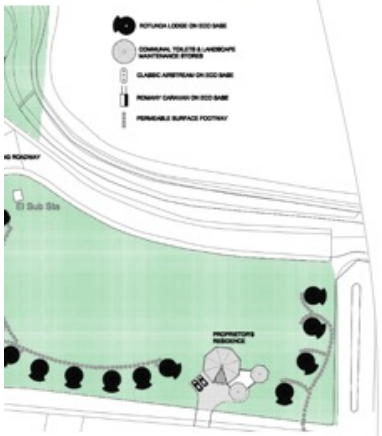

Earth Environmental
& Geotechnical

Phase II GeoEnvironmental Investigation

Old Ironworks

Devonshire Road

Millom

July 2017

On behalf of

Rotunda Roundhouses

Earth Environmental & Geotechnical Ltd
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GEOENVIRONMENTAL INVESTIGATION

THE OLD IRON WORKS

DEVONSHIRE ROAD

MILLOM

Report Ref: A1287/17

July 2017

Prepared on Behalf of:

Rotunda Roundhouses

By:

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DISTRIBUTION:

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GEOENVIRONMENTAL INVESTIGATION

THE OLD IRON WORKS, DEVONSHIRE ROAD, MILLOM

Report Reference: A1287/17

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Definition of Version Code:
D. Applied during initial drafting of the report before it has been reviewed.
C. Applied after the report has been reviewed but before it has been approved by the Project Manager.
B. Applied after the Project Manager has approved the report ready for issue to the client.
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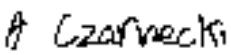
The version number starts at "0" and is raised by "1" at each re-type.

Written by: **Kate Laxton**
Geoenvironmental Consultant



Approved by:

Adam Czarnecki
Managing Director

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1.0 INTRODUCTION

1.1 Background

A Geo-Environmental Site Investigation has been commissioned by Cestria Partnership Architects on behalf of Rotunda Roundhouses (the Client) to examine ground conditions and retrieve soil samples for chemical testing for a proposed new residential development at a site in Millom.

1.2 Terms of Reference

Earth Environmental and Geotechnical Ltd (EEGL) was commissioned by the Client to undertake a Geo-Environmental Investigation of the site in accordance with a proposal A1287/17 dated 11th June 2017.

The objectives of this investigation are as follows:

- *Assess ground conditions for foundation design purposes.*
- *• Assess the presence and likely extent of any potential environmental hazards (soil contamination) associated within the site boundary.*

This report should be read in conjunction with an earlier Phase 1 Desk Study report by Earth Environmental & Geotechnical.

1.3 Limitations of the Study

The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information, improved practices or changes in legislation may require a reinterpretation of the report in whole or in part. EEGL reserve the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use by the client and is confidential to them.

Recommendations within this report are also based on exploratory records and examination of samples and, where applicable, laboratory tests. No liability can be accepted for conditions not revealed by the boreholes and trial pits, particularly at intervening locations. Whilst every effort is made to ensure accuracy of data supplied, all opinions expressed as to the spatial distribution of strata between sampling locations is for guidance only and no responsibility is accepted as to its accuracy.

2.0 SITE LOCATION & DESCRIPTION

2.1 Site Location & Description

At the time of the investigation the site was an area of disused and derelict land located off Devonshire Road, approximately 1.25km south east of Millom town centre, and 0.75km west of Duddon Estuary. The approximate National Grid Reference for the centre of the site is Easting: 318312, Northing: 479860, postcode LA18 4LW.

The site location is shown in Figure 1.

Figure 1 Site Location Plan

The site is an irregularly shaped parcel of land, occupying approximately 2.27ha, and forms part of Millom Ironworks Local Nature Reserve. The site is relatively flat lying towards the southern site entrance, with a more hummocky topography towards the north. The eastern boundary is formed by a small wooded area and unoccupied scrub land. Similarly, scrub land which leads toward Duddon Estuary, forms the northern boundary of the site. Photographs of the site are presented in Figures 2 to 4 overleaf.

