysis have confirmed that the made ground materials on this site do not represent a risk to the end users and no further investigation, sampling, screening or risk assessment is considered necessary. Similarly, there will be no requirement for remediation measures for the made ground which will remain on this site.

7.3 Level 1 Generic Quantitative Risk Assessment – Controlled Waters:-

Based on the results of the soil screening, leachate screening has been carried out on 2 no. soil samples. The results have been used to complete a Level 1 Risk Assessment for the potential impact on Controlled Waters and adjacent sites, and the results have been summarised in Table 7.2 below and on the following page.

Table 7.2

Bold = result exceeds target concentration

Analyte	Critical Conc. (C_C)	No. of Samples Screened	Max. Conc. (C_M) Recorded	No. of Samples > C_C
Arsenic	10 ⁽¹⁾	2	10.28	1 – WS06
Boron	1000 ⁽¹⁾	2	13	0
Cadmium	5 ⁽¹⁾	2	<0.07	0
Chromium	50 ⁽¹⁾	2	0.8	0
Copper	2000 ⁽¹⁾	2	1.8	0
Lead	10 ⁽¹⁾	2	0.6	0
Mercury	1 ⁽¹⁾	2	<0.008	0
Nickel	20 ⁽¹⁾	2	<0.5	0
Selenium	10 ⁽¹⁾	2	0.99	0
Zinc	5000 ⁽¹⁾	2	1	0
Sulphate	250mg/l ⁽¹⁾	2	2.7	0
Cyanide	50 ⁽¹⁾	2	<20	0
Speciated PAH's				
Acenaphthene	0.1 ⁽¹⁾	2	0.2	1 – WS11
Acenaphthylene	0.1 ⁽¹⁾	2	0.3	1 – WS11
Anthracene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(a)anthracene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(a)pyrene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(b)fluoranthene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(ghi)perylene	0.1 ⁽¹⁾	2	<0.1	0
Benzo(k)fluoranthene	0.1 ⁽¹⁾	2	<0.1	0
Chrysene	0.1 ⁽¹⁾	2	<0.1	0
Dibenz(ah)anthracene	0.1 ⁽¹⁾	2	<0.1	0
Fluoranthene	0.1 ⁽¹⁾	2	<0.1	0
Fluorene	0.1 ⁽¹⁾	2	0.4	1 – WS11
Indeno(123cd)pyrene	0.1 ⁽¹⁾	2	<0.1	0
Naphthalene	10 ⁽¹⁾	2	5.7	0
Phenanthrene	0.1 ⁽¹⁾	2	0.5	1 – WS11
Pyrene	0.1 ⁽¹⁾	2	<0.1	0

⁽¹⁾ = EQS Freshwater, ⁽²⁾ = UK Drinking Standard, ⁽³⁾ = WHO Health

7.0 Ground Contamination Risk Assessment (Cont'd)

7.3 Level 1 Risk Assessment (Controlled Waters) (Cont'd): -

Table 7.2 (Cont'd)

Bold = result exceeds target concentration

Analyte	Critical Conc. (C _C)	No. of Samples Screened	Max. Conc. (C _M) Recorded	No. of Samples > C _C
BTEX				
Benzene	1.0 ⁽¹⁾	2	<1	0
Toluene	50 ⁽²⁾	2	<1	0
Ethylbenzene	300 ⁽³⁾	2	<1	0
M & p-Xylene	30 ⁽²⁾	2	<2	0
o-Xylene	30 ⁽²⁾	2	<1	0
Speciated TPH's				
VPH Aliphatic (>C5-C6)	10 ⁽¹⁾	2	<1	0
VPH Aliphatic (>C6-C8)	10 ⁽¹⁾	2	<1	0
VPH Aliphatic (>C8-C10)	10 ⁽¹⁾	2	<1	0
EPH Aliphatic (>C10-C12)	10 ⁽¹⁾	2	2	0
EPH Aliphatic (>C12-C16)	10 ⁽¹⁾	2	7	0
EPH Aliphatic (>C16-C35)	10 ⁽¹⁾	2	86	3 – WS11
EPH Aliphatic (>C35-C44)	10 ⁽¹⁾	2	4	0
VPH Aromatic (>EC5-EC7)	10 ⁽¹⁾	2	<1	0
VPH Aromatic (>EC7-EC8)	10 ⁽¹⁾	2	<1	0
VPH Aromatic (>EC8-EC10)	10 ⁽¹⁾	2	<1	0
EPH Aromatic (>EC10-EC12)	10 ⁽¹⁾	2	6	0
EPH Aromatic (>EC12-EC16)	10 ⁽¹⁾	2	2	0
EPH Aromatic (>EC16-EC21)	10 ⁽¹⁾	2	3	0
EPH Aromatic (>EC21-EC35)	10 ⁽¹⁾	2	2	0
EPH Aromatic (>EC35-EC44)	10 ⁽¹⁾	2	<1	0

⁽¹⁾ = EQS Freshwater, ⁽²⁾ = UK Drinking Standard, ⁽³⁾ = WHO Health

- The C_M values for Arsenic, Acenaphthene, Acenaphthylene, Fluorene, Phenanthrene, EPH Aliphatic (>C16-C35) exceed the chosen C_C values for this site.

In addition, the following issues have been taken into consideration when assessing the risks towards Controlled Waters:

- There was no visual or olfactory evidence of hydrocarbon / fuel derived contamination noted in the boreholes.
- There was no 'free product' recorded during the investigation.
- The site is situated within an historic and current industrialised area of Dewsbury.
- The site does not lie in or within c.500m of a Source Protection Zone (SPZ).
- There are no Water Abstractions points within c.500m of the site.
- The superficial and solid deposits are a Secondary Aquifer – A.
- Boreholes have recorded initial made ground materials underlain by firm to stiff cohesive deposits, which would in turn limit any potential vertical migration of contaminants to the underlying solid geology.
- There is a minor surface water feature (Calder & Hebble Navigation Canal) recorded c.245m to the east; however, as a canal this feature is likely to have been constructed with some form of lining and is unlikely to be in hydraulic continuity with any perched shallow groundwater below the site.
- The proposed development and wider site area will comprise 100% permanent hardstanding / hardcover with no areas of soft landscaping therefore minimising surface infiltration.

Consequently, the potential risk to Controlled Waters from the proposed development is considered to be low and no further works and / or assessment are deemed necessary.

7.0 Ground Contamination Risk Assessment (Cont'd)

7.4 Revised Conceptual Site Model (CSM):-

Following the results of the intrusive investigation works, a Revised Conceptual Site Model (CSM) has been developed. Table 7.3 below summarises the *source(s)*, *pathways* and potentially sensitive *receptors* for this site, assuming no remediation, additional protection measures and/or removal of the sources contamination takes place.

Table 7.3

<u>Sources (S)</u>		<u>Pathways (P)</u>		<u>Receptors (R)</u>	
S1	Made ground materials encountered to a maximum depth of c.1.00m – No elevated contamination test results	P1	Ingestion & Dermal Contact	R1	Human health - End users and construction workforce.
		P2	Plant Uptake & attached soil	R2	Controlled Waters: Groundwater – within the underlying drift and solid geology designated as Secondary Aquifer – A. Calder & Hebble Navigation Canal.
S2	Potential ground gases associated with made ground beneath the site/ adjacent landfill activities – Elevated readings have been recorded to date - ground gas protection measures are required - (CS2)	P3	Air – Inhalation of Vapour and Direct Contact with Dust	R3	Adjacent sites
		P4	Migration through services	R4*	Building materials.
		P5	Direct contact with building materials.	R5*	Flora and fauna.
		P6	Surface runoff and leachate migration.		

* = Not included in the Human Health & Controlled Waters Risk Assessment

7.4.1 Sources:-

The site is underlain by made ground materials, recorded to a maximum depth of c.1.00m and comprising initial surfacing of tarmac and vegetation over limestone sub-base, sandy gravel of brick and ash and firm sandy gravelly clay. No elevated contamination test results have been recorded within the samples tested (see section 7.2) and these materials are deemed not to represent a risk to the end users and can be reused across the site during the re-development.

There is the potential hazard to the site from ground gases associated with the made ground recorded on site and adjacent landfill activities. From the current ground gas monitoring undertaken as part of these investigation works to date, gas protective measures are required for the proposed development (CS2). Following completion of the remaining two gas monitoring visits, a final assessment of these results and recommendations will follow as an addendum to this report.

