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GROUND INVESTIGATION REPORT

MKR PROPERTIES LTD

PROPOSED COMMERCIAL DEVELOPMENT

PANT INDUSTRIAL ESTATE

MERTHYR TYDFIL

CF48 2SR

Project No: 19-1012

Prepared By:

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Date:

28th February 2020

Approved By:

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Date:

28th February 2020

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.

Report Type:- Ground Investigation Report.

Project:- 19-1012 – Proposed Commercial Development, Pant Industrial Estate, Merthyr Tydfil, CF48 2SR.

Prepared For:- MKR Properties Ltd.

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1.0 Introduction

February 2020

As requested by Harley Haddow on behalf of MKR Properties Ltd., a targeted programme of Ground Investigation works have been carried out by Arc Environmental Ltd. for a proposed commercial development at Pant Industrial Estate in Merthyr Tydfil.

The intrusive investigation works comprised, 3 no. cable percussive boreholes (BH01 – BH03), 5 no. windowless sampling boreholes (WS01 – WS05) and 8 no. mechanically excavated trial pits (TP01 – TP08). In addition, 3 no. combined ground gas/groundwater monitoring standpipes have been installed within WS01, WS04 & WS05 and the locations of all the investigation positions can be seen on the Borehole and Trial pit Location Plan, a copy of which is attached in Appendix II. It should be noted that this plan is primarily for orientating purposes, as the location of the investigation positions 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 Development, Pant Industrial Estate, Merthyr Tydfil, CF48 2SR.
National Grid Reference:	306063, 208756 (representative for the central part of the development site).
Description of Location:	Existing commercial buildings are present around the site on Pant Industrial Estate to the north of Merthyr Tydfil Town Centre.

3.0 Scope of Works

Table 3.1

Client:	MKR Properties Ltd.
Consultant:	Harley Haddow.
Project type:	New commercial units with associated access road and car parking infrastructure.
Aerial Photograph:	See Appendix I.
Existing & Proposed Site Layout:	See Appendix I.
Intrusive Investigation Works:	3 no. cable percussive boreholes (BH01 – BH03). 5 no. windowless sampling boreholes (WS01 – WS05). 8 no. mechanically excavated foundation trial pits (TP01 – TP08). 3 no. combined ground gas/groundwater monitoring standpipes (WS01, WS04 & WS05).
Laboratory Testing:	Geotechnical & Ground Contamination.
CLEA Classification:	<i>Commercial.</i>
Reporting:	Factual & Interpretative including a quantitative ground contamination risk assessment for Human Health and an assessment of the potential risks to Controlled Waters. Works carried out in accordance with the current UK Guidance and various British Standards.

The information contained in this report is limited to the area of the site, as indicated on the Existing Site Layout Plan shown in Appendix I, and to those areas accessible during the ground investigation.

This ground investigation has been designed to provide information on the general ground and groundwater conditions where access would allow, within the boundaries of the site whilst targeting any specific potential areas of concern.

The rationale behind the location of each exploratory hole is summarised in Table 3.1 on the following page.

3.0 Scope of Works (Cont'd)

3.1 Investigation Rationale:-

Table 3.1

<u>Potential issue</u>	<u>Exploratory hole</u>
Geotechnical considerations around area of the proposed development.	WS01 - WS05 BH01 - BH03 TP01 - TP08
Determination of ground gas regime & shallow groundwater monitoring.	WS01, WS04 & WS05
General site wide contamination assessment.	WS01 - WS05 TP01 - TP08

3.2.1 Ground Contamination Sampling:-

Samples of the made ground were recovered by a representative of Arc Environmental Ltd. during the intrusive investigation works. Samples of soil for chemical analysis were placed into air tight amber glass jars. All samples were stored at approximately 2°C - 8°C using cool boxes and ice packs prior to delivery to a UKAS/MCERTS accredited laboratory.

3.2.2 Avoiding Cross-Contamination between Sample Locations:-

To avoid possible cross-contamination of materials between soil horizons, drill casing was used to seal off the made ground. The sampling equipment was washed down between sampling positions. With regards to the trial pits, the samples were recovered manually using dedicated disposable plastic gloves, replaced between each sample recovery.

3.2.3 Onsite Health & Safety Requirements:-

All site representatives wore relevant and appropriate PPE including (where required) safety footwear, high visibility jacket/vest and hard hats, in accordance with the site Health and Safety policy.

4.0 Ground Conditions

For an accurate description of the ground conditions encountered at each investigation position, reference should be made to the borehole and trial pit record sheets, copies of which can be found in Appendix II.

4.1 Ground Profile:-

A summary of the soil profile for this site can be seen in Table 4.1 below and continued on the following page.

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.0.60m and c.2.00m	Concrete, firm sandy gravelly clay and sandy clayey gravel. Fragments of brick, concrete, ash, sandstone and breeze block with some plastic, metal and wire were noted. Cobbles and boulders present whilst relic foundations and structures were also noted within several of the exploratory holes. TP02, TP04, TP05 & TP06 all refused at shallow depth owing to the presence of relic concrete structures.
DRIFT DEPOSITS: (Glacial Till)	From 0.60m and c.2.00m up to c.0.90m and c.>8.93m	Initially very soft and firm sandy gravelly SILT and firm sandy silty CLAY over medium dense becoming dense clayey sandy GRAVEL becoming firm sandy gravelly CLAY in places with cobbles noted.

4.0 Ground Conditions (Cont'd)

4.1 Ground Profile (Cont'd):-

Table 4.1 (Cont'd)

<u>Type of Strata</u>	<u>Depths Recorded (BGL)</u>	<u>Description & General Comments</u>
SOLID GEOLOGY: (Bishopston Mudstone Formation)	Not encountered	~

There was no visual and/or olfactory evidence of significant heavy or gross ground contamination present within any of the investigations undertaken across the development area.

4.2 Groundwater & Stability:-

Ingresses of water were recorded within all exploratory hole positions within the made ground and natural deposits below the site. Monitoring of groundwater levels is being undertaken as part of the ground gas monitoring and this is discussed further in Section 5.3 of this report.

Several trial pits were noted to be unstable during and on completion of the excavations. Owing to the nature of the made ground and natural drift deposits present across the site, adequate lateral trench support will be required for excavations, in order 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 were carried out within the boreholes with the use of a normal split spoon sampler (SPT), in order to determine the strength and density of the made ground and natural drift deposits. The results are shown as uncorrected 'N' values on the graphic borehole record sheets, adjacent to the appropriate sample level. Where the full penetration depth, including seating blows (450mm), could not be achieved, the actual depth of penetration and number of blows undertaken has been recorded.

5.1.1 Made Ground:-

- Tests completed within the made ground materials recorded 'N' values of 19 to 44, which is indicative of firm and stiff deposits.

5.1.2 Granular Drift Deposits (Glacial Till):-

- Tests completed within the granular drift deposits recorded 'N' values of 13 to 36 and 75 blows for limited penetration which is indicative of medium dense, dense and very dense deposits.

5.1.3 Cohesive Drift Deposits (Glacial Till):-

- Tests completed within the cohesive drift deposits recorded 'N' values of 5 to 29 which is indicative of soft, firm and stiff deposits.

5.0 Insitu Testing (Cont'd)

5.2 Insitu Hand Shear Vane Tests:-

Insitu hand vane tests were carried out using a portable hand vane tester (Upper limit 120kN/m²) on the natural clayey natural drift encountered. The results obtained can be found adjacent to the appropriate sample levels, on the borehole and trial pit record sheets attached.

Shear strengths ranging from 20kN/m² to 80kN/m² were recorded equating to low, medium and high strength deposits.

5.3 Insitu Ground Gas & Groundwater Monitoring:-

5.3.1 Hazardous Ground Gas Risk Assessment:-

Soil gas & water monitoring standpipes were installed within WS01, WS04 & WS05, primarily to check for the possible presence of hazardous ground gases associated with the on-site made ground deposits and off-site sources. These monitoring wells were also utilised to monitor insitu shallow groundwater levels. A standard 50mm diameter HDPE standpipe, with gravel and/or geo-wrap surround, bentonite seal, gas valve cap and security cover, was installed at WS01, WS04 & WS05 to a depth of between c.2.30m and c.2.90m bgl. The soil gas and water levels were allowed to reach equilibrium, prior to the first monitoring visit and monitoring to date has been undertaken using a GFM 435 series soil gas analyser, with integral flow meter, and a Geotechnical Instruments electronic dip-meter.

In accordance with CIRIA Report C665, November 2007, and BS8485:2015 – Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings, and from these intrusive investigation works, 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** (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**, (assessment based on the environmental setting and results of the site investigations, etc.).
- Monitoring over a **minimum of one month** with a minimum **four recorded** readings (Table 5.5 – Typical /idealised frequency and period of monitoring after Wilson et al, 2005).
- **Negligible** flow rates have been recorded (Table 8.5 – Modified Wilson & Card classification).
- A targeted and phased programme of gas monitoring to be completed, which will try to 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 ideally during low atmospheric pressure (i.e. c.1000mb and below).

A summary of the results for the visit undertaken to date, compared with the ‘inert’ background gas levels are presented in Table 5.1 below with a copy of the monitoring certificate attached in Appendix III. A further three monitoring visits are scheduled and the results along with the final recommendations will be issued as an addendum letter to this report.

Table 5.1

Elevated levels shown **Bold**.

<u>Position</u>	<u>Date</u>	<u>Atmospheric Pressure (mbar)</u>	<u>Water (m bgl)</u>	<u>CH₄ (%v/v)</u>	<u>LEL (%v/v)</u>	<u>CO₂ (%v/v)</u>	<u>O₂ (%v/v)</u>	<u>Flow Rate (l/hr)</u>
Background		~	~	0	0	0	21.0	<0.1
WS01	13/02/20	955	1.30	0.0	0.0	0.9	15.2	<0.1
WS04		(Falling)	Flooded	~	~	~	~	~
WS05			1.10	0.0	0.0	0.0	19.9	<0.1
3 visits remaining								

5.0 Insitu Testing (Cont'd)

5.3 Insitu Ground Gas & Groundwater Monitoring (Cont'd):-

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

From the results undertaken to date, no levels of Methane (CH₄) have been recorded during the monitoring period, with some detectible concentrations of Carbon Dioxide (CO₂), up to a maximum level of 0.9% v/v, with associated minor reductions in oxygen (O₂) concentrations (minimum 15.2% v/v). Negligible flow rates of <0.1l/hr have also been recorded during the monitoring period so far.

Based on the results undertaken to date, in accordance with CIRIA Report C665, a preliminary risk assessment has been completed for this site, by converting the results in Table 5.1 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, as no increased levels of Methane have been recorded to date, the gas screening value (GSV) for Carbon Dioxide only has been calculated, the results of which are shown below:

$$\text{Carbon Dioxide GSV} = 0.009 (0.9\%) \times 0.1 = 0.0009 \text{ l/hr}$$

When considering the gas screening value (GSV) for Carbon Dioxide, the GSV of 0.0009 l/hr falls below the lower target concentration of 0.07 l/hr and as such equates to a Characteristic Situation 1 (CS1), in accordance with Table 8.5 in CIRIA C665. Therefore, at this stage, it can be seen that no gas protection measures are required for methane or carbon dioxide.

5.3.2 Groundwater:-

When considering the results of the groundwater monitoring completed to date, shallow water levels have been recorded between c.1.10m and c.1.30m whilst WS04 was flooded at the time of monitoring.

It would therefore be considered prudent to allow for the introduction of appropriate temporary groundwater control techniques, if excavations are required to extend to and/or below the depths at which groundwater has been recorded below this site. These techniques should also be designed to take care of any localised ingresses of surface water which may occur, during the construction period, especially if these works take place during the wetter periods of the year.

6.0 Laboratory Testing

All laboratory geotechnical testing was carried out in accordance with BS1377:1990:Parts 1-9 by Professional Soils Laboratory (PSL) of Doncaster, South Yorkshire and Chemtech Environmental Limited, of Consett, County Durham (UKAS accredited) unless otherwise stated.

6.1 Determination of Liquid & Plastic Limits:-

Representative samples of the cohesive natural deposits recovered from the trial pits and boreholes were tested in order to determine their liquid and plastic limits, so these materials could be classified. The results can be seen in Table 6.1 below, and are also contained in the PSL analytical report ref no. PSL20/1060 a copy of which can be found in Appendix IV.

Table 6.1

Position	Depth (m)	M/C	LL	PL	PI	Class	% Passing 425µm Sieve
BH02	2.50	23	30	17	13	CL	90
TP08	2.00	19	40	20	20	CI	95
WS02	1.00	20	39	19	20	CI	93

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

6.0 Laboratory Testing (Cont'd)

6.1 Determination of Liquid & Plastic Limits (Cont'd):-

The deposits tested are inorganic in nature, and when plotted on the plasticity chart, fall within the low to intermediate plasticity range. From the resulting plasticity indices, these materials have a low volume change potential, when taking into account the amount passing the 425µm sieve.

Subsequently, the cohesive natural deposits are unlikely to 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 shallow foundations were to be based within these materials, they would need to be taken down to a minimum depth of 0.75m below finished ground levels.

6.2 Determination of pH & SO₄:-

Representative samples of the made ground and natural deposits recovered from the boreholes and trial pits were tested in order to determine their pH value and soluble sulphate (SO₄) levels. The results are shown in Table 6.2 below, and are also contained in the Chemtech Environmental Limited Analytical Reports (ref no. 84433(1)), a copy of which can be seen in Appendix IV.