Figure 2 Site Photograph – Looking SW towards Devonshire Road

Figure 3 Site Photograph – Looking SE from the north boundary

2.2 Former Site Use

It is understood the site was hosted the Millom Iron Works with associated reservoirs and surface workings from around 1899. As of ~1968, the site became disused with the reservoirs used as cooling ponds and surface workings listed as iron slag heaps

A photograph of a residual slag heap just north of the site boundary is shown in Figure 4 overleaf.

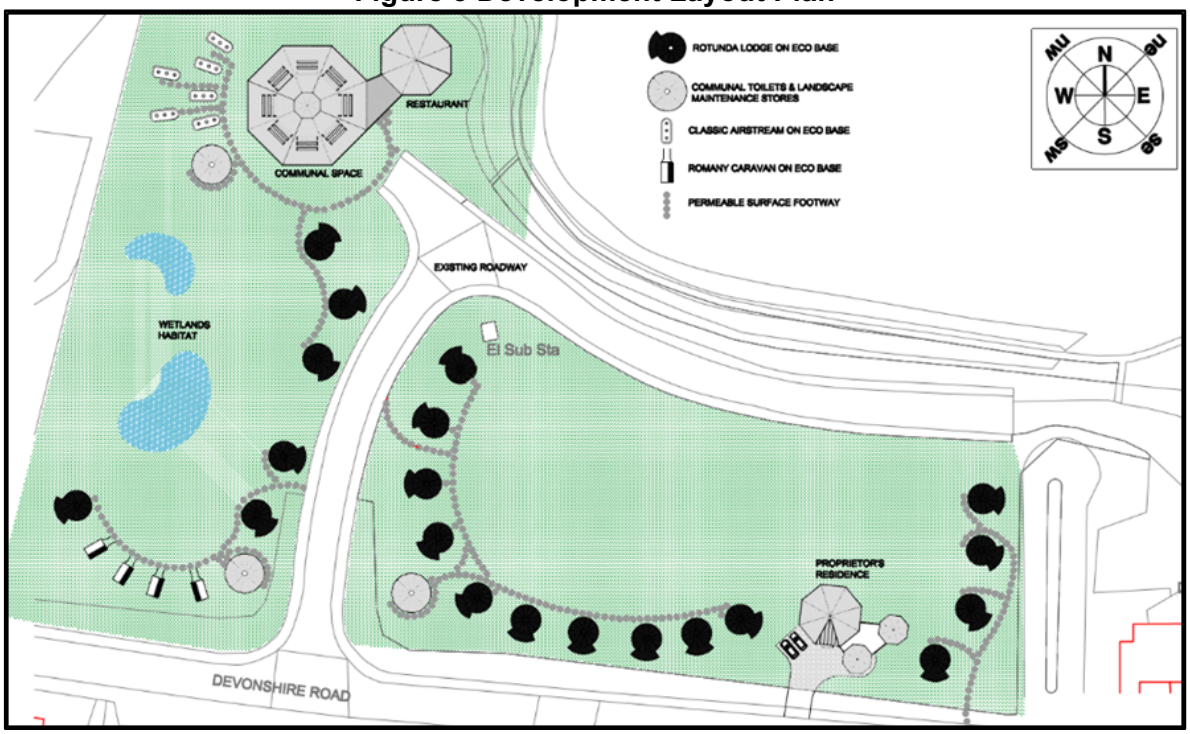
Figure 4 Site Photograph – View of residual slag heap, facing NW

2.3 Proposed Development

It is understood that the proposed development comprises of the construction of a new recreational lodge facility, which includes the construction of 16no. Eco Lodges, 4no. Eco Bases for caravan use and the construction of communal toilets, a restaurant, pathways and soft landscaping.

Figure 5 overleaf shows the Development Layout Plan provided by the client.