7.4.2 Pathways:-

When considering the proposed end use (*Commercial*), and without considering treatment, removal or protection measures, there are some potential plausible pathways available for direct contact, dermal contact, ingestion, inhalation, wind (dust / particulate), volatilization, and vertical and lateral transportation below the site.

Within the CLEA Risk Assessment Model for Human Health, there are 3 exposure mediums considered for on site receptors, comprising ingestion of soil containing contaminants, inhalation of contaminated dust/vapours and dermal contact, with up to 10 no. exposure pathways considered, as shown below.

7.0 Ground Contamination Risk Assessment (Cont'd)

7.4 Revised Conceptual Site Model (CSM) (Cont'd):-

7.4.2 Pathways (Cont'd):-

1. *Ingestion of soil and indoor dust*
2. *Consumption of home-grown produce and attached soil*
3. *Dermal contact (indoor)*
4. *Dermal contact (outdoor)*
5. *Inhalation of dust (indoor)*
6. *Inhalation of dust (outdoor)*
7. *Inhalation of vapour (indoor)*
8. *Inhalation of vapour (outdoor)*
9. *Oral background intake*
10. *Inhalation background intake.*

Where the future site has hard cover and below new structures, a number of these pathways may not be available. In addition, when considering the potential pathways for leachate migration, where either hard cover and/or future surface water drainage systems are present, the potential effects of surface infiltration or contaminated surface water runoff will be greatly reduced.

Similarly, when considering the construction work force, exposure pathways through direct contact, ingestion and dust inhalation will be available during part of the construction process, and therefore adequate PPE should be provided to protect the work force during this period.

7.4.3 Receptors:-

Within the CLEA Risk Assessment Model for Human Health, the potential receptors are assessed initially on site end use, followed by a delineation of age category (i.e. child or adult), with default settings for *Residential*, *Allotment* and *Public Open Space (Park)* end uses based on a child aged 0 to 6 years, *Public Open Space (Residential)* based on a child aged 3 to 9 and *Commercial* end uses based upon an adult working exposure period of up to 49 years (i.e. age 16 to age 65).

Key generic assumptions for *Residential* and *Public Open Space (Residential)* are based upon a typical residential property, consisting of a two-storey small terraced house, with private garden, and a *Commercial* end use based upon a typical commercial or light industrial property, consisting of a three-storey office building (pre-1970). No buildings are anticipated for *Allotment* or *Public Open Space (Park)* end uses.

Within the CLEA Risk Assessment Model for Human Health there are 6 no. generic end use categories presently in use, as follows;

- 1) *Residential - with home grown produce,*
- 2) *Residential - without home grown produce,*
- 3) *Allotments,*
- 4) *Commercial*
- 5) *Public Open Space – Residential,*
- 6) *Public Open Space - Park*

When considering the proposed end use of this site, the Level 1 Risk Assessment has taken as:

- 4) *Commercial*

For Controlled Waters and assuming a worst case scenario, the primary receptors for this Level 1 Risk Assessment is potential groundwater within the underlying drift and solid geology (identified as Secondary Aquifer -A) and the Calder & Hebble Navigation Canal.

8.0 Conclusions & Recommendations

8.1 Ground Conditions:-

Made ground generally comprised tarmac and vegetation over limestone sub-base, sandy gravel of brick and ash and firm sandy gravelly clay to a depth of between c.0.30m and c.1.00m.

8.0 Conclusions & Recommendations (Cont'd)

8.1 Ground Conditions (Cont'd):-

Drift deposits were recorded to a depth in excess of c.5.45m and comprised firm and stiff (medium and high strength) sandy gravelly clay interbedded with loose, medium dense and dense clayey sand generally below c.3.00m.

Solid deposits of the Lower Coal Measures were not encountered during the investigation works.

8.2 Groundwater & Stability:-

During the investigation works, no water strikes were encountered within any of the excavations.

However, water levels have been recorded within the wells installed across the site between c.1.47m and c.4.77m during the monitoring visit undertaken to date .

Therefore, it would be prudent to allow for the introduction of suitable groundwater control measures, to take care of any surface water and water ingresses within the natural strata, particularly during the wetter periods of the year.

Owing to the nature of the natural deposits present across the site, adequate lateral trench support will be required for excavations, to prevent trench wall collapse or over excavations, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time. Reference to CIRIA 97 'Trenching Practice' would be beneficial to establish a suitable means of support or battering of excavation sides during construction.

8.3 Foundation Options:-

When considering the ground conditions recorded and proposed development, it is felt that traditional shallow (strip / pad) foundations can be adopted for the proposed development. Footings should be taken down through the full thickness of made ground and be based within the natural firm and stiff sandy gravelly clay deposits at a minimum depth of c.0.90m below finished ground levels where a maximum allowable bearing pressure of 150kN/m² is available.

For the construction of ground bearing floor slabs, road pavement and car park areas, where the initial natural deposits are to be used as an undisturbed subgrade, a design CBR value of 3% can be adopted.

Furthermore, it is recommended that the sub-grade materials are 'proof rolled' to identify any potential 'loose spots' below this development area, and these can be dealt with by excavation, processing and re-compaction or by introducing an increased thickness of compacted sub-base and/or a geogrid reinforcement. In addition, it may also be prudent to allow for an engineer to attend site during the development works, to confirm the design CBR value of the materials to be utilised prior to construction (e.g. plate bearing tests or similar).

8.4 Hazardous Ground Gas Risk Assessment:-

When considering these results, in accordance with CIRIA C665, the GSV for CH₄ and CO₂ would fall below the lower target concentration of 0.07l/hr and would equate to a Characteristic Situation 1 (CS1) site classification, resulting in no gas protective measures being required for the proposed development.

However, since the maximum Methane concentration has reached the action trigger level of 1%, the CIRIA C665 guidance recommends considering an increase in the characteristic situation by an order of 1 to take into account the higher gas concentrations recorded. Therefore, it is felt that an appropriate determination for this site, would be to place the site within Characteristic Situation 2 (CS2), therefore ground gas protection measures are required.

8.0 Conclusions & Recommendations (Cont'd)

8.4 Hazardous Ground Gas Risk Assessment (Cont'd):-

Further reference can be made to BS8485: 2015 + A1: 2019 Code of practice for the design of protective measures: for methane and carbon dioxide ground gases for new buildings and BRE414:2001: Protective measures for housing on gas contaminated land for further design specifications and details of the protective measures required.

Following completion of the remaining three gas monitoring visits, a final assessment of these results and recommendations will follow as an addendum to this report.

8.5 Ground Contamination:-

8.5.1 Made Ground

From the results of the contamination screening carried out on this site and the Level 1 Risk Assessment (Section 7.0), the made ground encountered across the site does not represent a risk to the end users and can be reused across the site during the re-development.

No asbestos fibres have been identified within the samples screened. Consequently, there is no requirement for removal, treatment, protection measures and/or further risk assessment to protect the existing end users (i.e. no risk to Human Health) from potential asbestos fibres.

8.5.2 Controlled Waters

When considering the contamination results, the levels of contaminants in the samples screened are not considered to represent a significant risk to controlled waters or adjacent sites, and as such no further treatment, removal, protection measures and/or DQRA is considered necessary in this regard.

8.5.3 General

When considering the risks to the construction workforce, adequate PPE will be required to provide protection against the levels of contaminants recorded during these investigation works. Similarly, the results can also be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations. If during future development works, any excavated materials are to be discarded and removed from this site as a waste to landfill, these materials will need to be classified using HazWasteOnline™ Software in accordance with the 'Guidance on the Classification and Assessment of Waste (1st Edition 2015) – Technical Guidance WM3'.

Where possible, removal of materials from site as a 'waste' should be kept to a minimum and ideally excavated materials should all be reused on site. However, if excavated materials must be discarded it should be noted that additional analysis and screening is likely to be required once each specific waste stream has been identified and the volume of material to be disposed of has been calculated, since the amount of screening required, including any pre-disposal WAC screening, will be dependent upon the final volume of material to be disposed of.

8.6 General Comments:-

It is recommended that a watching brief be undertaken by Arc Environmental when development works commence in the area of the potential below ground fuel storage tank to determine if they are present and to undertake further contamination testing.

For future site works, adequate lateral trench support will be required for excavations, to prevent trench wall collapse or over excavations, as well as to create a safe working environment, and any excavations on this site should remain open for as short a period as possible, since some of these materials may be susceptible to deterioration, if left open to the natural elements for any significant period of time.