Table 6.2

Position	Depth (m)	Strata	SO ₄ (mg/l)	pH value	Design SO ₄ Class	ACEC Class
BH01	1.20-1.65	NS	107	7.7	DS-1	AC-1
TP01	0.30	MG	94	7.8	DS-1	AC-1
TP02	0.40	MG	48	8.0	DS-1	AC-1
TP03	0.30	MG	96	7.8	DS-1	AC-1
TP06	0.50	MG	197	7.7	DS-1	AC-1
TP07	0.50	MG	54	8.0	DS-1	AC-1
TP08	0.40	MG	43	7.6	DS-1	AC-1
WS01	1.00	NS	110	5.6	DS-1	AC-1
WS02	2.00	NS	16	7.2	DS-1	AC-1
WS04	1.00	NS	36	7.6	DS-1	AC-1
WS05	2.00	NS	23	7.6	DS-1	AC-1

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

The amount of soluble sulphate present ranges between 23mg/l and 197mg/l, and the pH values range between 5.6 up to 8.0. Therefore, in accordance with BRE Special Digest 1: 2005, the materials should be given a classification of Class DS-1. When considering the nature of the materials tested and assuming mobile groundwater the assessment of the Aggressive Chemical Environment for Concrete (ACEC) is AC-1.

6.3 Determination of Particle Size Distribution: -

Representative samples of the natural coarse deposits encountered have been tested in order to determine the particle size distribution (PSD), so that these materials can be classified. The results of the tests are represented both numerically and graphically on the analytical result sheets (ref no. PSL19/1060), copies of which are attached, and are also summarised in Table 6.3 on the following page.

Table 6.3

Position	Depth (m)	Clay / Silt Fraction	Sand Fraction	Gravel Fraction	Cobble Fraction	Grading Characteristics	Brief Soil Description
BH03	2.00-2.45	19	13	45	23	Poorly Graded	Sandy clayey GRAVEL
TP01	2.00	13	21	48	18	Poorly Graded	Sandy clayey GRAVEL
TP03	2.00	47	24	29	0	Poorly Graded	Gravelly sandy CLAY
WS01	2.00	10	12	78	0	Poorly Graded	Sandy clayey GRAVEL
WS04	2.00	44	28	28	0	Poorly Graded	Gravelly sandy CLAY

Particle fractions expressed as %

6.0 Laboratory Testing (Cont'd)

6.4 Contamination Screening & Screening Strategy:-

Based on the results of these intrusive investigation works, generally there is little evidence of any significant heavy or gross contamination being present below this site, nor any evidence of unknown or unforeseen ground contamination being evident within the made ground encountered. Furthermore, given that the proposed development works will likely result in a majority of hard cover with potentially limited areas of soft landscaping, there will be limited plausible contaminant migration pathways available for ground contamination to migrate or potentially put at risk the future end users of the development or significantly impact Controlled Waters.

However, for completeness, representative samples of the made ground materials from below this site were passed onto Chemtech Environmental of Stanley, Co. Durham, so that soil screening could be carried out to aid in the completion of risk assessments as well as for waste classification. Furthermore, owing to the historic use within the vicinity of the site as a Gas Works, the soil samples have been screened using a Gas Works Suite. In addition, the samples were also screened for the presence of Asbestos.

The catalogue of testing results can be found in the Chemtech Environmental analytical report (ref no. 84433(1)), a copy of which is contained in Appendix IV, and the total analysis carried out is summarised below.

- 6 no. soil sample screened using a Generic Soils Suite - based on the historic CLEA SGV listed analytes with additions and which is used to assess typical made ground of an unknown source (suite comprises; *Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc & Cyanide*).
- 6 no. soil samples screened for speciated *Polycyclic Aromatic Hydrocarbons (PAH's)* – based on the current USEPA 16.
- 6 no. soil samples screened for speciated *Total Petroleum Hydrocarbons (TPH's)* – Full equivalent carbon banding Aliphatic & Aromatic Spilt (TPHCWG), with BTEX.
- 6 no. soil samples targeted for the presence of Asbestos (ACM's & fibres).
- 6 no. soil samples screened for Thiocyanate, Phenol, Cresols, Xylenols, Naphthols, Trimethylphenols and asbestos (presence) followed by 3 no. soil samples subjected to asbestos quantification.

These results have been used to carry out a ground contamination risk assessment for Human Health and assess any potential risks to Controlled Waters, and are discussed in Section 7.0 below and on the following pages.

7.0 Ground Contamination Risk Assessment

7.1 Methodology:-

Following completion of the contamination screening undertaken on the representative samples of made ground from this site, a quantitative ground contamination risk assessment has been undertaken, generally in accordance with CLR11: Model Procedures for the Management of Land Contamination (currently being updated as Land Contamination: Risk Management (LCRM) – GOV.UK). 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) for this site (described further in the following Section 7.2), a site-specific screening strategy for the site has been developed (see Section 6.4) and the risks from potential contaminants have been assessed for human health and Controlled Waters. The results of the risk assessments can be found in Sections 7.3 (Human Health) & 7.4 (Controlled Waters).

7.0 Ground Contamination Risk Assessment (Cont'd)

7.2 Conceptual Site Model (CSM):-

From the findings of the results of the intrusive investigation works, a Conceptual Site Model (CSM) has been developed for this site, and is represented in Table 7.1 below, which summarises any identified contaminant sources, plausible migration pathways and potentially sensitive receptors identified for this site, assuming no remediation, additional protection measures and/or removal of the sources contamination takes place.

Table 7.1

	<i>Sources (S)</i>		<i>Pathways (P)</i>		<i>Receptors (R)</i>
S1	Made ground associated with the historical development of the site.	P1	Ingestion and dermal contact.	R1	Human health (End users and construction workers).
		P2	Air-inhalation of vapours and direct contact with dust.		
		P3	Plant uptake and attached soils.	R2	Deep groundwater (Secondary Aquifer) and nearby surface water features.
S2	On site sources of ground gases.	P4	Migration through existing services.	R3	Building materials*.
			Direct contact with building materials.		
		P5	Surface run off and leachate migration.	R5*	Flora and fauna*.

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

7.2.1 Sources:-

Although made ground is present across the whole of the site to depths of up to c.2.00m bgl (associated with historical development of the site), there was generally no visual or olfactory evidence of any significant ground contamination being present below this site, such waste oils, fuels, buried ACM's (asbestos containing materials).

7.2.2 Pathways:-

When considering the proposed end use (taken as *Commercial*) as well as the type of structures to be built, it is understood that the majority of the site will have hard cover which will limit (if any) plausible pathways for contamination migration. Similarly, given the lack of mobile contaminants present within the made ground, once the site has been redeveloped there will be limited opportunity for any contaminants to become mobile through surface water infiltration, nor any risks of vertical migration occurring towards the known Controlled Waters below this site.

However, for the purposes of this risk assessment, pathways for direct contact, dermal contact, ingestion, inhalation, wind (dust / particulate) and volatilization to the end users have been considered further. 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.

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.

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.

7.0 Ground Contamination Risk Assessment (Cont'd)

7.2 Conceptual Site Model (CSM) (Cont'd):-

7.2.3 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. 16 to 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 a conservative best fit end use category as:

- 4) *Commercial*

For Controlled Waters the primary receptors are the deep groundwater within the underlying Secondary Aquifer.

7.3 Human Health Risk Assessment (Made Ground):-

7.3.1 Human Health – Generic Made Ground (soils):-

The results of the soil screening have been assessed by comparing the maximum values (C_M) recorded for each analyte to the critical concentration values (C_C) chosen for this site. The results of the testing are contained in Appendix IV, and the risk assessment has been summarised in Table 7.2 below and continued on the following pages.

Table 7.2

Analyte	Critical Conc. (C_C)	No. of Samples Screened	Max. Conc. (C_M) Recorded	No. of Samples $\geq C_C$
Arsenic	640 ⁽¹⁾	6	43	0
Cadmium	190 ⁽¹⁾	6	3.9	0
Chromium III	8600 ⁽¹⁾	6	194	0
Chromium VI	33 ⁽¹⁾	6	<1	0
Copper	68000 ⁽¹⁾	6	156	0
Lead	2330 ⁽²⁾	6	129	0
Mercury	1100 ⁽¹⁾	6	2.2	0
Nickel	980 ⁽¹⁾	6	172	0
Selenium	12000 ⁽¹⁾	6	2.7	0
Zinc	730000 ⁽¹⁾	6	369	0
Cyanide	34 ⁽³⁾	6	<1	0

⁽¹⁾ = LQM CIEH 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)

7.3 Human Health Risk Assessment (Made Ground) (Cont'd):-

7.3.1 Human Health – Generic Made Ground (soils) (Cont'd):-

Table 7.2 (Cont'd)

Analyte	Critical Conc. (C _C)	No. of Samples Screened	Max. Conc. (C _M) Recorded	No. of Samples >C _C
PAH's				
Acenaphthene	84000 ⁽¹⁾	6	4.71	0
Acenaphthylene	83000 ⁽¹⁾	6	1.01	0
Anthracene	520000 ⁽¹⁾	6	8.81	0
Benzo(a)anthracene	170 ⁽¹⁾	6	46.24	0
Benzo(a)pyrene	35 ⁽¹⁾	6	48.03	1 (TP01)
Benzo(b)fluoranthene	44 ⁽¹⁾	6	54.73	1 (TP01)
Benzo(ghi)perylene	3900 ⁽¹⁾	6	30.51	0
Benzo(k)fluoranthene	1200 ⁽¹⁾	6	23.34	0
Chrysene	350 ⁽¹⁾	6	46.02	0
Dibenz(ah)anthracene	3.5 ⁽¹⁾	6	6.13	1 (TP01)
Fluoranthene	23000 ⁽¹⁾	6	100.30	0
Fluorene	63000 ⁽¹⁾	6	2.79	0
Indeno(123cd)pyrene	500 ⁽¹⁾	6	32.06	0
Naphthalene	190 ⁽¹⁾	6	0.21	0
Phenanthrene	22000 ⁽¹⁾	6	41.70	0
Pyrene	54000 ⁽¹⁾	6	90.55	0
Speciated TPH's				
VPH Aliphatic (>C5-C6)	3200 ⁽¹⁾	6	<0.1	0
VPH Aliphatic (>C6-C8)	7800 ⁽¹⁾	6	<0.1	0
VPH Aliphatic (>C8-C10)	2000 ⁽¹⁾	6	<0.1	0
EPH Aliphatic (>C10-C12)	9700 ⁽¹⁾	6	25	0
EPH Aliphatic (>C12-C16)	59000 ⁽¹⁾	6	444	0
EPH Aliphatic (>C16-C35)	1600000 ⁽¹⁾	6	18265	0
EPH Aliphatic (>C35-C44)	1600000 ⁽¹⁾	6	2088	0
VPH Aromatic (>EC5-EC7)	26000 ⁽¹⁾	6	<0.01	0
VPH Aromatic (>EC7-EC8)	56000 ⁽¹⁾	6	<0.01	0
VPH Aromatic (>EC8-EC10)	3500 ⁽¹⁾	6	<0.01	0
EPH Aromatic (>EC10-EC12)	16000 ⁽¹⁾	6	2	0
EPH Aromatic (>EC12-EC16)	36000 ⁽¹⁾	6	13	0
EPH Aromatic (>EC16-EC21)	28000 ⁽¹⁾	6	537	0
EPH Aromatic (>EC21-EC35)	28000 ⁽¹⁾	6	564	0
EPH Aromatic (>EC35-EC44)	28000 ⁽¹⁾	6	67	0
BTEX				
Benzene	27 ⁽¹⁾	6	<0.01	0
Toluene	56000 ⁽¹⁾	6	<0.01	0
Ethylbenzene	5700 ⁽¹⁾	6	<0.01	0
m & p-Xylene	5900 ⁽¹⁾	6	<0.02	0
o-Xylene	6600 ⁽¹⁾	6	<0.01	0
Asbestos	Presence	6	Chrysotile, Crocidolite & Amosite (<0.001% w/w – 0.033% w/w)	3 (TP03, 06 & 07)

⁽¹⁾ = LQM CIEH 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)

7.3 Human Health Risk Assessment (Made Ground) (Cont'd):-

7.3.1 Human Health – Generic Made Ground (soils) (Cont'd):-

Table 7.2 (Cont'd)

Analyte	Critical Conc. (C _C)	No. of Samples Screened	Max. Conc. (C _M) Recorded	No. of Samples > C _C
Other Gas Works Analytes				
Thiocyanate	16 ⁽⁵⁾	6	1.6	0
Phenol	420 ⁽⁶⁾	6	0.11	0
Cresols	180 ⁽⁴⁾	6	0.06	0
Xylenols	0.1 ⁽⁷⁾	6	<0.01	0
Naphthols	0.1 ⁽⁷⁾	6	<0.01	0
Trimethylphenols	0.1 ⁽⁷⁾	6	<0.01	0

⁽⁴⁾ = CL:AIRE GAC (Residential without consumption of home grown produce – 2.5% SOM), ⁽⁵⁾ = USEPA Region 9 Remedial goals, ⁽⁶⁾ = CL:AIRE SGV Values (Residential), ⁽⁷⁾ = Limit of analytical detection, NAD = No Asbestos Detected, Bold = result exceeds critical concentration, Note = All units are mg/kg.