Figure 5 Development Layout Plan



3.0 SITE INVESTIGATION

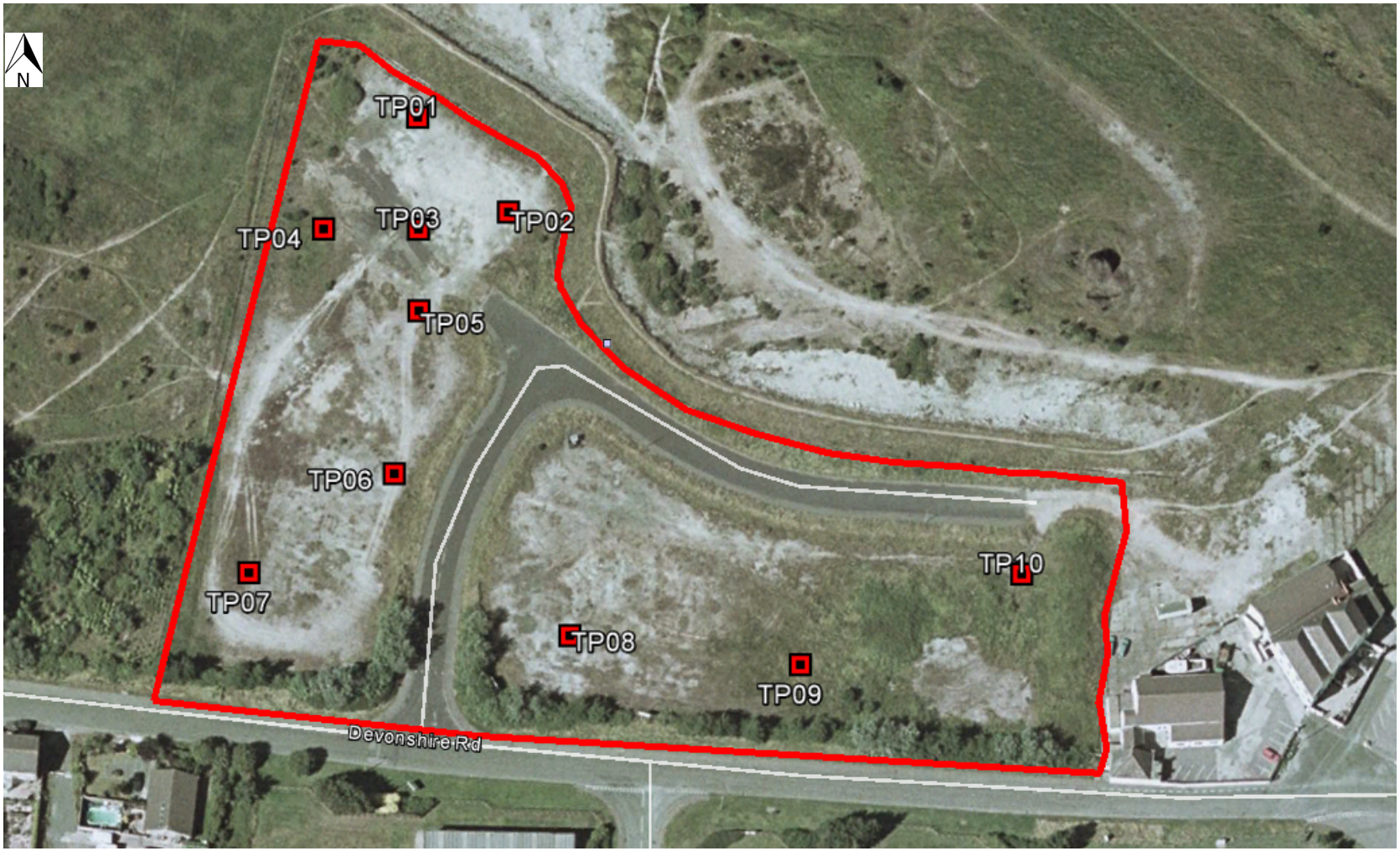
3.1 Exploratory Fieldwork

The fieldwork was carried out by EEGL between 20th and 21st June 2017 and comprised:

- The excavation of ten trial pits (designated TP01 toTP10) to a maximum depth of 4.0m below existing ground level, using a wheeled excavator. Representative disturbed samples were recovered from the excavated material as pitting proceeded. The trial pits were backfilled immediately on completion of sampling. In the original site investigation proposal, a total of twenty trial pits were proposed, however due to difficult ground conditions on site it only proved possible to excavate ten trial pits over the two days.

The fieldwork was carried out generally in accordance with BS 5930:2015 Code of Practice for Site Investigations, Eurocode 7, unless otherwise stated. The trial pit locations were determined on site by EEGL and are shown approximately on the Exploratory Hole Location Plan overleaf (Figure 6).