8.0 Conclusions & Recommendations (Cont'd)

8.6 General Comments (Cont'd):-

With regard to asbestos in soil, where we have sampled and tested for asbestos this is discussed in the report. Whilst we would target any asbestos sampling and testing in accordance with a Conceptual Site Model and site findings, there is always the possibility, along with other contamination, that undiscovered asbestos exists between sample locations and the possibility of unknown asbestos exists on all sites, particularly brownfield sites where previous buildings have been demolished, there were previous features that were infilled (old hollows, pits etc) or where significant quantities of materials such as demolition and brick rubble exist. It is not uncommon for historical asbestos wastes to be deliberately buried on derelict sites, or imported old demolition rubble which could contain asbestos to be imported for use as hardstanding/hardcore. Unless otherwise stated we have not assessed any above or below ground features such as existing buildings, service ducts, basements, culverts, partly demolished or dilapidated structures, spoil heaps, fly tipped materials, security bunds, etc.

It is also recommended for the development of this site, adequate surface drainage should be designed and installed by a competent contractor, to prevent surface water 'ponding' or collection, during and post construction, particularly where the existing surface drainage system is disrupted or damaged.

In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any existing or proposed new foundations, these should be undertaken with care and completed prior to the preparation of any new foundations, so as not to allow any loose or granular material to move or 'flow', thus causing settlement to occur to any new or adjacent old foundation based at a higher level.

An "observational technique" can be applied to the design and construction of this site, and where ground conditions seem to vary from that indicated from the conceptual ground model derived from works to date, then advice from a suitably qualified Engineer should be sought.

The site is recorded to lie within an intermediate probability radon area, with 1% - 3% of homes estimated to be at or above the action level, in accordance with the BGS, National Geoscience Information Service, and their assessment suggests that no radon protective measures are necessary in the construction of new dwellings or extensions.

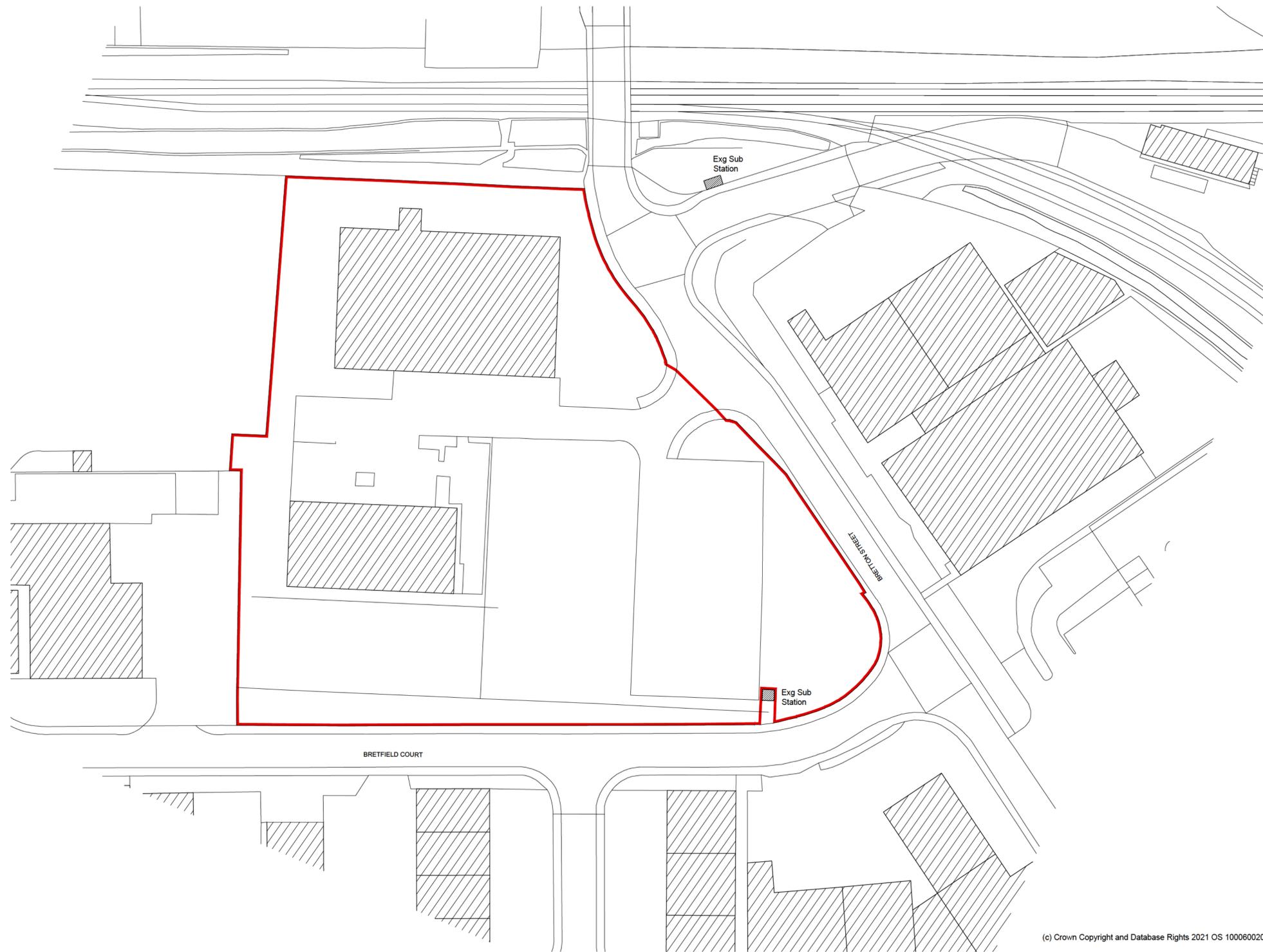
The site is not deemed to be at risk from potential future surface stability issues that can arise from shallow coal mining activities. As such no further assessment or intrusive works are required with regards to historical coal mining activities or instability issues that may arise from this potential geohazard.

END OF REPORT

APPENDIX I

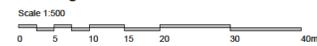
**Existing Site Layout Plan
Proposed Site Layout Plan**

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Existing Site Plan



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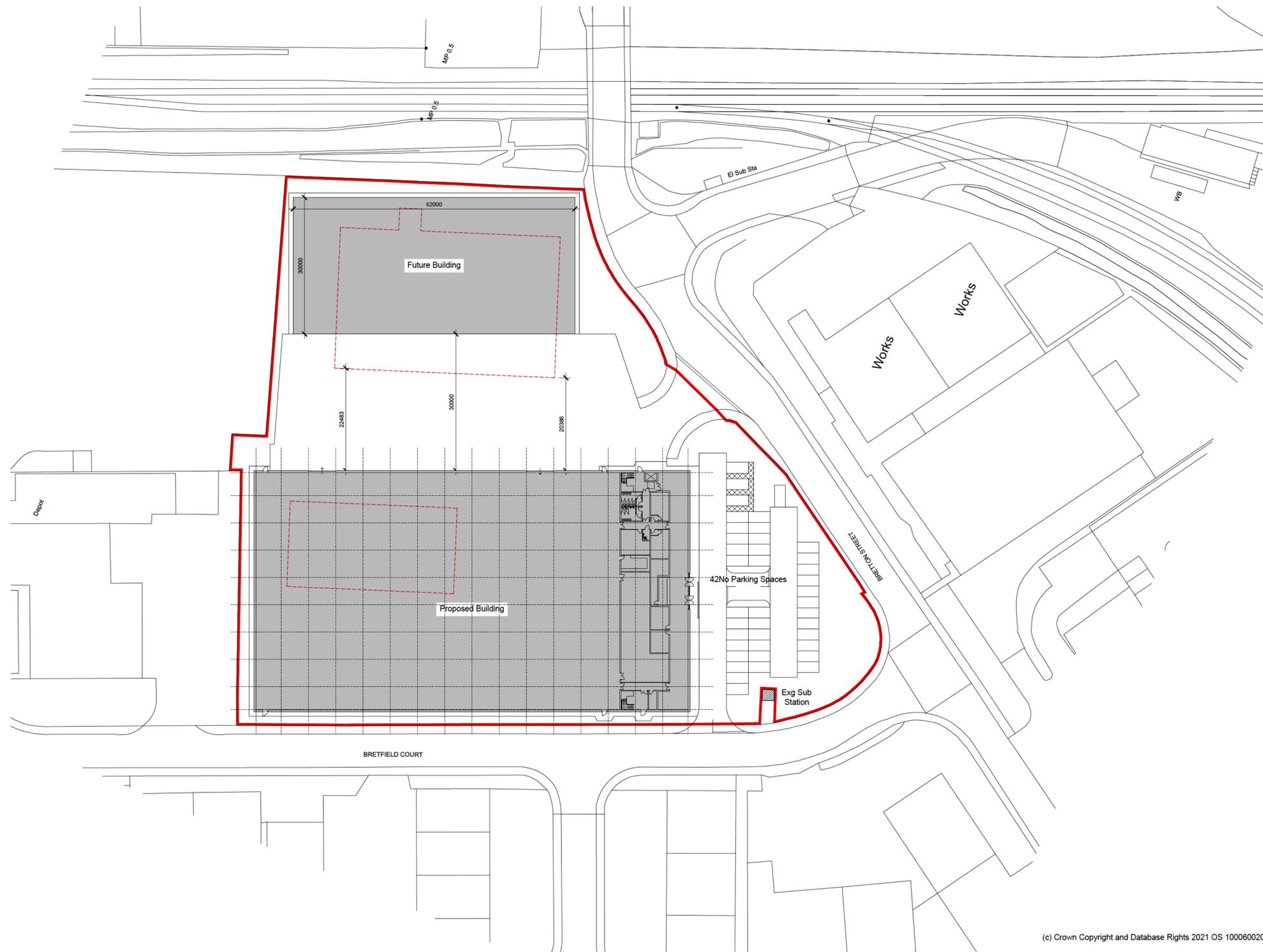
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 Email: info@parkdesigned.com
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Client:	Date:	Scale:
Sueno	Oct 2021	1:500 @A1
Project Name:	Drawn:	Reviewed:
Proposed HQ Building, Dewsbury	JAH	JAH
Drawing Title:	Drawing No:	Revision:
Existing Site Plan	004	-
Drawing Status:	Project No:	
FOR INFORMATION	21.33	