The results have identified the following:

- The maximum concentration (C_M) value for Benzo(a)pyrene, Benzo(b)fluoranthene and Dibenz(ah)anthracene exceed the critical concentration (C_C) values taken for this site.
- Chrysotile, Crocidolite & Amosite asbestos fibres have been identified (<0.001% w/w – 0.033% w/w).
- None of the remaining C_M values for the generic metals, metalloids, non-organics, speciated PAH's, speciated TPH's or Gas Works Analytes exceeds the critical concentration (C_C) values taken for this site.
- The results of the contamination screening and analysis have generally confirmed that the made ground is not considered to pose a risk to Human Health if any exposure pathways are available. However, elevated Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(ah)anthracene and asbestos has been recorded within across the site. Given the proposed development will be proposed units / car park and access road, with total and permanent hardcover envisaged, the risk to end users will be negligible.
- The presence of asbestos would represent a potential risk to construction workers without appropriate protection measures i.e. controlled wetting, appropriate RPE/PPE and minimum disturbance. When considering the potential risks to the construction workforce with regards to the presence of asbestos in the made ground it is recommended that reference is made to the 2016 CL:AIRE Guidance; Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials, and it is recommended that appropriate controlled wetting and suitable RPE / PPE is adopted together with site awareness to deal with the presence of asbestos during any future earthworks or groundworks undertaken. Furthermore, 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.

7.4 Controlled Waters Risk Assessment:-

Based on the results of the soil screening carried out, there are limited elevated levels of contaminants within the made ground. Furthermore, given the nature of the proposed development works which will prevent the majority of surface water infiltration occurring, there is limited risk to Controlled Waters from any potentially leachable contaminants being present within the made ground below this site, following completion of the construction and development works.

Consequently, there is no requirement for further leachate, groundwater screening or risk assessment at this stage and the proposed redevelopment works are not considered to represent any significant risk to Controlled Waters.

8.0 Conclusions & Recommendations

8.1 Ground Conditions:-

Made ground was encountered across the site to depths of between c.0.60m and c.2.00m below current ground levels and comprises concrete, firm sandy gravelly clay and sandy clayey gravel with fragments of brick, concrete, ash, sandstone and breeze block with some plastic, metal and wire noted. Cobbles and boulders were noted with relic foundations and structures were noted within several of the exploratory holes.

Below the made ground the natural Glacial Till deposits typically comprise initially very soft and firm sandy gravelly silt and firm sandy silty clay over medium dense becoming dense clayey sandy gravel becoming firm sandy gravelly clay in places with cobbles noted. These materials were proven to a depth in excess of c.8.93m.

Solid deposits were not encountered during the site investigation works and are anticipated to comprise interbedded sandstone, siltstone and mudstone of the Millstone Grit Formation at a depth in excess of c.10m.

8.2 Groundwater:-

Water ingresses were noted within all of the exploratory positions across the site during the investigation works. Furthermore, water has been recorded within the three monitoring standpipes, during the visit undertaken to date between a depth of c.1.10m and c.1.30m with one of the monitoring wells noted as flooded at surface.

Therefore, it would be prudent to introduce appropriate temporary groundwater control measures, in order to take care of any ingresses of groundwater and help maintain stability of the excavations. In addition, control of any surface water ingresses as well as pockets of trapped surface drainage within the made ground and upper natural drift deposits will be required, especially during the wetter periods of the year.

8.3 Foundation Options:-

Given the findings of the investigation works across the site, it is felt that the following foundation options are applicable to the proposed new development.

8.3.1 Units 1 – 6

It is anticipated that mass trench fill foundations will be suitable for these units based within the natural very clayey sandy gravel deposits between a depth of c.1.50m and c.2.20m and designed to a maximum allowable bearing pressure not exceeding 100kN/m². It should be noted that trench stability and shallow water ingress will significantly impact on this foundation solution.

8.3.2 Units 7 – 13

It is anticipated that traditional shallow strip / pad foundations will be suitable for these Units based within the natural very clayey sandy gravel deposits at a depth of c.1.00m and designed to a maximum allowable bearing pressure not exceeding 100kN/m². It should be noted that trench stability and shallow water ingress may impact on this foundation solution.

8.3.3 General

Should the above foundation solutions not prove viable, consideration should be given to ground improvement methods or short piles. Recourse should be made to specialist piling / ground improvement contractors who have experience of undertaking work in the vicinity of the site or similar ground conditions.

8.0 Conclusions & Recommendations (Cont'd)

8.3 Foundation Options (Cont'd):-

8.3.3 General (Cont'd)

For the construction of ground bearing floor slabs, road pavement and car park areas, where the made ground and 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 accordance with BRE Special Digest 1: 2005 (3rd Edition) the materials should be given a classification of Class DS-1, with the assessment of the Aggressive Chemical Environment for Concrete (ACEC) as AC-1.

8.4 Hazardous Ground Gas Risk Assessment:-

From the results of the single gas monitoring visit undertaken to date, detectable levels of Carbon Dioxide (CO₂) have been recorded, up to a maximum level of 0.9% *v/v*, whilst slightly depleted oxygen (O₂) concentrations (minimum 15.2% *v/v*) have also been recorded. Flow rates of <0.1l/hr have been recorded during the monitoring visits completed to date.

When considering these results in accordance with CIRIA Report C665, the resulting GSV for this site would be 0.0009l/hr. Therefore, this result would suggest the site should be given Characteristic Situation 1 classification, resulting in no gas protective measures being required for the proposed development.

It should be noted that a final risk assessment will be undertaken following the completion of the remaining gas monitoring visits, and a reassessment of the site characterisation classification made. This will be issued as an addendum to this report.

8.5 Ground Contamination:-

From the results of the contamination screening carried out on this site and the ground contamination risk assessments carried out (see Section 7.0), the made ground materials are generally not considered to pose a risk to Human Health where exposure pathways are available. However, elevated Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(ah)anthracene and asbestos has been recorded within some of the exploratory holes across the site. Given the proposed development, with total and permanent hardcover envisaged, the risk to end users will be negligible. Therefore, there is no requirement for further investigation, risk assessment or remediation, such as removal or treatment, and the materials can remain on site where finished levels allow.

However, the presence of asbestos would represent a potential risk to construction workers without appropriate protection measures i.e. controlled wetting, appropriate RPE/PPE and minimum disturbance. When considering the potential risks to the construction workforce with regards to the presence of asbestos in the made ground it is recommended that reference is made to the 2016 CL:AIRE Guidance; Control of Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials, and it is recommended that appropriate controlled wetting and suitable RPE / PPE is adopted to deal with the presence of asbestos during any future earthworks or groundworks undertaken.

It is also recommended that during the future site works as well as any other groundworks on this site, a 'watching brief' is maintained to confirm that there is no unknown or unforeseen ground contamination on this site, between the exploratory investigation positions completed to date as part of this Phase 2: Ground Investigation.

8.0 Conclusions & Recommendations (Cont'd)

8.5 Ground Contamination (Cont'd):-

Where we have sampled and tested for asbestos this is discussed in this 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.

When considering the potential risks to the construction workforce, and future maintenance teams, appropriate PPE and training should be provided to adequately protect personnel against the levels of potential contaminants recorded during these investigation works, particularly as the potential risks are associated with acute rather than long term exposure (which is used in the CLEA model for assessing ground contamination). The results in this report can also be used by the Main Contractor / Project Coordinator, when devising an adequate Site Health & Safety Plan, in accordance with current CDM Regulations. For further guidance reference should be made to the Health and Safety Executive (HSE) document EH40/2005 Workplace exposure limits.

8.6 Waste Classification:-

During future redevelopment works any excavated materials that are to be discarded and removed from this site as a waste to landfill will need to be classified in accordance with the 'Guidance on the Classification and Assessment of Waste (1st Edition V1.1, May 2018) – 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 have to be discarded to accommodate finished ground levels etc., it should be noted that additional analysis and screening could 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.

8.7 General Comments:-

For all future site works, adequate lateral trench support will be required for excavations, in order 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.

It is also recommended that adequate surface drainage should be designed and installed by a competent contractor, in order to prevent surface water 'ponding' or collection, during and post construction, particularly since any existing surface drainage systems have been/will be disrupted or damaged.

In addition, for deeper excavations, drainage, service runs or the like that may pass close to or beneath any 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 foundations based at a higher level.

8.0 Conclusions & Recommendations (Cont'd)

8.7 General Comments (Cont'd):-

An “observational technique” can also be applied to the design and construction of this development, and where ground conditions seem to vary from those identified from the works to date, then advice should be sought from Arc Environmental Ltd.

END OF REPORT

APPENDIX I

Aerial Photograph, Existing & Proposed Site Layout Plan



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The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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rev.	date	amendments	drawn	chckd

Client:
Harley Haddow

Project Title:
**Pant Ind. Est.
Merthyr Tydfil**

Drawing Title:
Aerial Plan

Scale at A3: | Date: 28/02/20 | Drawn by: | Approved by:

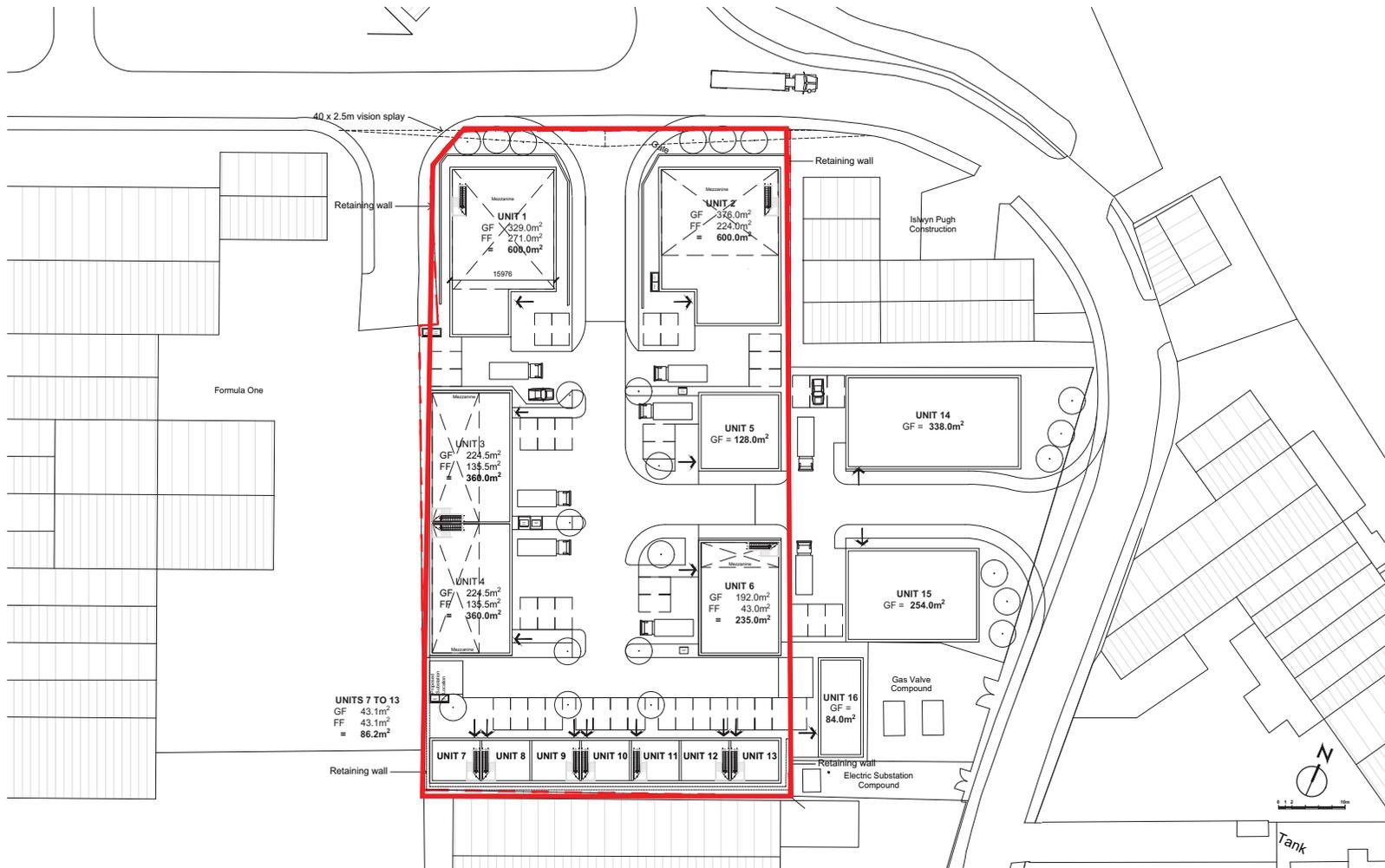
Job Ref: 19-1012 | Drg no: | Rev:



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rev.	date	amendments	drawn	chkd

Client:
Harley Haddow

Project Title:
**Pant Ind. Est.
 Merthyr Tydfil**

Drawing Title:
Proposed

Scale at A3: | Date: 28/02/20 | Drawn by: | Approved by:

Job Ref: 19-1012 | Drg no: | Rev:

Figured dimensions and levels to be used. Any inaccuracies must be notified to the architect.
 Detail drawings and large scale drawings take precedence over smaller drawings.