Figure 6 Exploratory Hole Location Plan



Each trial pit location was scanned using a Cable Avoidance Tool (CAT) in order to avoid possible unrecorded underground services, and the exploratory locations were repositioned if necessary. On completion, all samples recovered from the site were taken to a specialist laboratory for testing. The co-ordinates of each trial pit were obtained using hand held GPS equipment, to a sub-metre accuracy.

All site investigation work was supervised full time by a representative of EEGL. The logging of soils has been carried out in accordance with BS5930(2015) except where superseded by the soil and rock description methodology in BS EN14688-1(2002), BS EN 14688-2(2004) and BS EN 14689-1(2003).

A summary of exploratory holes undertaken during the investigation is presented in the following table.

Table 1: Summary of Exploratory Holes Undertaken

Hole	Type*	Depth (m)	Date Started	Date Finished	Location	Backfill Details
					Easting (m) Northing (m)	
TP01	TP	3.1	20/06/17	20/6/17	318266 479940	Arisings
TP02	TP	2.9	20/06/17	20/6/17	318286 479918	Arisings
TP03	TP	3.5	20/06/17	20/6/17	318265 479914	Arisings
TP04	TP	1.00	20/06/17	20/6/17	318243 479914	Arisings
TP05	TP	3.80	20/06/17	20/6/17	318265 479895	Arisings
TP06	TP	1.20	21/06/17	21/06/17	318258 479857	Arisings
TP07	TP	3.70	21/06/17	21/06/17	-	Arisings
TP08	TP	4.00	21/06/17	21/06/17	-	Arisings
TP09	TP	2.80	21/06/17	21/06/17	-	Arisings
TP10	TP	1.20	21/06/17	21/06/17	-	Arisings
*TP = Trial Pit,						

3.2 Laboratory Testing Programme

3.2.1 *Environmental Testing*

The environmental chemistry of the ground was investigated by specialist chemical analysis of selected samples, scheduled by EEGL and carried out by QTS Environmental Ltd.

Chemical analyses were carried out on 16 soil samples and were submitted for the following suite of determinants:

Asbestos Screen, Arsenic, Beryllium, Boron, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc, Cyanide, Thiocyanate, Phenol, Sulphate (SO_4), Sulphide, pH, Sulphur, Soil Organic Matter, speciated Polyaromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbons (TPH).

The results of the laboratory contamination tests are discussed in Section 7 and included in Appendix 2.

4.0 GROUND CONDITIONS ENCOUNTERED

4.1 Soil Profile Encountered

The sequence of strata encountered beneath the site was:

- Made Ground (encountered to a maximum depth of 3.50m below ground level).
- Raised Marine Deposits.

Made Ground was encountered in all the trial pits at existing ground level and to a maximum depth of 3.50m at TP03. Due to instability of this trial pit, natural strata was not encountered and therefore the thickness of the made ground could not be proven at this location. The Made Ground generally consisted of sandy gravel and silt with fragments of concrete and brick and pockets of organic, fibrous 'peaty' material, with horizons of blueish grey glassy vesicular conglomerate (iron slag) encountered within all of the trial pits with the exceptions of TP01,TP02 and TP10.

A substantial horizon of red brick and ashy, sandy gravel was encountered between 0.30m and 1.85m below ground level within trial pit TP02, indicating the possible presence of a former building.

Horizons of silt and silty sand, which have been classified as natural ground associated with the Raised Marine Deposits, which, according to the BGS are present beneath the site, were encountered beneath the made ground at several locations. Due to the historical presence of reservoirs across the site and the nature of the material encountered however, it was not always possible to clearly distinguish between natural deposits and made ground associated with the former reservoirs.

The depths of the various materials encountered in each of the exploratory holes are summarised in the following table.