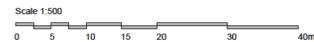
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A	28.09.21	Updated to suit Clients comments.	JAH	JAH
B	08.10.21	Updated to suit Clients comments.	JAH	JAH
C	13.10.21	Updated to suit Clients comments.	JAH	JAH



Proposed Site Plan



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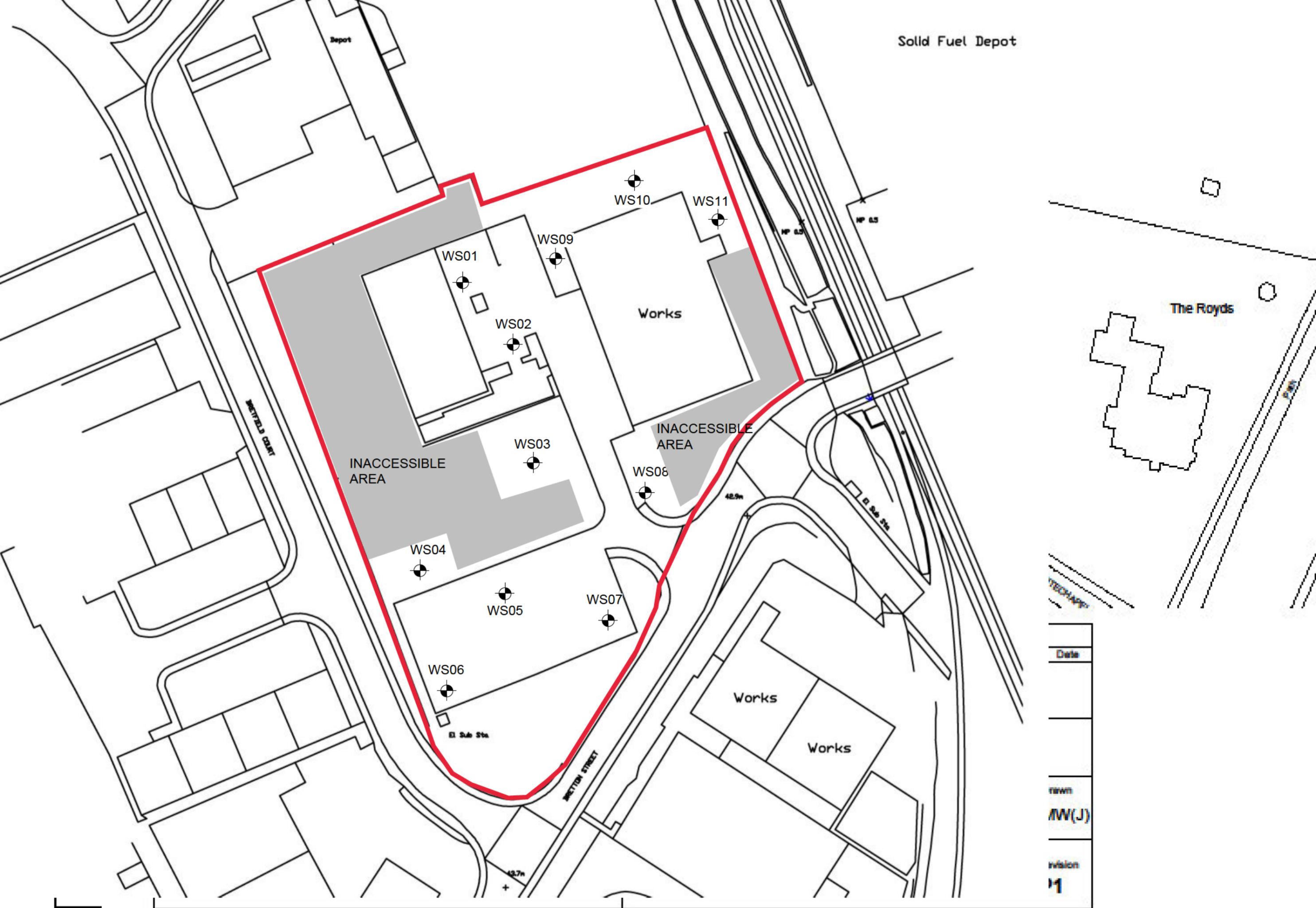
Tel: 0113 819 8057
 Email: info@parkdesigned.com
 Website: www.parkdesigned.com

Client:	Date:	Scale:
Sueno	Sept 2021	1:500 @A1
Project Name:	Drawn:	Reviewed:
Proposed HQ Building, Dewsbury	JAH	JAH
Drawing Title:	Drawing No:	Revision:
Proposed Site Plan	003	C
Drawing Status:	Project No:	
FOR COMMENTS	21.33	

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APPENDIX II

**Borehole Location Plan
Borehole Record Sheets**





So um House, Un t 1 E ott Court
 St Johns Road, Meadowf e d
 Durham, DH7 8PN
 Te ephone: 01913786380

BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS01
Job No 21-775	Date 20-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.30	J/D			[Cross-hatch pattern]	0.10	Tarmac (MADE GROUND).			
0.30 0.40	J/D			[Cross-hatch pattern]	0.30	Yellow brown limestone hardcore sub base (MADE GROUND).			
0.30 0.40	J/D			[Cross-hatch pattern]	0.40	Reddish brown sandy gravel. Gravel is fine to coarse comprising fragments of brick. Cobbles noted (MADE GROUND).			
0.60 0.80	B			[Horizontal dashes]	(0.60)	Firm (medium strength) brown and grey sandy CLAY			
1.00	V	72kN/m ²		[Vertical dashes]	1.00	Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.			
1.40 1.60	B			[Vertical dashes]					
1.50	V	120kN/m		[Vertical dashes]					
2.00	V	120kN/m		[Vertical dashes]	(1.90)				
2.60 2.80	B			[Vertical dashes]					
3.00 3.45	SPT	N 44		[Vertical dashes]	2.90	Dense brown clayey SAND. Becoming very sandy clay in places.			
3.40 3.60	B			[Vertical dashes]	(1.55)				
4.00 4.45	SPT	N 22		[Vertical dashes]	4.45	Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
--	---------------------	--	------------------------

AGS3 UK BH WS LOGS GPJ AGS3 ALL GD 27/09/21



So um House, Un t 1 E ott Court
 St Johns Road, Meadowf e d
 Durham, DH7 8PN
 Te ephone: 01913786380

BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS02
Job No 21-775	Date 20-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.20	J/D			[Cross-hatch pattern]	0.10	Tarmac (MADE GROUND).			
0.20 0.40	J/D			[Cross-hatch pattern]	0.20	Yellow brown limestone hardcore sub base (MADE GROUND).			
0.60 0.80	B			[Stippled pattern]	0.40	Reddish brown sandy gravel. Gravel is fine to coarse comprising fragments of brick. Cobbles noted (MADE GROUND).		[Cobble pattern]	
1.00	V	120kN/m		[Stippled pattern]	(2.80)	Stiff (high strength) brown and dark brown sandy gravelly CLAY with cobbles noted.		[Cobble pattern]	
1.40 1.60	B			[Stippled pattern]				[Cobble pattern]	
1.50	V	120kN/m		[Stippled pattern]				[Cobble pattern]	
2.00 2.40	B			[Stippled pattern]				[Cobble pattern]	
2.00	V	120kN/m		[Stippled pattern]				[Cobble pattern]	
2.80 3.00	B			[Stippled pattern]				[Cobble pattern]	
3.00	V	120kN/m		[Stippled pattern]	3.20			[Cobble pattern]	
3.20 3.50	B			[Stippled pattern]	(0.30) 3.50	Dark brown clayey SAND. Becoming very sandy clay in places.		[Cobble pattern]	
3.50 4.00	B			[Stippled pattern]		Medium dense light brown gravelly fine SAND.		[Cobble pattern]	
4.00 4.45	SPT	N 28		[Stippled pattern]	(0.95) 4.45			[Cobble pattern]	
						Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
--	---------------------	--	------------------------

AGS3 UK BH WS LOGS GPJ AGS3 ALL GD 27/09/21



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 St Johns Road, Meadowfe d
 Durham, DH7 8PN
 Te ephone: 01913786380

BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS03
Job No 21-775	Date 20-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)		
0.00 0.30	J/D				(0.30)	Grass over dark brown sandy gravel (MADE GROUND).		
0.30 0.50	J/D				0.30	Firm grey sandy clay (MADE GROUND).		
0.50 0.70					0.50	Firm (medium strength) brown sandy gravelly CLAY.		
0.80 1.00	B				(0.70)			
1.00 1.20	V	64kN/m ²			1.20			
1.40 1.60	B					Stiff (high strength) dark brown and brown very sandy CLAY with cobbles noted.		
1.60 1.50	V	90kN/m ²						
2.00 2.20	B				(1.65)			
2.20 2.45	SPT	N 31						
2.45 2.60	B							
2.60 2.85	SPT	75 Blows			2.85			
						Borehole terminated at 2.85m due to refusal.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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 St Johns Road, Meadowfe d
 Durham, DH7 8PN
 Te ephone: 01913786380

BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS04
Job No 21-775	Date 20-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00 0.20	J/D			[Cross-hatch pattern]	0.20	Vegetation over dark brown sandy gravel (MADE GROUND).			
0.20 0.50	J/D			[Cross-hatch pattern]	(0.30) 0.50	Stiff dark brown sandy gravelly clay. Gravel is fine to coarse comprising fragments of brick (MADE GROUND).		[Cross-hatch pattern]	
0.80 1.00	B			[Stippled pattern]		Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.		[Stippled pattern]	
1.00	V	120kN/m		[Stippled pattern]				[Stippled pattern]	
1.40 1.60	B			[Stippled pattern]		(2.30)		[Stippled pattern]	
1.50	V	80kN/m ²		[Stippled pattern]				[Stippled pattern]	
2.00	V	120kN/m		[Stippled pattern]				[Stippled pattern]	
2.60 2.80	B			[Stippled pattern]	2.80			[Stippled pattern]	
3.00 3.45	SPT	N 40		[Dotted pattern]		Dense brown clayey SAND. Becoming very sandy clay in places.		[Dotted pattern]	
3.60 3.80	B			[Dotted pattern]	(1.65)			[Dotted pattern]	
4.00 4.45	SPT	N 26		[Dotted pattern]	4.45			[Dotted pattern]	
						Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS05
Job No 21-775	Date 20-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.50	J/D				0.10 (0.40) 0.50	Tarmac (MADE GROUND). Black sandy gravel of ash and brick (MADE GROUND).			
0.80 1.00	B				(1.10)	Firm (medium strength) becoming stiff (high strength) brown sandy gravelly CLAY.			
1.00	V	60kN/m ²							
1.50	V	82kN/m ²			1.60				
1.60 1.80	B					Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.			
2.00	V	120kN/m			(1.06)				
2.40 2.60	B				2.66				
2.50	V	120kN/m							
2.60 2.66	SPT					Borehole terminated at 2.66m due to refusal.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS06
Job No 21-775	Date 21-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.30	J/D			[Cross-hatch pattern]	0.10 0.30	Tarmac (MADE GROUND). Black sandy gravel of ash and brick (MADE GROUND).		[Cross-hatch pattern]	
0.50 0.70	B	80kN/m ²		[Horizontal lines]	(0.40) 0.70	Stiff (high strength) light brown and brown sandy CLAY.		[Horizontal lines]	
0.80 1.00	B				[Horizontal lines]		Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.		[Horizontal lines]
1.00	V	110kN/m		[Horizontal lines]				[Horizontal lines]	
1.60 1.80	B			[Horizontal lines]	(2.00)			[Horizontal lines]	
2.00	V	120kN/m		[Horizontal lines]				[Horizontal lines]	
2.40 2.60	B			[Horizontal lines]				[Horizontal lines]	
2.70 3.00	B			[Horizontal lines]				[Horizontal lines]	
3.00 3.45	SPT	N 21		[Dotted pattern]	(0.80) 3.50	Medium dense brown and grey clayey SAND. Becoming very sandy clay in places.		[Dotted pattern]	
3.70 4.00	B			[Dotted pattern]		Loose grey silty SAND.		[Dotted pattern]	
4.00 4.45	SPT	N 8		[Dotted pattern]	(0.90) 4.40			[Dotted pattern]	
4.40 5.00	B			[Dotted pattern]		Firm brown and grey sandy silty CLAY.		[Dotted pattern]	
5.00 5.45	SPT	N 11		[Dotted pattern]	(1.05) 5.45			[Dotted pattern]	
							Borehole terminated at 5.45m.		[Dotted pattern]

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS07
Job No 21-775	Date 21-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.30	J/D				0.10	Tarmac (MADE GROUND).			
0.30 0.70	J/D				0.30	Black sandy gravel of ash and brick (MADE GROUND).			
0.70 1.00	B				0.70	Firm dark brown sandy gravelly clay. Gravel is fine to coarse comprising fragments of brick (MADE GROUND).			
1.00	V	40kN/m ²							
1.40 1.60	B				(1.30)	Firm (medium strength) light brown and grey very sandy gravelly CLAY.			
1.50	V	50kN/m ²							
2.00	V	50kN/m ²			2.00	Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.			
2.50	V	120kN/m							
2.60 2.80	B				(1.70)				
3.00	V	120kN/m							
3.40 3.60	B								
3.50	V	120kN/m			3.70	Medium dense brown and grey clayey SAND. Becoming very sandy clay in places.			
3.70 4.00	B								
4.00 4.45	SPT	N 21			(0.75)				
					4.45	Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS08
Job No 21-775	Date 21-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.00 0.60	J/D				(0.60) 0.60	Vegetation over dark brown sandy gravel (MADE GROUND).			
0.80 1.00	J/D	66kN/m ²			(0.50) 1.10	Firm dark grey sandy gravelly CLAY.			
1.00 1.20	V				(0.60) 1.70	Firm medium brown and grey sandy CLAY.			
1.20 1.40	B				(0.50) 2.20	Firm medium brown very sandy CLAY.			
1.80 2.00	B	N 14			(1.10) 3.30	Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.			
2.00 2.45	SPT				(1.15) 4.45	Medium dense brown and grey clayey SAND. Becoming very sandy clay in places.			
2.60 2.80	B	120kN/m			(1.15) 4.45				
3.00 3.60	V								
3.60 4.00	B								
4.00 4.45	SPT	N 23							
						Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:43.75	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS09
Job No 21-775	Date 21-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.10 0.50	J/D				(0.50)	Vegetation over dark brown sandy gravel of brick and concrete (MADE GROUND).			
0.70 1.00	J/D				(0.50)	Firm brown sandy clay. (MADE GROUND).			
1.00	V	40kN/m ²			1.00	Firm (medium strength) becoming stiff (high strength) brown sandy gravelly CLAY.			
1.40 1.60	B	120kN/m			(2.50)				
1.50	V								
2.00	V	120kN/m							
2.60 2.80	B								
3.00 3.50	B	120kN/m			3.50				
3.00	V								
3.50 4.00	B								
4.00 4.45	SPT	N 50					(0.95)	Dense brown gravelly SAND. Becoming very sandy clay in places.	
					4.45	Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS10
Job No 21-775	Date 22-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.20 0.40	J/D				(0.70)	Vegetation over dark brown sandy gravelly clay (MADE GROUND).			
0.70 1.00	J/D				(0.30) 1.00	Firm (medium strength) dark grey sandy CLAY.			
1.00	V	44kN/m ²				Stiff (high strength) dark brown sandy gravelly CLAY with cobbles noted.			
1.40 1.60	B	110kN/m							
1.50	V								
2.00	V	120kN/m			(2.60)				
2.60 2.80	B								
3.00	V	120kN/m							
3.10 3.30	B								
3.60 4.00	B				3.60				
4.00 4.45	SPT	N 48			(0.85)	Dense brown gravelly SAND. Becoming very sandy clay in places.			
					4.45	Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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 Durham, DH7 8PN
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BOREHOLE LOG