Rev:	Description	Rev:	Description
A	Slight amendments to size and position of units 1, 2 & 5 with parking numbers updated to suit. Bin locations indicated. BT 22.08.2019		
B	Potential substation position indicated with parking & bin positions amended to accommodate along with slight adjustments to positioning of phase 2 units BT 23.08.2019		

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PRELIMINARY	<input checked="" type="checkbox"/>
PLANNING	<input type="checkbox"/>
DESIGN	<input type="checkbox"/>
TENDER	<input type="checkbox"/>
CONSTRUCTION	<input type="checkbox"/>

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ARCHITECTS

Contract: MKR Property
 Pant Industrial Estate
 Proposed Site Plan

Drawing No.	Rev.
19070 (SK)02	B

Scale: 1:500@A3
 Date: Aug 19
 Drawn: JPF
 Checked: -

APPENDIX II

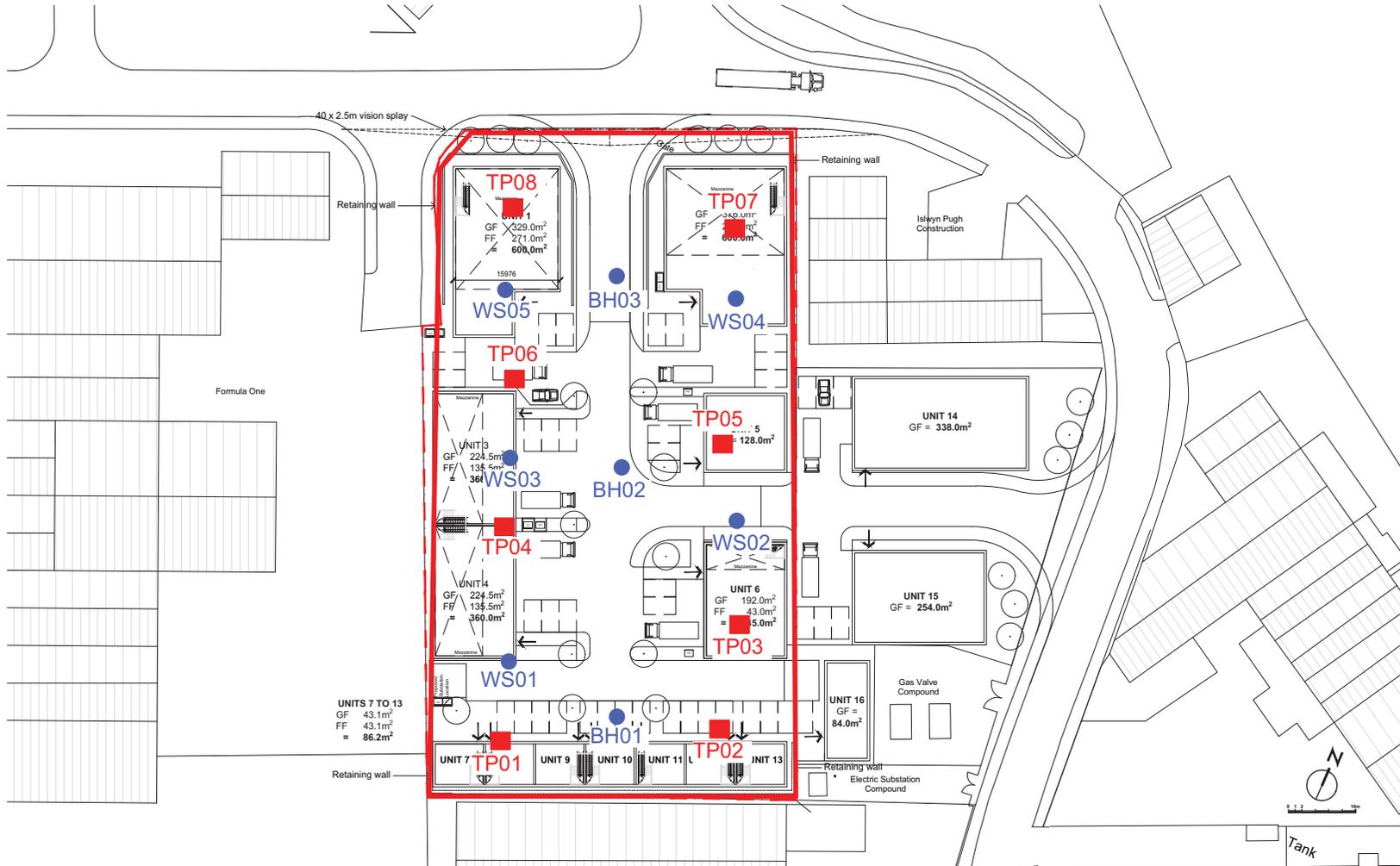
Borehole and Trial Pit Location Plan, Borehole and Trial Pit Record Sheets



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The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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rev.	date	amendments	drawn	chckd

Client:
Harley Haddow

Project Title:
**Pant Ind. Est.
 Merthyr Tydfil**

Drawing Title:
Borehole & Trial Pit Location Plan

Scale at A3: | Date: 28/02/20 | Drawn by: | Approved by:

Job Ref: 19-1012 | Drg no: | Rev:

- Figured dimensions and levels to be used. Any inaccuracies must be notified to the architect.
 Detail drawings and large scale drawings take precedence over smaller drawings.
- Rev: A Slight amendments to size and position of units 1, 2 & 5 with parking numbers updated to suit. Bin locations indicated. BT 22.08.2019
 - Rev: B Potential substation position indicated with parking & bin positions amended to accommodate along with slight adjustments to positioning of phase 2 units BT 23.08.2019

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PRELIMINARY	<input checked="" type="checkbox"/>
PLANNING	<input type="checkbox"/>
DESIGN	<input type="checkbox"/>
TENDER	<input type="checkbox"/>
CONSTRUCTION	<input type="checkbox"/>

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ARCHITECTS

Contract: MKR Property
 Pant Industrial Estate
 Proposed Site Plan

Drawing No.	Rev1
19070 (SK)02	B
Scale:	1:5000A3
Date:	Aug 19
Drawn by:	JPF
Checked:	



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 St Johns Road, Meadowfield
 Durham, DH7 8PN
 Telephone: 01913786380

TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP01
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

0	A	B	C	D	0	Legend
1					1	
2					2	
3					3	
4					4	

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.70		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone and ash. Cobbles and boulders noted (MADE GROUND).	0.30	J/D	
0.70-2.00		Brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles and boulders noted.			
2.00		Trial pit terminated at 2.00m due to collapse.	2.00	B	

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

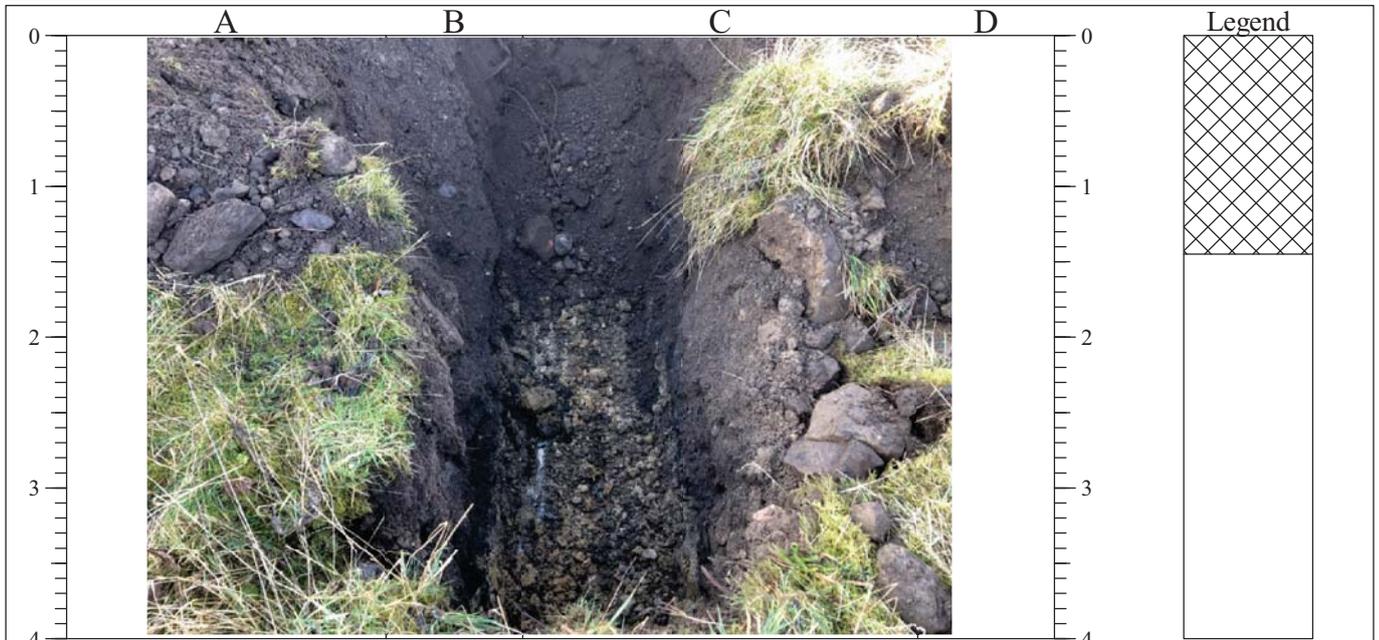
<p>Shoring/Support: Stability:</p> <div style="text-align: center;"> </div>		<p style="text-align: center;">GENERAL REMARKS</p> <p>Standing water at 1.50m. Trial pit collapsing throughout.</p>	
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB



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TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP02
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.45		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone and ash. Cobbles and boulders noted (MADE GROUND).	0.40	J/D	
1.45		Trial pit terminated at 1.45m due to refusal on relic concrete structure. Brick wall in side of pit.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

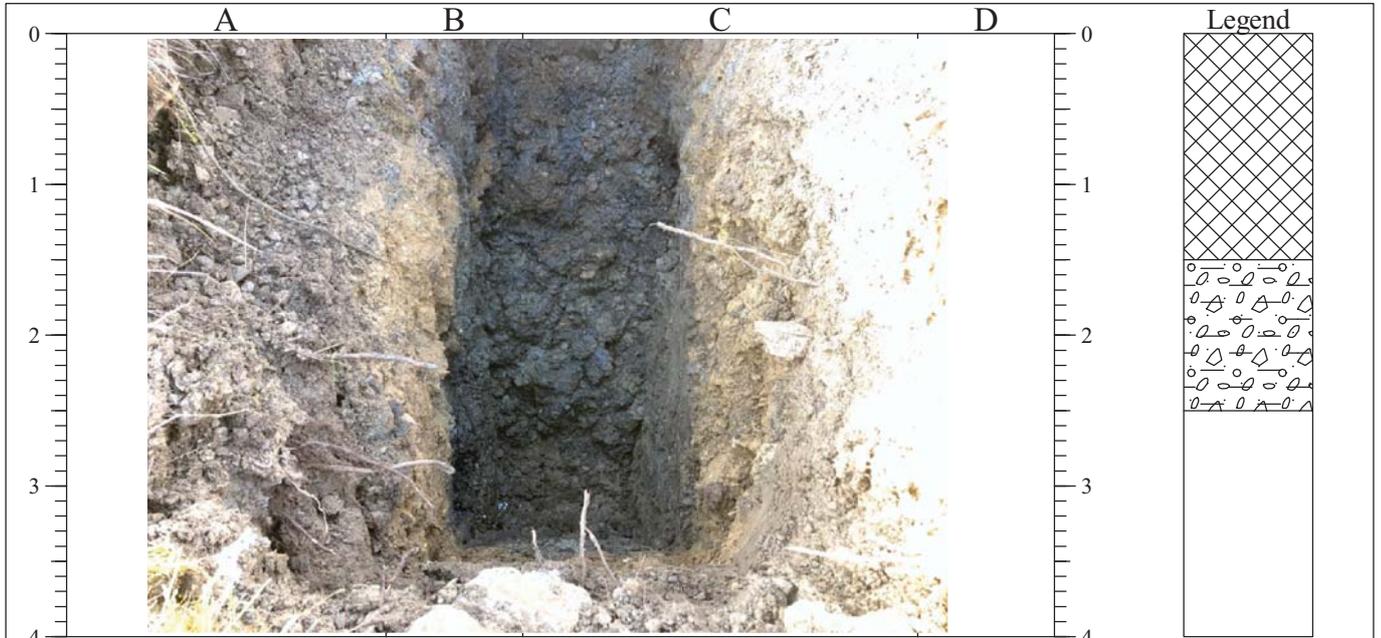
<p>Shoring/Support: Stability:</p>		<p style="text-align: center;">GENERAL REMARKS</p> <p>Trial pit collapsing throughout.</p>
All dimensions in metres Scale 1:50	Client Harley Haddow	Method/ Plant Used JCB 3cx
		Logged By MPB



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TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP03
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.50		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone breeze block and ash with some plastic. Cobbles and boulders noted (MADE GROUND).	0.30	J/D	
1.50-2.50		Brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles and boulders noted.	2.00	B	
2.50		Trial pit terminated at 2.50m.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

<p>Shoring/Support: Stability:</p>		<p style="text-align: center;">GENERAL REMARKS</p> <p>Standing water at 2.00m. Trial pit collapsing throughout.</p>
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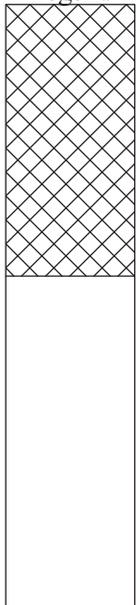
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB
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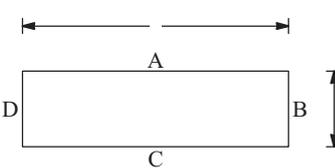
TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP04
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1

0	A	B	C	D	0	Legend 
1					1	
2					2	
3					3	
4					4	

STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.80		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone and ash with some metal and wire rope. Cobbles and boulders noted (MADE GROUND).			
1.80		Trial pit terminated at 1.80m due to refusal on relic concrete structure. Relic concrete structures in ends of pit.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

<p>Shoring/Support: Stability:</p> 	
--	--

GENERAL REMARKS
Trial pit collapsing throughout.