Table 2: Summary of Ground Conditions Encountered

Hole	Depth to Stratum (m)			GROUNDWATER	Trial Pit Stability
	MADE GROUND		Raised Marine Deposits		
	Overall Thickness	Iron Slag Horizon	Silt / Silty Sand		
TP01	GL – 3.10	-	-	Dry	Slightly unstable
TP02	GL – 1.85	-	1.85 – 2.90-	Perched water Seepage 1.80m	Unstable
TP03	GL – 3.50	0.30 – 0.70	-	Dry	Unstable
TP04	GL – 1.00	0.60 - 1.00	-	Dry	Stable
TP05	GL - 2.20	0.05 – 0.60	2.20 – 3.80	Dry	Stable
TP06	GL – 1.20	0.30 – 0.80	-	Dry	Stable
TP07	GL – 1.70	0.30 – 1.00	1.70 – 3.70	Dry	Unstable
TP08	GL – 2.30	0.20 – 1.80	2.30 – 4.00	Dry	Unstable
TP09	GL – 2.80	0.30 – 2.00	-	Dry	Unstable
TP10	GL – 1.20	-	-	Dry	Stable
- = Not Encountered					

4.2 Observable Indications of Contamination

A strong, acrid, sulphurous odour was noted within the iron slag encountered within several of the trial pits.

4.3 Groundwater

Groundwater was not encountered within any of the trial pits during the investigation. A water seepage was however noted within TP02 once a large boulder was removed from the made ground at a depth of 1.20m to 1.80m below ground level. This was within the area of a suspected former building.

5.0 GEOTECHNICAL ASSESSMENT

5.1 Proposed Development

It is understood that the proposed development comprises of the construction of a new recreational lodge facility, which includes the construction of 16no. Eco Lodges, 4no. Eco Bases for caravan use and the construction of communal toilets, a restaurant, pathways and soft landscaping.

5.2 Ground Conditions Encountered

The exploratory holes have encountered made ground, comprising predominantly sand and gravel with horizons of soft to firm silt and clay and pockets of organic 'peaty' fibres to depths of up to 3.50m. Iron slag deposits of between 0.40m and 1.70m thick were also encountered within the made ground at seven of the ten locations. Deposits of fine silty, micaceous sand and silt were encountered beneath the made ground within TP02, TP05, TP07 and TP08. This has been classed as natural material associated with the Raised Marine Deposits, which according to the BGS are present beneath the site, however due to the historical presence of reservoirs across the site and the nature of the material encountered it was not always possible to clearly distinguish between natural deposits and made ground associated with the former reservoirs.

5.3 Foundation Considerations

The main consideration for this site is the significant thickness of fill across the site. From trial pitting it can be seen this material is fairly consistent near surface and whereas this material is not usually acceptable as a founding stratum for conventional foundations (strip/pads) other alternatives such as a shallow depth raft foundation is likely to be suitable, subject to Local Authority approval and anticipated loadings for the proposed structure. Other alternative foundation options could be ground improvement with strip/footings and piled foundations.

For the purposes of this report the following foundation options will be discussed:

a) Shallow depth raft foundation.
b) Strip footing with ground improvement beneath building footprint.
c) Piled foundations.

5.3.1 *Raft Foundation*

A thickened edge raft is likely to be suitable at this site, placed at shallow depth and suitably reinforced to act as a rigid structure. Calculations suggest allowable bearing pressures of the order of 50kN/m^2 would be achievable in the fill material at a depth of between 0.6m and 1.0m below existing ground level.

In-situ geotechnical testing would be required to determine the bearing capacity of supporting made ground material.

5.3.2 *Ground Improvement*

Vibro stone columns are often used to solve a wide range of static, dynamic and seismic foundation problems by using powerful depth vibrators to densify soils of form stone columns that compact or reinforce soils in situ. Vibro systems can be used to treat granular deposits, fills, made ground and soft clays/silts.

Soils treated by vibro could offer an allowable bearing pressure in the range 100kN/m^2 to 200kN/m^2, depending on column spacing's and ground encountered.

Ground treatment (e.g. vibro displacement) may is not considered to be an option on this site.

5.3.3 *Piled Foundations*

A piled foundation solution is not considered to be viable for this site.

5.4 Chemical Attack on Buried Concrete

Chemical tests (see Appendix 2) show low levels of water soluble sulphates and predominantly alkaline soil conditions. Based on these conditions, it is recommended that for foundations the Design Sulphate Class for the site, as defined in BRE Special Digest 1$^{(2005)}$, be taken as DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification be taken as AC-1s. The recommendations of BRE Special Digest 1 should be followed for concrete foundations and ground bearing floor slabs.