Project Proposed Industrial Unit, Sueno, Bretton Street, Dewsbury				BOREHOLE No WS11
Job No 21-775	Date 22-09-21	Ground Level (m)	Co Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.30 0.50	J/D				(0.70)	Vegetation over dark brown sandy gravelly clay (MADE GROUND).			
0.70 0.90	J/D				0.70 0.90	Black and dark brown sandy clayey soil (MADE GROUND).			
1.00 1.30	B	40kN/m ²			(0.40)	Soft (low strength) light brown sandy CLAY.			
1.00	V					1.30			
1.30 1.60	B	104kN/m			(2.30)	Stiff (high strength) dark brown and grey sandy gravelly CLAY with cobbles noted.			
1.50	V								
1.80 2.00	B	120kN/m			(2.30)				
2.00	V								
2.40 2.60	B								
3.00 3.40	B	98kN/m ²			3.60				
3.00	V								
3.60 4.00	B								
4.00 4.45	SPT	N 47			(0.85)	Dense brown gravelly SAND. Becoming very sandy clay in places.			
					4.45	Borehole terminated at 4.45m.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Borehole remained dry on completion.

All dimensions in metres Scale 1:37.5	Client Sueno	Method/ Plant Used Windowless Sampling	Logged By DO
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AGS3 UK BH WS LOGS GPJ AGS3 ALL GD 27/09/21

APPENDIX III

Laboratory Results (Geotechnical & Ground Contamination)



LABORATORY REPORT



4043

Contract Number: PSL21/7736

Report Date: 19 October 2021
Client's Reference: 21-775
Client Name: Arc Environmental
Solum House
Unit 1 Elliott Court
St Johns Road, Meadowfield
Durham
DH7 8PN

For the attention of: Matt Bradford

Contract Title: Bretton Street, Dewsbury
Date Received: 28/9/2021
Date Commenced: 28/9/2021
Date Completed: 19/10/2021

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

L Knight
(Assistant Laboratory Manager)

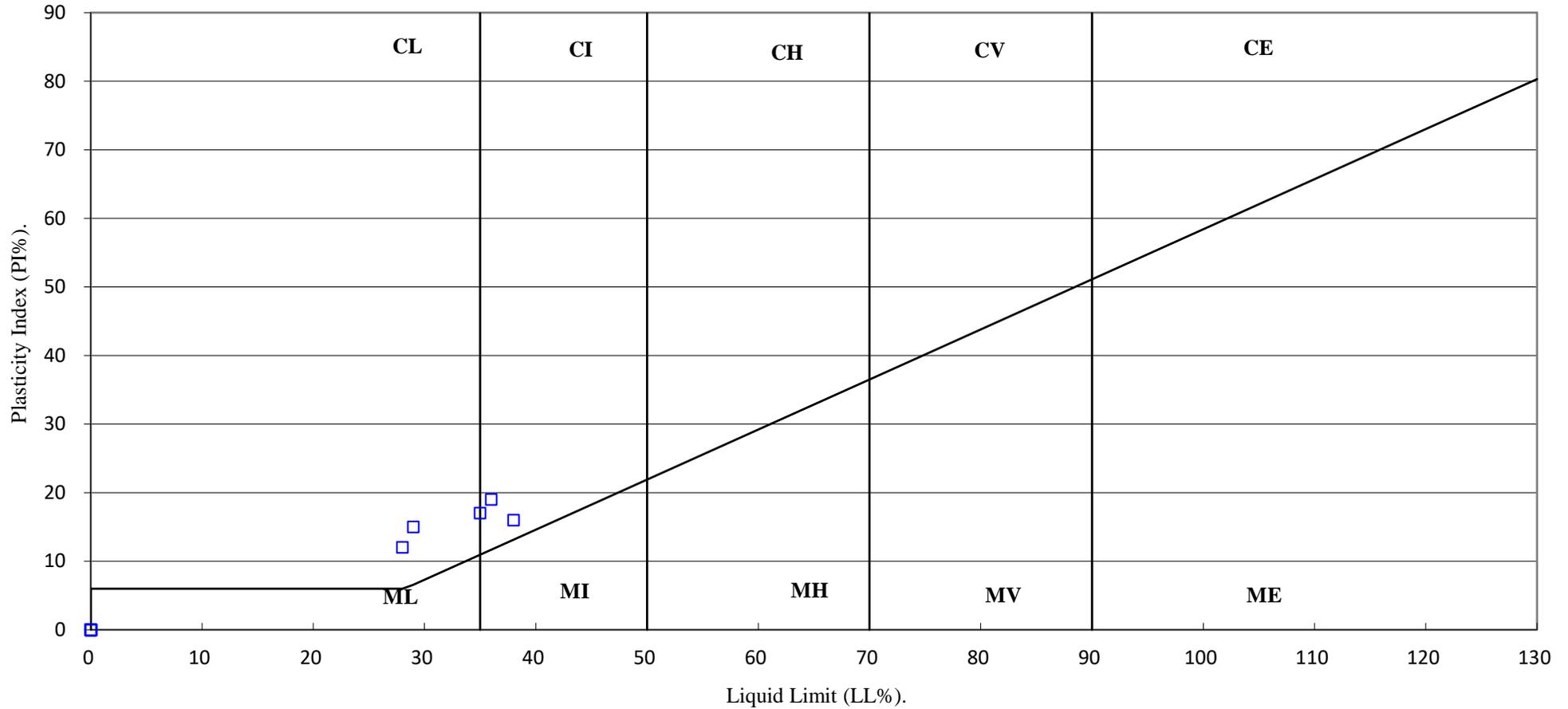
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Page 1 of

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Bretton Street, Dewsbury

Contract No:

PSL21/7736

Client Ref:

21-775



ANALYTICAL TEST REPORT

Contract no: 100892
Contract name: Bretton Street, Dewsbury
Client reference: 21-775
Clients name: ARC Environmental
Clients address: Solum House, Unit 1 Elliott Court
St Johns Road
Meadowfield
DH7 8PN

Samples received: 28 September 2021

Analysis started: 28 September 2021

Analysis completed: 05 October 2021

Report issued: 05 October 2021

Notes: Opinions and interpretations expressed herein are outside the UKAS accreditation scope.
Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.
All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.
Methods, procedures and performance data are available on request.
Results reported herein relate only to the material supplied to the laboratory.
This report shall not be reproduced except in full, without prior written approval.
Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.
BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

Key: U UKAS accredited test
M MCERTS & UKAS accredited test
\$ Test carried out by an approved subcontractor
I/S Insufficient sample to carry out test
N/S Sample not suitable for testing
NAD No Asbestos Detected

Approved by: _____
Rachael Burton
Customer Support Squad Leader

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

All results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

Analytical results are inclusive of stones.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
100892-1	WS01	0.30-0.40	Clayey Sand with Gravel	-	-	11.4
100892-2	WS01	0.60-0.80	Sandy Clay with Gravel	-	-	12.8
100892-3	WS02	1.40-1.60	Sandy Clay with Gravel	-	-	10.9
100892-4	WS03	0.00-0.30	Sandy Loam with Roots	-	-	22.4
100892-5	WS03	0.80-1.00	Sandy Clay	-	-	17.5
100892-6	WS04	0.20-0.50	Sandy Clay with Gravel & Roots	-	-	9.2
100892-7	WS04	1.40-1.60	Sandy Clay with Gravel	-	-	10.1
100892-8	WS06	0.10-0.30	Loamy Sand with Gravel	-	-	16.2
100892-9	WS07	0.10-0.30	Loamy Sand with Gravel	-	-	17.8
100892-10	WS08	0.00-0.60	Loamy Sand with Gravel	-	-	6.5
100892-11	WS09	0.70-1.00	Sandy Clay with Gravel	-	-	27.3
100892-12	WS11	0.30-0.50	Sandy Clay with Gravel	-	-	12.5