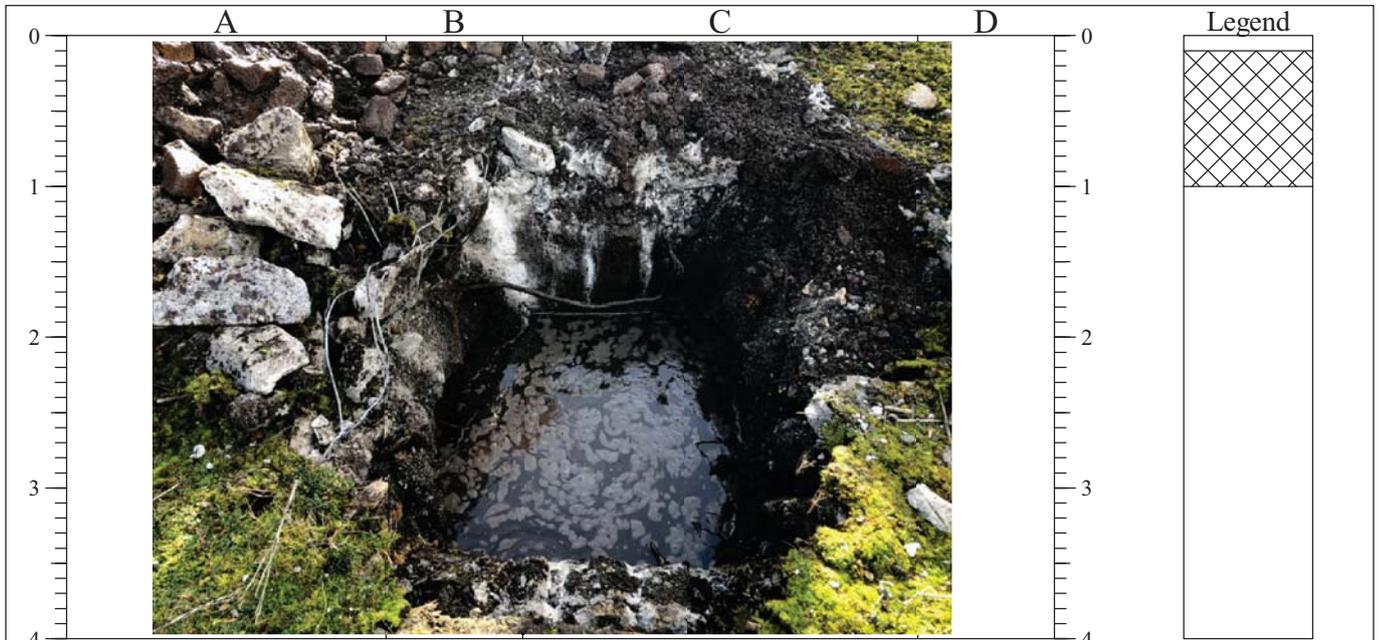
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB
--	----------------------------	--------------------------------------	----------------------



Solum House, Unit 1 Elliott Court
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TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP05
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.10		Concrete with rebar (MADE GROUND).			
0.10-1.00		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone breeze block and ash with some plastic. Cobbles and boulders noted (MADE GROUND).			
1.00		Trial pit terminated at 1.00m due to refusal on relic concrete structure. Relic concrete structures in side of pit.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

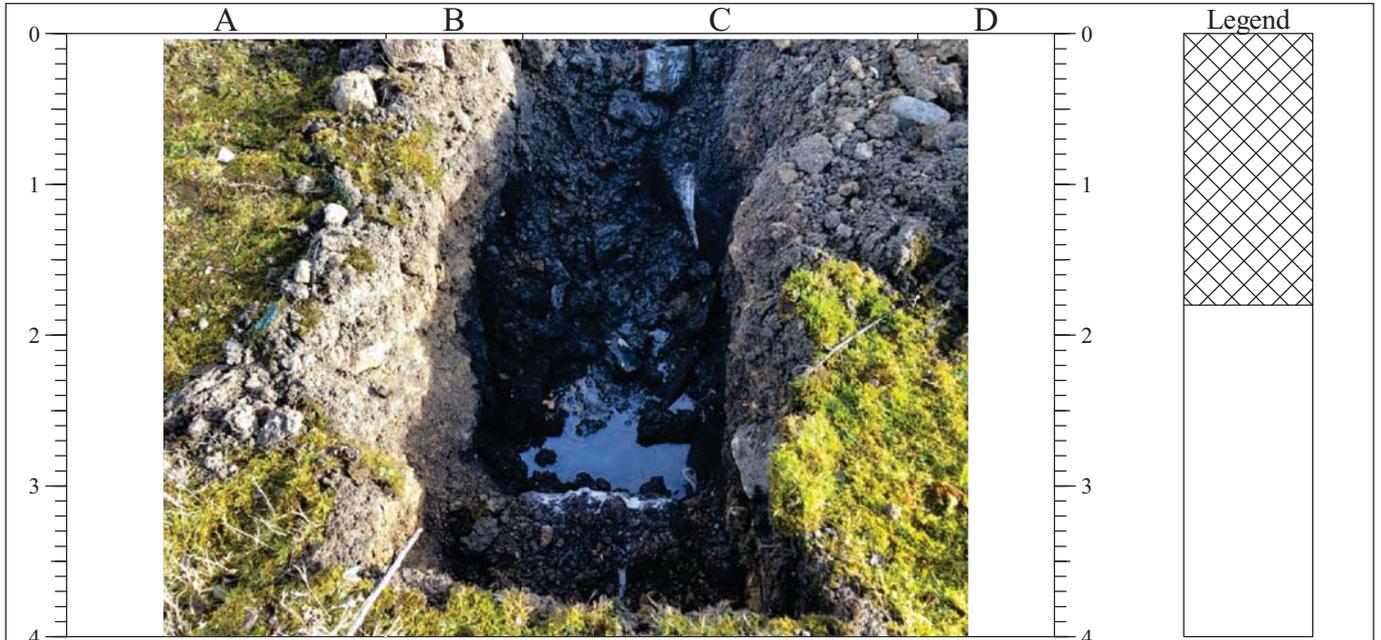
<p>Shoring/Support: Stability:</p>		<p style="text-align: center;">GENERAL REMARKS</p> <p>Standing water at 0.60m. Trial pit collapsing throughout.</p>	
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB



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 St Johns Road, Meadowfield
 Durham, DH7 8PN
 Telephone: 01913786380

TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP06
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.80		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone and ash with some metal and wire rope. Cobbles and boulders noted (MADE GROUND).	0.50	J/D	
1.80		Trial pit terminated at 1.80m due to refusal on relic concrete structure. Relic concrete structures in ends of pit.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

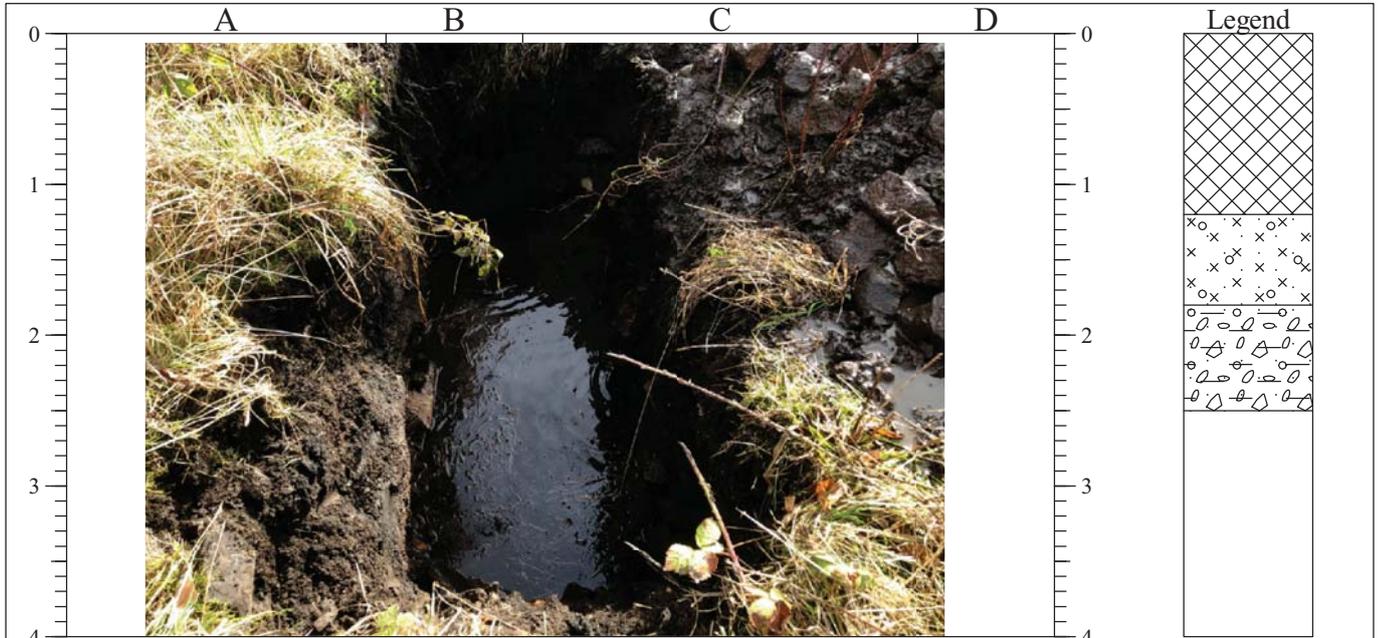
<p>Shoring/Support: Stability:</p>		<p style="text-align: center;">GENERAL REMARKS</p> <p>Standing water at 1.00m. Trial pit collapsing throughout.</p>	
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB



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TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP07
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.20		Black sandy gravel. Gravel is fine to coarse comprising fragments of ash concrete and brick. Cobbles and boulders noted (MADEGROUND).	0.50	J/D	20kN/m ²
1.20-1.80		Very soft brown and medium brown slightly sandy gravelly SILT. Gravel is fine to coarse of sandstone.	1.50	V	
1.80-2.50		Brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles and boulders noted.			
2.50		Trial pit terminated at 2.50m.			

AGS3 UK TP LOGS.GPJ AGS3_ALL.GDT 7/2/20

Shoring/Support:
Stability:

GENERAL REMARKS

Standing water at 1.00m.
 Trial pit collapsing throughout.

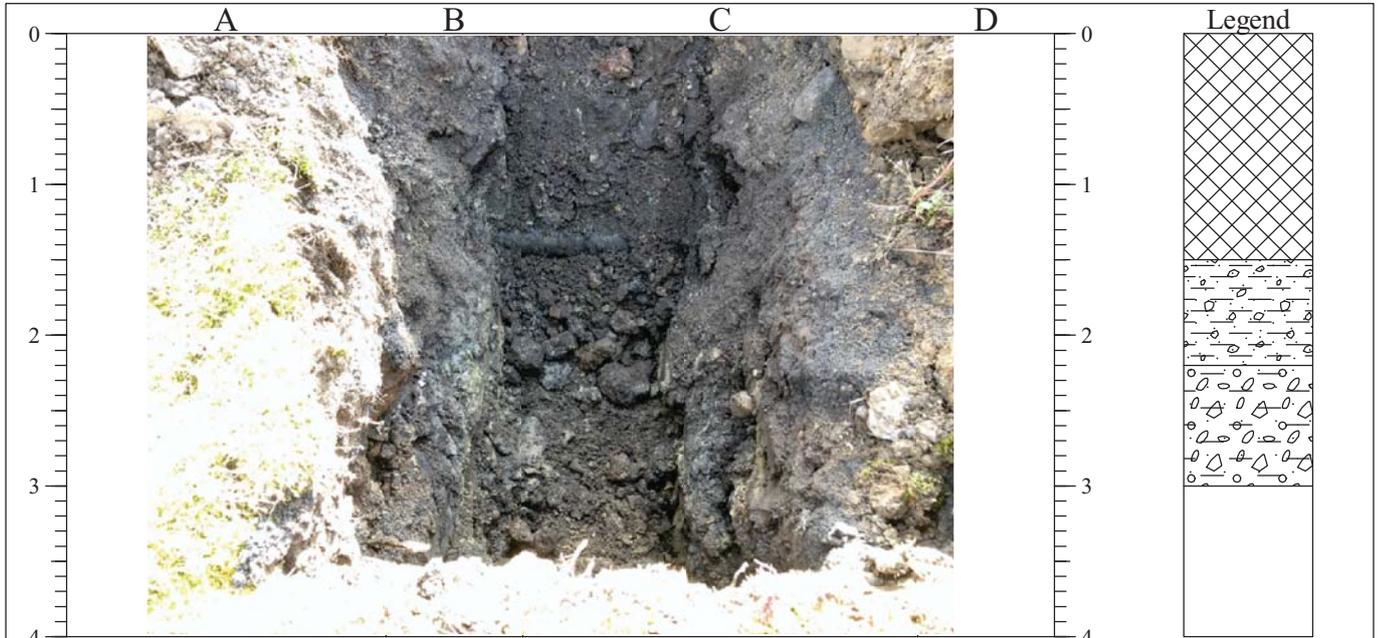
All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB
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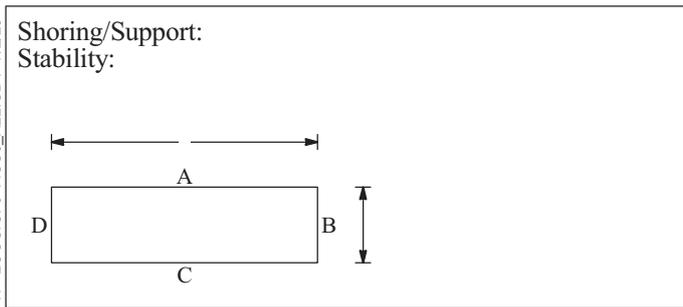
TRIAL PIT LOG