Chemtech Environmental Limited

SOILS

Lab number			100892-1	100892-2	100892-3	100892-4	100892-5	100892-6
Sample id			WS01	WS01	WS02	WS03	WS03	WS04
Depth (m)			0.30-0.40	0.60-0.80	1.40-1.60	0.00-0.30	0.80-1.00	0.20-0.50
Date sampled			22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021
Test	Method	Units						
Arsenic (total)	CE127 ^M	mg/kg As	4.4	-	-	7.4	-	12
Cadmium (total)	CE127 ^M	mg/kg Cd	0.5	-	-	0.2	-	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	13	-	-	61	-	81
Chromium (III)	CE208	mg/kg CrIII	13	-	-	61	-	81
Chromium (VI)	CE146	mg/kg CrVI	<1	-	-	<1	-	<1
Copper (total)	CE127 ^M	mg/kg Cu	6.5	-	-	23	-	30
Lead (total)	CE127 ^M	mg/kg Pb	12	-	-	32	-	27
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	-	-	<0.5	-	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	5.5	-	-	14	-	26
Selenium (total)	CE127 ^M	mg/kg Se	<0.3	-	-	0.8	-	1.5
Zinc (total)	CE127 ^M	mg/kg Zn	40	-	-	56	-	68
pH	CE004 ^M	units	8.8	5.7	6.2	10.6	7.9	8.0
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	76	109	54	54	64	37
Cyanide (free)	CE077	mg/kg CN	<1	-	-	<1	-	<1
Total Organic Carbon (TOC)	CE197	% w/w C	0.7	-	-	4.9	-	1.6
PAH								
Acenaphthene	CE087 ^M	mg/kg	0.79	-	-	<0.02	-	<0.02
Acenaphthylene	CE087 ^M	mg/kg	0.10	-	-	<0.02	-	<0.02
Anthracene	CE087 ^U	mg/kg	3.60	-	-	0.04	-	0.03
Benzo(a)anthracene	CE087 ^U	mg/kg	8.47	-	-	0.29	-	0.15
Benzo(a)pyrene	CE087 ^U	mg/kg	7.56	-	-	0.23	-	0.16
Benzo(b)fluoranthene	CE087 ^M	mg/kg	8.31	-	-	0.34	-	0.23
Benzo(ghi)perylene	CE087 ^M	mg/kg	4.30	-	-	0.15	-	0.12
Benzo(k)fluoranthene	CE087 ^M	mg/kg	3.68	-	-	0.12	-	0.08
Chrysene	CE087 ^M	mg/kg	7.72	-	-	0.39	-	0.17
Dibenz(ah)anthracene	CE087 ^M	mg/kg	1.02	-	-	0.03	-	0.02
Fluoranthene	CE087 ^M	mg/kg	22.15	-	-	0.64	-	0.33
Fluorene	CE087 ^U	mg/kg	0.70	-	-	<0.02	-	<0.02
Indeno(123cd)pyrene	CE087 ^M	mg/kg	5.00	-	-	0.16	-	0.13
Naphthalene	CE087 ^M	mg/kg	0.03	-	-	0.04	-	<0.02
Phenanthrene	CE087 ^M	mg/kg	9.75	-	-	0.19	-	0.15
Pyrene	CE087 ^M	mg/kg	19.09	-	-	0.63	-	0.30
PAH (total of USEPA 16)	CE087	mg/kg	102	-	-	3.24	-	1.87
BTEX & TPH								
Benzene	CE192 ^U	mg/kg	<0.01	-	-	<0.01	-	<0.01
Toluene	CE192 ^U	mg/kg	<0.01	-	-	<0.01	-	<0.01
Ethylbenzene	CE192 ^U	mg/kg	<0.01	-	-	<0.01	-	<0.01
m & p-Xylene	CE192 ^U	mg/kg	<0.02	-	-	<0.02	-	<0.02
o-Xylene	CE192 ^U	mg/kg	<0.01	-	-	<0.01	-	<0.01

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SOILS

Lab number			100892-1	100892-2	100892-3	100892-4	100892-5	100892-6
Sample id			WS01	WS01	WS02	WS03	WS03	WS04
Depth (m)			0.30-0.40	0.60-0.80	1.40-1.60	0.00-0.30	0.80-1.00	0.20-0.50
Date sampled			22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021
Test	Method	Units						
VPH Aliphatic c (>C5-C6)	CE067	mg/kg	<0.1	-	-	<0.1	-	<0.1
VPH Aliphatic c (>C6-C8)	CE067	mg/kg	<0.1	-	-	<0.1	-	<0.1
VPH Aliphatic c (>C8-C10)	CE067	mg/kg	<0.1	-	-	<0.1	-	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	-	-	<4	-	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	7	-	-	6	-	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	146	-	-	71	-	50
EPH Aliphatic (>C35-C44)	CE068	mg/kg	13	-	-	13	-	<10
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	<0.01	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	<0.01	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	<0.01	-	<0.01
EPH Aromatic c (>EC10-EC12)	CE068	mg/kg	<1	-	-	<1	-	<1
EPH Aromatic c (>EC12-EC16)	CE068	mg/kg	<1	-	-	<1	-	<1
EPH Aromatic c (>EC16-EC21)	CE068	mg/kg	56	-	-	3	-	<1
EPH Aromatic c (>EC21-EC35)	CE068	mg/kg	43	-	-	3	-	<1
EPH Aromatic c (>EC35-EC44)	CE068	mg/kg	5	-	-	<1	-	<1
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	-	-	NAD	-	NAD

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SOILS

Lab number			100892-7	100892-8	100892-9	100892-10	100892-11	100892-12
Sample id			WS04	WS06	WS07	WS08	WS09	WS11
Depth (m)			1.40-1.60	0.10-0.30	0.10-0.30	0.00-0.60	0.70-1.00	0.30-0.50
Date sampled			22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021
Test	Method	Units						
Arsenic (total)	CE127 ^M	mg/kg As	-	17	34	3.6	9.6	42
Cadmium (total)	CE127 ^M	mg/kg Cd	-	<0.2	0.4	0.2	0.2	0.2
Chromium (total)	CE127 ^M	mg/kg Cr	-	116	108	41	104	59
Chromium (III)	CE208	mg/kg CrIII	-	116	108	41	104	59
Chromium (VI)	CE146	mg/kg CrVI	-	<1	<1	<1	<1	<1
Copper (total)	CE127 ^M	mg/kg Cu	-	44	72	18	30	46
Lead (total)	CE127 ^M	mg/kg Pb	-	66	26	20	31	88
Mercury (total)	CE127 ^M	mg/kg Hg	-	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel (total)	CE127 ^M	mg/kg Ni	-	30	58	16	26	26
Selenium (total)	CE127 ^M	mg/kg Se	-	1.3	1.8	0.6	1.6	1.8
Zinc (total)	CE127 ^M	mg/kg Zn	-	58	34	56	71	70
pH	CE004 ^M	units	7.8	8.5	8.5	11.6	7.2	8.2
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	41	52	165	16	96	43
Cyanide (free)	CE077	mg/kg CN	-	<1	<1	<1	<1	<1
Total Organic Carbon (TOC)	CE197	% w/w C	-	2.2	4.5	3.3	1.0	2.0
PAH								
Acenaphthene	CE087 ^M	mg/kg	-	0.03	<0.02	1.07	<0.02	0.02
Acenaphthylene	CE087 ^M	mg/kg	-	0.04	<0.02	0.19	<0.02	<0.02
Anthracene	CE087 ^U	mg/kg	-	0.14	0.03	1.00	<0.02	0.08
Benzo(a)anthracene	CE087 ^U	mg/kg	-	0.58	0.19	2.02	<0.02	0.59
Benzo(a)pyrene	CE087 ^U	mg/kg	-	0.59	0.34	1.69	<0.02	0.66
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	0.82	0.41	2.13	<0.02	0.86
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	0.44	0.30	1.27	<0.02	0.51
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	0.27	0.14	0.88	<0.03	0.30
Chrysene	CE087 ^M	mg/kg	-	0.67	0.23	2.01	<0.03	0.61
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	0.08	0.06	0.30	<0.02	0.10
Fluoranthene	CE087 ^M	mg/kg	-	1.28	0.43	5.36	<0.02	1.05
Fluorene	CE087 ^U	mg/kg	-	0.05	<0.02	0.58	<0.02	<0.02
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	0.46	0.30	1.33	<0.02	0.58
Naphthalene	CE087 ^M	mg/kg	-	0.19	0.08	4.63	<0.02	0.03
Phenanthrene	CE087 ^M	mg/kg	-	0.88	0.14	4.20	<0.02	0.32
Pyrene	CE087 ^M	mg/kg	-	1.12	0.47	4.17	<0.02	0.96
PAH (total of USEPA 16)	CE087	mg/kg	-	7.65	3.13	32.8	<0.34	6.68
BTEX & TPH								
Benzene	CE192 ^U	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	CE192 ^U	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01
Ethylbenzene	CE192 ^U	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01
m & p-Xylene	CE192 ^U	mg/kg	-	<0.02	<0.02	<0.02	<0.02	<0.02
o-Xylene	CE192 ^U	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01

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SOILS

Lab number	100892-7	100892-8	100892-9	100892-10	100892-11	100892-12		
Sample id	WS04	WS06	WS07	WS08	WS09	WS11		
Depth (m)	1.40-1.60	0.10-0.30	0.10-0.30	0.00-0.60	0.70-1.00	0.30-0.50		
Date sampled	22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021	22/09/2021		
Test	Method	Units						
VPH Aliphatic c (>C5-C6)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic c (>C6-C8)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic c (>C8-C10)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	<4	4	42	12	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	4	12	44	66	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	73	198	476	162	86
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	<10	68	673	<10	12
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	-	<0.01	<0.01	<0.01	<0.01	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	-	0.01	<0.01	<0.01	<0.01	<0.01
EPH Aromatic c (>EC10-EC12)	CE068	mg/kg	-	<1	<1	6	<1	<1
EPH Aromatic c (>EC12-EC16)	CE068	mg/kg	-	<1	<1	2	<1	<1
EPH Aromatic c (>EC16-EC21)	CE068	mg/kg	-	4	2	16	<1	3
EPH Aromatic c (>EC21-EC35)	CE068	mg/kg	-	4	3	11	<1	5
EPH Aromatic c (>EC35-EC44)	CE068	mg/kg	-	<1	<1	2	<1	<1
Subcontracted analysis								
Asbestos (qualitative)	\$	-	-	NAD	NAD	NAD	NAD	NAD

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PREPARED LEACHATES

Lab number			100892-8L	100892-12L
Sample id			WS06	WS11
Depth (m)			0.10-0.30	0.30-0.50
Test	Method	Units		
Arsenic (dissolved)	CE128 ^u	µg/l As	10.28	2.21
Boron (dissolved)	CE128 ^u	µg/l B	<6	13
Cadmium (dissolved)	CE128 ^u	µg/l Cd	<0.07	<0.07
Chromium (dissolved)	CE128 ^u	µg/l Cr	0.8	0.3
Copper (dissolved)	CE128 ^u	µg/l Cu	1.7	1.8
Lead (dissolved)	CE128 ^u	µg/l Pb	0.5	0.6
Mercury (dissolved)	CE128 ^u	µg/l Hg	<0.008	<0.008
Nickel (dissolved)	CE128 ^u	µg/l Ni	<0.5	<0.5
Selenium (dissolved)	CE128 ^u	µg/l Se	0.99	0.48
Zinc (dissolved)	CE128 ^u	µg/l Zn	1	<1
pH	CE213 ^u	un ts	8.1	8.0
Sulphate	CE049 ^u	mg/l SO ₄	2.7	1.9
Cyanide (free)	CE147	µg/l CN	<20	<20
PAH				
Acenaphthene	CE051	µg/l	<0.1	0.2
Acenaphthylene	CE051	µg/l	<0.1	0.3
Anthracene	CE051	µg/l	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	0.4
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1
Naphthalene	CE051	µg/l	0.2	5.7
Phenanthrene	CE051	µg/l	<0.1	0.5
Pyrene	CE051	µg/l	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	7.1
BTEX & TPH				
Benzene	CE057 ^u	µg/l	<1	<1
Toluene	CE057 ^u	µg/l	<1	<1
Ethylbenzene	CE057 ^u	µg/l	<1	<1
m & p-Xylene	CE057 ^u	µg/l	<2	<2
o-Xylene	CE057 ^u	µg/l	<1	<1
VPH Aliphatic c (>C5-C6)	CE175	µg/l	<1	<1
VPH Aliphatic c (>C6-C8)	CE175	µg/l	<1	<1
VPH Aliphatic c (>C8-C10)	CE175	µg/l	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	2
EPH Aliphatic (>C12-C16)	CE161	µg/l	2	7

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PREPARED LEACHATES

Lab number			100892-8L	100892-12L
Sample id			WS06	WS11
Depth (m)			0.10-0.30	0.30-0.50
Test	Method	Units		
EPH Aliphatic (>C16-C35)	CE161	µg/l	5	86
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	4
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1
EPH Aromat c (>EC10-EC12)	CE161	µg/l	<1	6
EPH Aromat c (>EC12-EC16)	CE161	µg/l	<1	2
EPH Aromat c (>EC16-EC21)	CE161	µg/l	<1	3
EPH Aromat c (>EC21-EC35)	CE161	µg/l	<1	2
EPH Aromat c (>EC35-EC44)	CE161	µg/l	<1	<1

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE208	Chromium (III)	Calculation: Cr (total) - Cr (VI)	Dry		1	mg/kg CrIII
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extract on, ICP-OES	Dry	U	10	mg/l SO ₄
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE192	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE192	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		15	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromat c (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromat c (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromat c (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromat c (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromat c (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
\$	Asbestos (qual tative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE002	Leachate preparation (EA)	L:S 10:1		-	-
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	8	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE213	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	1.7	mg/l SO ₄
CE147	Cyanide (free)	Continuous Flow Colorimetry		20	µg/l CN
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l

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METHOD DETAILS

METHOD	PREPARED LEACHATES	METHOD SUMMARY	STATUS	LOD	UNITS
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
100892-1	WS01	0.30-0.40	N	
100892-2	WS01	0.60-0.80	N	
100892-3	WS02	1.40-1.60	N	
100892-4	WS03	0.00-0.30	N	
100892-5	WS03	0.80-1.00	N	
100892-6	WS04	0.20-0.50	N	
100892-7	WS04	1.40-1.60	N	
100892-8	WS06	0.10-0.30	N	
100892-9	WS07	0.10-0.30	N	
100892-10	WS08	0.00-0.60	N	
100892-11	WS09	0.70-1.00	N	
100892-12	WS11	0.30-0.50	N	

APPENDIX IV

Gas and Water Monitoring Certificate

Arc Environmental Ground Gas & Groundwater Monitoring Certificate



Site	Bretton Street
Ref	21 - 775

Visit	Date	Time	Equipment	Weather	Initials	Comments	Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			Depth to Water (m bgl)		
										R/F/S	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H ₂ S	CO			
1	07/10/2021	12.50pm	GFM435	sunny	TMc	BH9 - Mal-odour noted.	3	<0.1	998			0.0		0.0		1.5		18.6				0.0	0.0	1.47		
							6	<0.1	996			0.0		0.0		4.7		15.4					0.0	0.0	4.77	
							9	<0.1	998			23.7		>>>>		2.3		18.8						0.0	0.0	4.37
2																										
3																										
4																										
5																										
6																										

Notes
 Detection limits - Methane 0.0%, Carbon Dioxide 0.0%, LEL 0.0%, Oxygen 0.0%, Flow 0.1l/hr
 Monitoring order is from **Left to Right** across table
 Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes
 N/A Not applicable Off the scale

CI PID compensation Factor (1-10) - Must be used to multiply the PID reading to give an accurate measure of the total hydrocarbons in the borehole when methane is present
 Hex Hexane (Valid and in range up to 2.000%) - Recorded when abnormally high methane is present.
 PID Photo Ionisation Detector (Calibrated to Isobutylene)