Project Pant Industrial Estate, Merthy Tydfil				TRIAL PIT No TP08
Job No 19-1012	Date 05-02-20	Ground Level (m)	Co-Ordinates ()	
Contractor Arc Environmental Limited				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-1.50		Brown grey and black sandy gravelly clay / clayey sandy gravel. Gravel is fine to coarse comprising fragments of brick concrete sandstone and ash with some metal. Cobbles and boulders noted (MADE GROUND).	0.40	J/D	
1.50-2.20		Stiff (high strength) brown and grey sandy gravelly CLAY.			
2.20-3.00		Brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles and boulders noted.	2.00 2.00	B V	80kN/m ²
3.00		Trial pit terminated at 3.00m. C.200mm diameter cast iron pipe in end of pit.			

AGS3_UK_TP_LOGS.GPJ AGS3_ALL_GDT 7/2/20



GENERAL REMARKS
Trial pit collapsing throughout.

All dimensions in metres Scale 1:50	Client Harley Hadow	Method/ Plant Used JCB 3cx	Logged By MPB
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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No BH01	
Job No 19-1012	Date 05-02-20	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		
0.00-1.00	B				(1.20)	Firm brown and black sandy gravelly clay. Gravel is fine to coarse comprising fragments of sandstone and concrete. Cobbles noted (MADE GROUND).			
1.20-1.65	B				1.20	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.			
1.20-1.65	SPT	N=16							
2.00-2.45	B								
2.00-2.45	SPT	N=30							
3.00-3.45	B								
3.00-3.45	SPT	N=13							
4.00-4.45	B								
4.00-4.45	SPT	N=30		(5.82)					
5.00-5.45	B								
5.00-5.45	SPT	N=25							
6.00-6.45	B								
6.00-6.45	SPT	N=25			7.02				
7.00-7.02	B					Borehole terminated at 7.02m due to refusal.			
7.00-7.02	SPT	75 Blows							

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	
						5	5.1	0.5hrs			Water strike at 1.60m.
						7	7.2	1hr			

All dimensions in metres Scale 1:62.5	Client Harley Hadow	Method/ Plant Used Cable Percussive	Logged By MH
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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No BH02	
Job No 19-1012	Date 06-02-20	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	B			[Cross-hatch pattern]	0.10 (0.50) 0.60	Concrete with rebar (MADE GROUND). Black and brown sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick concrete and ash (MADE GROUND).		[Cross-hatch pattern]	
1.20-1.65 1.20-1.65	B SPT	N=7		[X pattern]		Firm brown very sandy silty CLAY. Becoming soft clayey silt in places.		[X pattern]	
2.00-2.45	U100			[X pattern]				[X pattern]	
2.50	D			[X pattern]				[X pattern]	
3.00-3.45 3.00-3.45	B SPT	N=20		[X pattern]	(4.90)			[X pattern]	
4.00-4.45 4.00-4.45	B SPT	N=29		[X pattern]				[X pattern]	
5.00-5.45 5.00-5.45	B SPT	N=17		[X pattern]	5.50			[X pattern]	
6.00-6.45 6.00-6.45	B SPT	N=14	↓	[O pattern]		Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.		[O pattern]	
7.00-7.45 7.00-7.11	B SPT	75 Blows		[O pattern]	(3.43)			[O pattern]	
8.00 8.00-8.15	D SPT	75 Blows		[O pattern]	8.93			[O pattern]	
8.90 8.90-8.93	D SPT	75 Blows				Borehole terminated at 8.93m 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	
						7.2 8.7	7.4 8.9	0.5hrs 1hr			Water strike at 6.20m.

All dimensions in metres Scale 1:62.5	Client Harley Hadow	Method/ Plant Used Cable Percussive	Logged By MH
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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No BH03	
Job No 19-1012	Date 07-02-20	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		
0.00-0.80	B					(0.80) 0.80	Black and brown sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick concrete and ash (MADE GROUND).		
1.20-1.65 1.20-1.65	B SPT	N=2				(1.10) 1.90	Very soft brown and medium brown slightly sandy gravelly SILT. Gravel is fine to coarse of sandstone.		
2.00-2.45 2.00-2.45	B SPT	N=21				(6.96)	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.		
3.00-3.45 3.00-3.45	B SPT	N=36							
4.00-4.45 4.00-4.45	B SPT	N=23							
5.00-5.45 5.00-5.45	B SPT	N=14							
6.00-6.45 6.00-6.45	B SPT	N=34							
7.00-7.45 7.00-7.31	B SPT	75 Blows							
8.00-8.45 8.00-8.16	B SPT	75 Blows				8.86			
8.80-8.86	SPT	75 Blows					Borehole terminated at 8.86m 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	
						7.6	7.7	0.5hrs			Water strike at 2.20m.
						8.2	8.4	0.5hrs			
						8.6	8.8	1hr			

All dimensions in metres Scale 1:62.5	Client Harley Hadow	Method/ Plant Used Cable Percussive	Logged By MH
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AGS3 UK BH LOGS.GPJ AGS3_ALL.GDT 7/2/20



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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No WS01	
Job No 19-1012	Date 05-02-20	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		
0.50	B				(0.90)	Firm brown and black sandy gravelly clay. Gravel is fine to coarse comprising fragments of sandstone and concrete. Cobbles noted (MADE GROUND).			
1.00 1.00-1.45 1.00	B SPT V	N=9 20kN/m ²			(0.80)	Very soft brown and medium brown slightly sandy gravelly SILT. Gravel is fine to coarse of sandstone.			
1.80-2.25 2.00	SPT B	N=36	↓		(1.20)	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.			
2.45-2.90	SPT	75 Blows			2.90	Borehole terminated at 2.90m due to refusal on cobble / boulder.			

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	
											Water noted at 2.00m on completion.

All dimensions in metres Scale 1:25	Client Harley Hadow	Method/ Plant Used Windowless Sampling	Logged By MPB
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 Telephone: 01913786380

BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No WS03	
Job No 19-1012	Date 05-02-20	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		
0.50	B				(0.30)	Firm brown and black sandy gravelly clay. Gravel is fine to coarse comprising fragments of sandstone and concrete. Cobbles noted (MADE GROUND).			
					0.30	Brown and grey sandy gravel. Gravel is fine to coarse comprising fragments of brick and concrete. Cobbles noted (MADE GROUND).			
1.00-1.45	SPT	N=19			(1.70)				
1.50-1.95	SPT	N=44			2.00				
2.00-2.20	SPT	75 Blows			(0.20) 2.20	 	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted. Borehole terminated at 2.20m due to refusal on cobble / boulder.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS Water noted at 1.50m on completion.
Date	Time	Depth	Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	

All dimensions in metres Scale 1:25	Client Harley Hadow	Method/ Plant Used Windowless Sampling	Logged By MPB
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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No WS04	
Job No 19-1012	Date 05-02-20	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		
0.50	B		↓		(0.80)	Black and brown sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick concrete and ash (MADE GROUND).			
1.00 1.00-1.45 1.00	B SPT V	N=5 20kN/m ²		(1.00)	(1.00)	Very soft brown and medium brown slightly sandy gravelly SILT. Gravel is fine to coarse of sandstone.			
2.00 2.00-2.30	B SPT	75 Blows		(0.50)	(0.50)	2.30	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.		
							Borehole terminated at 2.30m due to refusal on cobble / boulder.		

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	
											Water noted at 1.00m on completion.

All dimensions in metres Scale 1:25	Client Harley Hadow	Method/ Plant Used Windowless Sampling	Logged By MPB
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 St Johns Road, Meadowfield
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BOREHOLE LOG

Project Pant Industrial Estate, Merthy Tydfil				BOREHOLE No WS05	
Job No 19-1012	Date 05-02-20	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		
0.50	B		↓ 1	[Cross-hatch pattern]	(1.30)	Black and brown sandy clayey gravel. Gravel is fine to coarse comprising fragments of brick concrete and ash (MADE GROUND).		[Cross-hatch pattern]	
1.00 1.00-1.45	B SPT	N=22		[X pattern]	(0.80)	1.30	Firm brown sandy clayey gravelly SILT. Gravel is fine to coarse of sandstone.		[X pattern]
2.00 2.00-2.40	B SPT	75		[O pattern]	(0.30)	2.10	Medium dense brown and grey very clayey sandy GRAVEL. Becoming firm very sandy gravelly clay in places. Gravel is fine to coarse. Cobbles noted.		[O pattern]
2.00	V	Blows ² 40kN/m ²		[O pattern]	(0.30)	2.40	Borehole terminated at 2.40m due to refusal on cobble / boulder.		[O 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	
											Water noted at 1.20m on completion.

All dimensions in metres Scale 1:25	Client Harley Hadow	Method/ Plant Used Windowless Sampling	Logged By MPB
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AGS3 UK BH LOGS.GPJ AGS3_ALL.GDT 7/2/20

APPENDIX III

Ground Gas and Groundwater Monitoring Certificate

Arc Environmental Ground Gas & Groundwater Monitoring Certificate



Site: Pant Industrial Estate, Merthyr Tydfil
Ref: 19-1012

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)				
											Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H ₂ S	CO					
1	13/02/2020	12.30pm	GFM435	Overcast	MPB	WS04 flooded	1	<0.1	955			0.0	0.0		0.9		15.2							1.30				
							4	<0.1	955	F																Flooded		
							5	<0.1	955			0.0	0.0		0.0		19.9											1.10
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

Cf = 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)

APPENDIX IV

Laboratory Testing Results



LABORATORY REPORT



4043

Contract Number: PSL20/1060

Report Date: 04 March 2020
Client's Reference: 19-1012
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: Pant Industrial Estate, Merthyr Tydfil
Date Received: 19/2/2020
Date Commenced: 19/2/2020
Date Completed: 4/3/2020

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:


R Gunson
(Director)

A Watkins
(Director)

R Berriman
(Quality Manager)

S Royle
(Laboratory Manager)

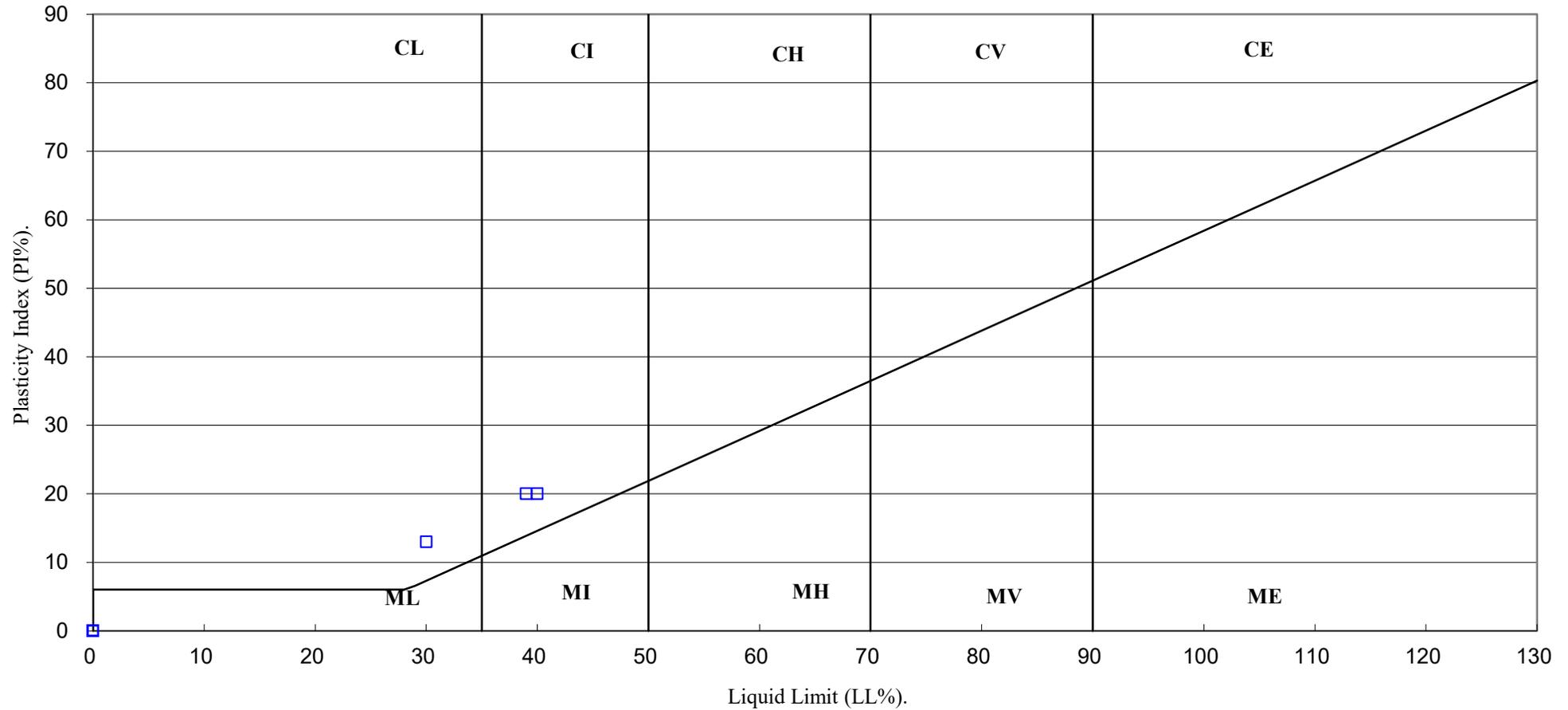
S Eyre
(Senior Technician)

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Page 1 of

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



4043

PSL
Professional Soils Laboratory

Pant Industrial Estate, Merthyr Tydil

Contract No:

PSL20/1060

Client Ref:

19-1012

PARTICLE SIZE DISTRIBUTION TEST

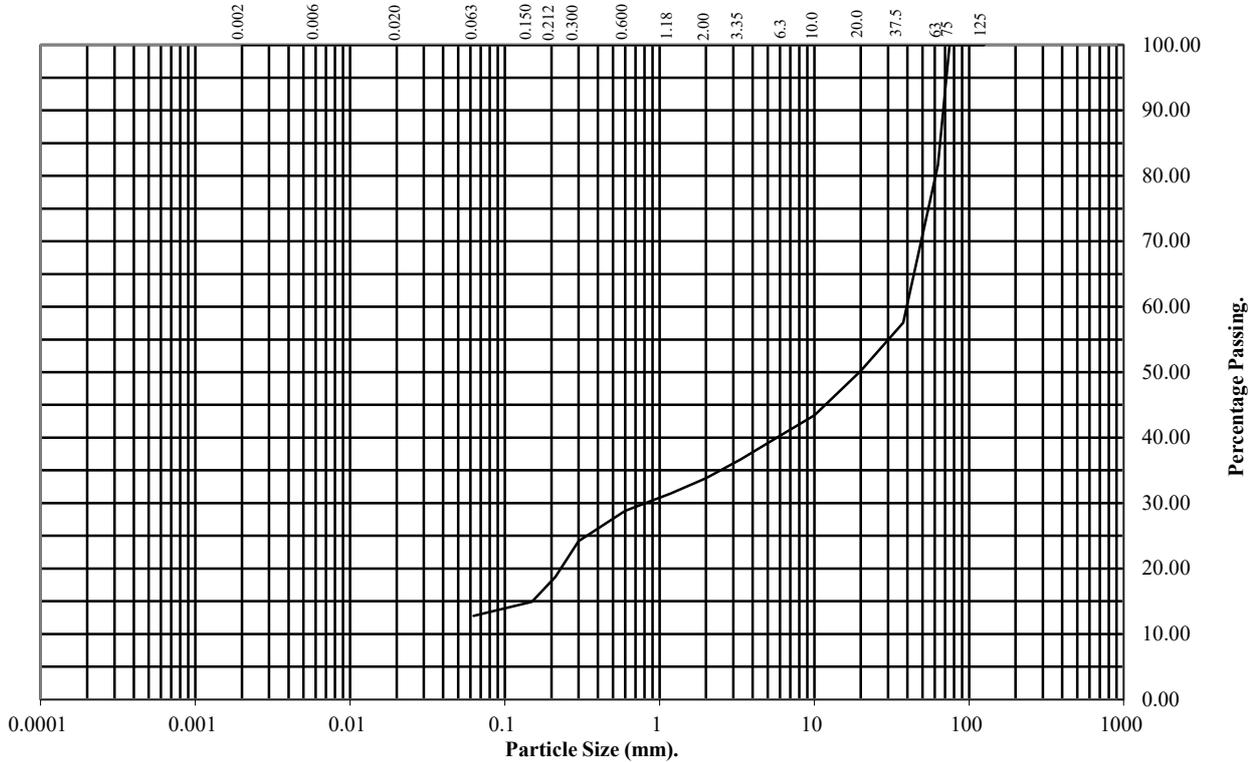
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP01 **Top Depth (m):** 2.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	82
37.5	58
20	50
10	43
6.3	41
3.35	37
2	34
1.18	31
0.6	29
0.3	24
0.212	19
0.15	15
0.063	13

Soil Fraction	Total Percentage
Cobbles	18
Gravel	48
Sand	21
Silt/Clay	13

Remarks:
See Summary of Soil Descriptions



Pant Industrial Estate, Merthyr Tydil

Contract No:
PSL20/1060
Client Ref:
19-1012

PARTICLE SIZE DISTRIBUTION TEST

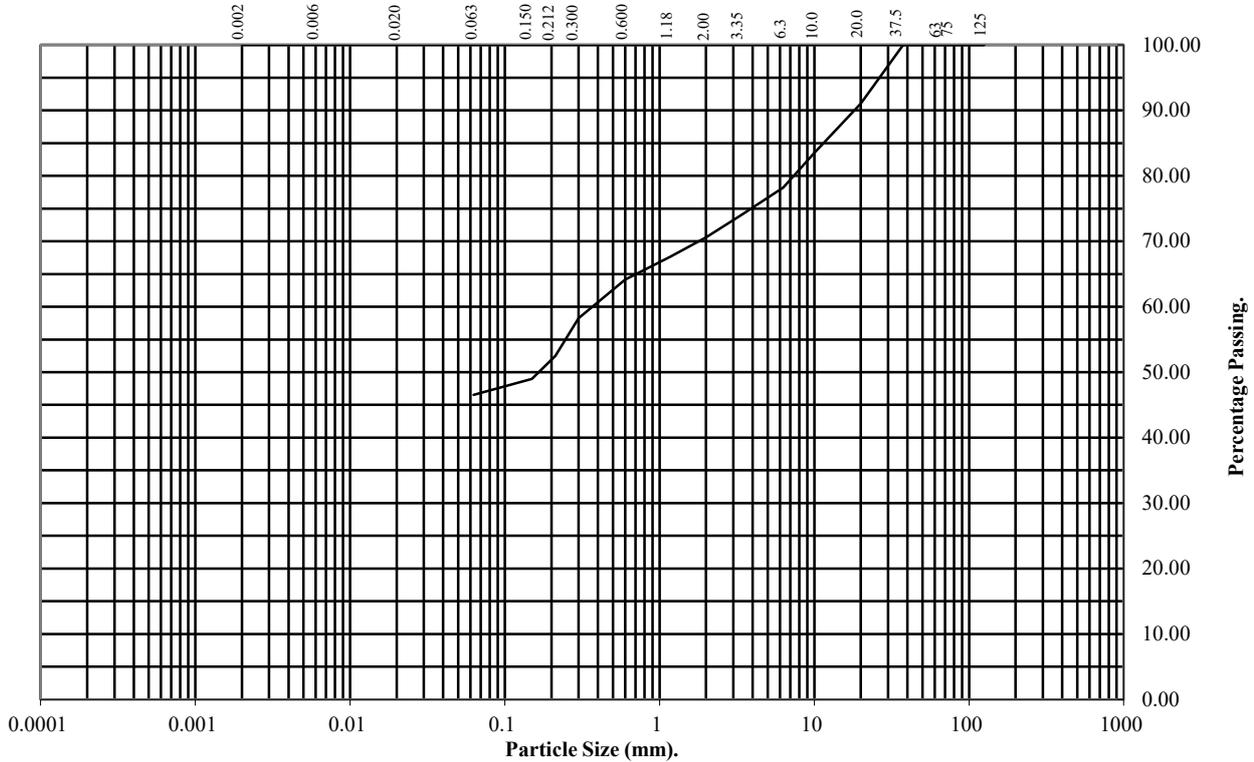
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: TP03 **Top Depth (m):** 2.00

Sample Number: **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	91
10	84
6.3	78
3.35	74
2	71
1.18	68
0.6	64
0.3	58
0.212	53
0.15	49
0.063	47

Soil Fraction	Total Percentage
Cobbles	0
Gravel	29
Sand	24
Silt/Clay	47

Remarks:
See Summary of Soil Descriptions



Pant Industrial Estate, Merthyr Tydil

Contract No:
PSL20/1060
Client Ref:
19-1012

PARTICLE SIZE DISTRIBUTION TEST

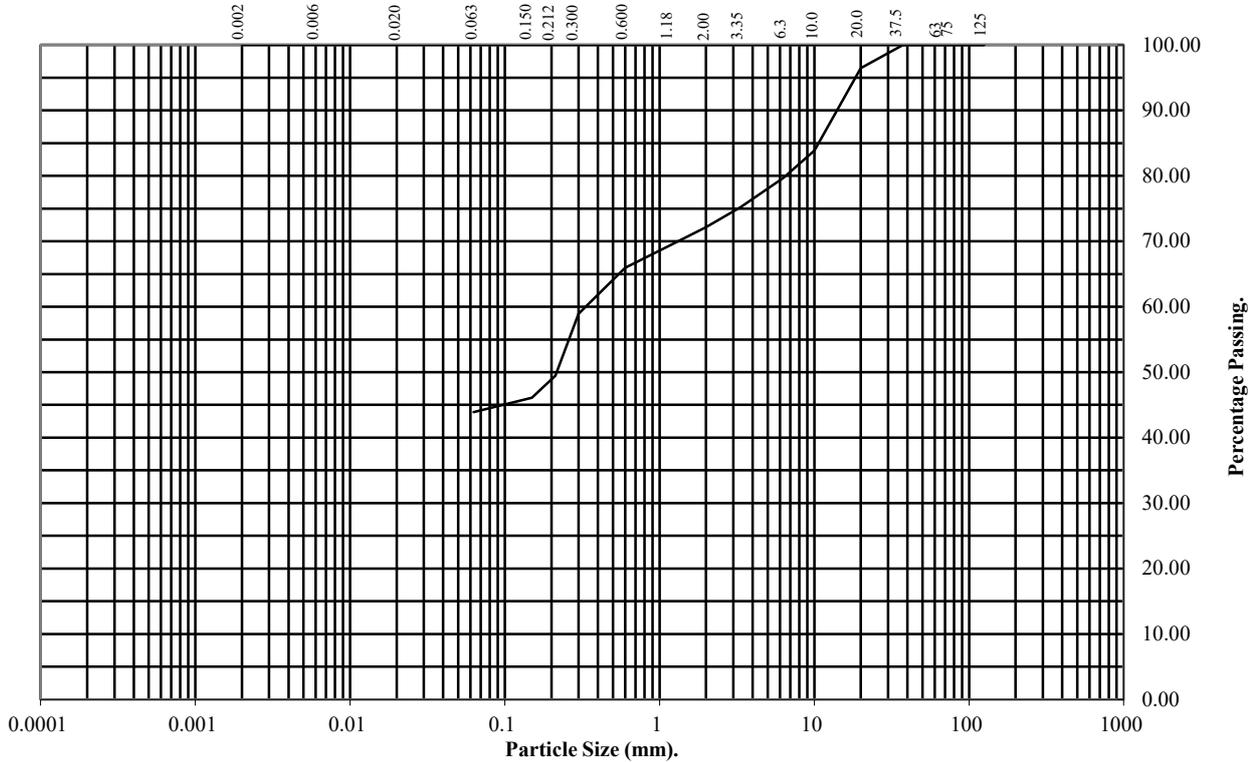
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **WS04** **Top Depth (m):** **2.00**

Sample Number: **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	84
6.3	80
3.35	75
2	72
1.18	69
0.6	66
0.3	59
0.212	49
0.15	46
0.063	44

Soil Fraction	Total Percentage
Cobbles	0
Gravel	28
Sand	28
Silt/Clay	44

Remarks:
See Summary of Soil Descriptions



Pant Industrial Estate, Merthyr Tydil

Contract No:
PSL20/1060
Client Ref:
19-1012



ANALYTICAL TEST REPORT

Contract no: 84433(1)
Contract name: Pant Industrial Estate, Merthyr Tydfil
Client reference: 19-1012
Clients name: ARC Environmental
Clients address: Solum House, Unit 1 Elliott Court
St Johns Road
Meadowfield
DH7 8PN
Samples received: 14 February 2020
Analysis started: 14 February 2020
Analysis completed: 03 March 2020
Report issued: 04 March 2020

This is a supplementary report to report number 84433 issued 23 February 2020.

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:

P. E. Hunter

Phil Hunter
Customer Support Hero

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
84433-1	BH01	1.20-.65	Sand with Gravel	-	-	14.4
84433-2	TP01	0.30	Sandy Clay with Gravel & Roots	-	-	15.0
84433-3	TP02	0.40	Clayey Sand with Gravel	-	-	14.3
84433-4	TP03	0.30	Sandy Clay with Gravel	-	-	15.1
84433-5	TP06	0.50	Clayey Sand with Gravel	-	-	15.3
84433-6	TP07	0.50	Clayey Sand with Gravel	-	-	18.2
84433-7	TP08	0.40	Sandy Clay with Gravel	-	-	15.5
84433-8	WS01	1.00	Sandy Clay with Gravel	-	-	14.3
84433-9	WS02	2.00	Sand with Gravel	-	-	10.5
84433-10	WS04	1.00	Sand with Gravel	-	-	13.5
84433-11	WS05	2.00	Sandy Clay with Gravel	-	-	16.1

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SOILS

Lab number			84433-1	84433-2	84433-3	84433-4	84433-5	84433-6
Sample id			BH01	TP01	TP02	TP03	TP06	TP07
Depth (m)			1.20-.65	0.30	0.40	0.30	0.50	0.50
Date sampled			11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020
Test	Method	Units						
Arsenic (total)	CE127 ^M	mg/kg As	-	19	25	18	32	43
Boron (water soluble)	CE063 ^M	mg/kg B	-	0.6	<0.5	<0.5	1.3	1.2
Cadmium (total)	CE127 ^M	mg/kg Cd	-	3.9	2.5	0.7	0.4	0.6
Chromium (total)	CE127 ^M	mg/kg Cr	-	194	157	107	100	90
Copper (total)	CE127 ^M	mg/kg Cu	-	136	156	89	91	147
Lead (total)	CE127 ^M	mg/kg Pb	-	127	129	82	109	108
Mercury (total)	CE127 ^M	mg/kg Hg	-	0.8	2.2	0.6	1.1	1.3
Nickel (total)	CE127 ^M	mg/kg Ni	-	172	112	78	61	64
Selenium (total)	CE127 ^M	mg/kg Se	-	2.1	1.8	1.9	2.7	2.4
Zinc (total)	CE127 ^M	mg/kg Zn	-	369	323	224	197	203
pH	CE004 ^M	units	7.7	7.8	8.0	7.8	7.7	8.0
Ammonia	CE144	mg/kg N	-	7.86	7.71	9.55	10.53	8.06
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	107	94	48	96	197	54
Sulphur (free)	CE034 ^M	mg/kg S	-	21	33	41	151	21
Cyanide (total)	CE077	mg/kg CN	-	<1	<1	<1	<1	<1
Thiocyanate	CE145 ^M	mg/kg SCN	-	1.6	1.2	1.1	<1	<1
Phenol	CE065	mg/kg PhOH	-	0.11	<0.01	<0.01	<0.01	<0.01
Cresols	CE065	mg/kg PhOH	-	0.06	<0.01	<0.01	<0.01	<0.01
Xylenols	CE065	mg/kg PhOH	-	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthols	CE065	mg/kg PhOH	-	<0.01	<0.01	<0.01	<0.01	<0.01
Trimethylphenols	CE065	mg/kg PhOH	-	<0.01	<0.01	<0.01	<0.01	<0.01
PAH								
Acenaphthene	CE087 ^M	mg/kg	-	4.71	<0.02	<0.02	0.03	0.10
Acenaphthylene	CE087 ^M	mg/kg	-	1.01	<0.02	<0.02	<0.02	0.05
Anthracene	CE087 ^U	mg/kg	-	8.81	<0.02	0.07	0.10	0.28
Benzo(a)anthracene	CE087 ^U	mg/kg	-	46.24	0.05	0.22	0.38	0.86
Benzo(a)pyrene	CE087 ^U	mg/kg	-	48.03	0.04	0.19	0.41	0.94
Benzo(b)fluoranthene	CE087 ^M	mg/kg	-	54.73	0.06	0.30	0.62	1.38
Benzo(ghi)perylene	CE087 ^M	mg/kg	-	30.51	0.04	0.15	0.34	0.83
Benzo(k)fluoranthene	CE087 ^M	mg/kg	-	23.34	<0.03	0.11	0.22	0.49
Chrysene	CE087 ^M	mg/kg	-	46.02	0.05	0.27	0.50	1.21
Dibenz(ah)anthracene	CE087 ^M	mg/kg	-	6.13	<0.02	0.04	0.08	0.19
Fluoranthene	CE087 ^M	mg/kg	-	100.30	0.08	0.35	0.64	2.05
Fluorene	CE087 ^U	mg/kg	-	2.79	<0.02	0.02	0.06	0.12
Indeno(123cd)pyrene	CE087 ^M	mg/kg	-	32.06	0.05	0.16	0.36	0.88
Naphthalene	CE087 ^M	mg/kg	-	0.09	<0.02	0.04	0.10	0.21
Phenanthrene	CE087 ^M	mg/kg	-	41.70	0.03	0.19	0.40	1.46
Pyrene	CE087 ^M	mg/kg	-	90.55	0.07	0.27	0.52	1.70
PAH (total of USEPA 16)	CE087	mg/kg	-	537	0.47	2.37	4.75	12.8
Benzo(j)fluoranthene	CE087	mg/kg	-	0.93	<0.02	<0.02	0.02	0.04
PAH (total of OIL 8)	CE087	mg/kg	-	230	0.20	1.07	2.16	6.15

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SOILS

Lab number			84433-1	84433-2	84433-3	84433-4	84433-5	84433-6
Sample id			BH01	TP01	TP02	TP03	TP06	TP07
Depth (m)			1.20-.65	0.30	0.40	0.30	0.50	0.50
Date sampled			11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020
Test	Method	Units						
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
VPH Aliphatic (>C5-C6)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	-	<0.1	<0.1	<0.1	<0.1	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	-	25	<4	<4	<4	7
EPH Aliphatic (>C12-C16)	CE068	mg/kg	-	444	<4	5	5	12
EPH Aliphatic (>C16-C35)	CE068	mg/kg	-	18265	401	85	330	316
EPH Aliphatic (>C35-C44)	CE068	mg/kg	-	2088	87	<10	48	54
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 (>EC10-EC12)	CE068	mg/kg	-	2	<1	<1	<1	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	-	13	<1	<1	<1	1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	-	537	2	2	6	12
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	-	564	11	6	10	19
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	-	67	5	<1	3	4
Subcontracted analysis								
Asbestos (qualitative)	\$	-	-	NAD	NAD	Chrysotile	Chrysotile, Crocidolite	Chrysotile, Amosite
Form of Asbestos	\$	-	-	-	-	Loose fibres	Loose fibres	Loose fibres
Asbestos (quantitative)	\$	% w/w	-	-	-	0.033	0.004	<0.001

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SOILS

Lab number			84433-7	84433-8	84433-9	84433-10	84433-11
Sample id			TP08	WS01	WS02	WS04	WS05
Depth (m)			0.40	1.00	2.00	1.00	2.00
Date sampled			11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020
Test	Method	Units					
Arsenic (total)	CE127 ^M	mg/kg As	14	-	-	-	-
Boron (water soluble)	CE063 ^M	mg/kg B	<0.5	-	-	-	-
Cadmium (total)	CE127 ^M	mg/kg Cd	1.2	-	-	-	-
Chromium (total)	CE127 ^M	mg/kg Cr	126	-	-	-	-
Copper (total)	CE127 ^M	mg/kg Cu	69	-	-	-	-
Lead (total)	CE127 ^M	mg/kg Pb	90	-	-	-	-
Mercury (total)	CE127 ^M	mg/kg Hg	0.6	-	-	-	-
Nickel (total)	CE127 ^M	mg/kg Ni	46	-	-	-	-
Selenium (total)	CE127 ^M	mg/kg Se	1.7	-	-	-	-
Zinc (total)	CE127 ^M	mg/kg Zn	236	-	-	-	-
pH	CE004 ^M	units	7.6	5.5	7.2	7.6	7.6
Ammonia	CE144	mg/kg N	11.05	-	-	-	-
Sulphate (2:1 water soluble)	CE061 ^M	mg/l SO ₄	43	110	16	36	23
Sulphur (free)	CE034 ^M	mg/kg S	26	-	-	-	-
Cyanide (total)	CE077	mg/kg CN	<1	-	-	-	-
Thiocyanate	CE145 ^M	mg/kg SCN	<1	-	-	-	-
Phenol	CE065	mg/kg PhOH	<0.01	-	-	-	-
Cresols	CE065	mg/kg PhOH	<0.01	-	-	-	-
Xylenols	CE065	mg/kg PhOH	<0.01	-	-	-	-
Naphthols	CE065	mg/kg PhOH	<0.01	-	-	-	-
Trimethylphenols	CE065	mg/kg PhOH	<0.01	-	-	-	-
PAH							
Acenaphthene	CE087 ^M	mg/kg	<0.02	-	-	-	-
Acenaphthylene	CE087 ^M	mg/kg	<0.02	-	-	-	-
Anthracene	CE087 ^U	mg/kg	0.35	-	-	-	-
Benzo(a)anthracene	CE087 ^U	mg/kg	0.29	-	-	-	-
Benzo(a)pyrene	CE087 ^U	mg/kg	0.25	-	-	-	-
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.43	-	-	-	-
Benzo(ghi)perylene	CE087 ^M	mg/kg	0.24	-	-	-	-
Benzo(k)fluoranthene	CE087 ^M	mg/kg	0.16	-	-	-	-
Chrysene	CE087 ^M	mg/kg	0.38	-	-	-	-
Dibenz(ah)anthracene	CE087 ^M	mg/kg	0.07	-	-	-	-
Fluoranthene	CE087 ^M	mg/kg	0.45	-	-	-	-
Fluorene	CE087 ^U	mg/kg	0.02	-	-	-	-
Indeno(123cd)pyrene	CE087 ^M	mg/kg	0.26	-	-	-	-
Naphthalene	CE087 ^M	mg/kg	0.06	-	-	-	-
Phenanthrene	CE087 ^M	mg/kg	0.23	-	-	-	-
Pyrene	CE087 ^M	mg/kg	0.33	-	-	-	-
PAH (total of USEPA 16)	CE087	mg/kg	3.53	-	-	-	-
Benzo(j)fluoranthene	CE087	mg/kg	<0.02	-	-	-	-
PAH (total of OIL 8)	CE087	mg/kg	1.47	-	-	-	-

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SOILS

Lab number			84433-7	84433-8	84433-9	84433-10	84433-11
Sample id			TP08	WS01	WS02	WS04	WS05
Depth (m)			0.40	1.00	2.00	1.00	2.00
Date sampled			11/02/2020	11/02/2020	11/02/2020	11/02/2020	11/02/2020
Test	Method	Units					
BTEX & TPH							
Benzene	CE192 ^u	mg/kg	<0.01	-	-	-	-
Toluene	CE192 ^u	mg/kg	<0.01	-	-	-	-
Ethylbenzene	CE192 ^u	mg/kg	<0.01	-	-	-	-
m & p-Xylene	CE192 ^u	mg/kg	<0.02	-	-	-	-
o-Xylene	CE192 ^u	mg/kg	<0.01	-	-	-	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	-	-	-	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	-	-	-	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	-	-	-	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	-	-	-	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	9	-	-	-	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	139	-	-	-	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	14	-	-	-	-
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	-	-	-	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	-	-	-	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	-	-	-	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	-	-	-	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	-	-	-	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	3	-	-	-	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	10	-	-	-	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	-	-	-	-
Subcontracted analysis							
Asbestos (qualitative)	\$	-	NAD	-	-	-	-
Form of Asbestos	\$	-	-	-	-	-	-
Asbestos (quantitative)	\$	% w/w	-	-	-	-	-

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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
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
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
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
CE144	Ammonia	KCl extraction, Colorimetry	As received		1	mg/kg N
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	M	10	mg/l SO ₄
CE034	Sulphur (free)	Solvent extraction, HPLC	Dry	M	10	mg/kg S
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE065	Phenol	Solvent extraction, GC-MS	As received		0.01	mg/kg PhOH
CE065	Cresols	Solvent extraction, GC-MS	As received		0.01	mg/kg PhOH
CE065	Xylenols	Solvent extraction, GC-MS	As received		0.01	mg/kg PhOH
CE065	Naphthols	Solvent extraction, GC-MS	As received		0.01	mg/kg PhOH
CE065	Trimethylphenols	Solvent extraction, GC-MS	As received		0.01	mg/kg PhOH
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
CE087	Benzo(j)fluoranthene	Solvent extraction, GC-MS	As received		0.02	mg/kg
CE087	PAH (total of OIL 8)	Solvent extraction, GC-MS	As received		0.18	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

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
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		4	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		4	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
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 Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-
\$	Asbestos (quantitative)	HSG 248, Microscopy & Gravimetry	Dry	U	0.001	% w/w

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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)
84433-1	BH01	1.20-.65	N	
84433-2	TP01	0.30	N	
84433-3	TP02	0.40	N	
84433-4	TP03	0.30	N	
84433-5	TP06	0.50	N	
84433-6	TP07	0.50	N	
84433-7	TP08	0.40	N	
84433-8	WS01	1.00	N	
84433-9	WS02	2.00	N	
84433-10	WS04	1.00	N	
84433-11	WS05	2.00	N	

Chemtech Environmental Limited

TEST REPORT REVISIONS

The table below identifies amendments that have been made to this test report for each revision.

Test Report Reference	Details of amendments to test report	Issue Date
84433	Original report issued	23 February 2020
84433(1)	Asbestos Quantification added	04 March 2020