6.0 SOIL CONTAMINATION RISK ASSESSMENT

6.1 Tier I Human Health Soil Risk Assessment – Groundworkers During Development

To assess the risk of soil contamination to construction and ground workers during development, guidelines from the HSE Document 'Protection of workers and the general public during development of contaminated land'[1991] are used. The document assesses soil contamination test results and classifies the site as being uncontaminated or contaminated with varying degrees of contamination from 'slight' to 'unusually heavy'.

The guideline values and laboratory test results are summarised in the following table:

Table 3: Summary of Guideline Values for Protection of Workers and the General Public during Development of Contaminated Land

Contaminant	Typical Values (mg/kg) for:					Test Results	Class
	Uncontaminated Soils	Slight Contamination	Contaminated	Heavy Contamination	Unusually Heavy Contamination		
	Class A	Class B	Class C	Class D	Class E		
pH (alkaline)	7 - 8	8 - 9	9 - 10	10 - 12	12	6.4–11.6	A-D
Arsenic	0 - 30	30 - 50	50 - 100	100 - 500	500	<2-40	A-B
Cadmium	0 - 1	1 - 3	3 - 10	10 - 50	50	<0.2-1.6	A-B
Chromium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	4-18	A
Copper	0 - 100	100 - 200	200 - 500	500 - 2500	2500	<4-70	A
Lead	0 - 500	500 - 1000	1000 - 2000	2000 – 1%	1.0%	5-653	A-B
Mercury	0 - 1	1 - 3	3 - 10	10 - 50	50	<1	A
Nickel	0 - 20	20 - 50	50 - 200	200 - 1000	1000	<3-24	A-B
Zinc	0 - 250	250 - 500	500 - 1000	1000 - 5000	5000	23-463	A-B
Boron	0 - 2	2 - 5	5 - 50	50 - 250	250	<1-3.6	A-B
Selenium	0 - 1	1 - 3	3 - 10	10 - 50	50	<3	A
Beryllium	0 - 5	5 - 10	10 - 20	20 - 50	50	<0.5-7.6	A-B
Vanadium	0 - 100	100 - 200	200 - 500	500 - 2500	2500	7-32	A
Sulphate	0 - 2000	2000 - 5000	5000 – 1%	1% - 5%	5.05%	687-48580	A-D
Sulphide	0 - 10	10 - 20	20 - 100	100 - 500	500	<5-82	A-C
Cyanide (free)	0 - 1	1 - 5	5 - 50	50 - 100	100	<2	A
Phenol	0 - 2	2 - 5	5 - 50	50 - 250	250	<2	A

Based on the above results there is a low to moderate potential risk, particularly in relation to the high pH values measured in the soil, from soil contamination to construction workers, ground workers and members of the public, and appropriate measures, such as PPE, site health plans, appropriate disposal of material arisings will mitigate this risk.

6.2 Tier I Human Health Soil Risk Assessment – Future Site Users

As part of the contamination assessment, the chemical results obtained by EEGL have been screened against accepted compliance criteria, namely:

- Defra C4SL Health Criteria Values (March 2014), where available; and
- Tier 1 assessment values - based on LQM/CIEH Suitable 4 Use Levels[2015] (S4ULs).

As a preliminary screening assessment, all results have been compared to residential end use (without home grown produce) criteria.

The comparison of results is summarised in the following tables:

Table 4: Soil Results Comparison with Defra C4SL HCV/LLTC Values

Determinand	C4SL (mg/kg)*			Min. (mg/kg)	Max. (mg/kg)	No. of Samples with Exceedances
	Residential with home grown produce (1)	**Residential** without home grown produce (2)	**Commercial** (3)			
Arsenic	37	40	640	<2	40	0
Benzo(a)pyrene	5.0	5.3	76	<0.1	1.51	0
Cadmium	26	149	410	<0.2	1.6	0
Chromium VI	21	21	49	<2	<2	0
Lead	200	310	2300	4	653	1
*Minimal risk Health Criteria Values						

The samples have shown contaminants at levels below the recommended C4SLs for a residential end use without plant uptake, with the exception of the sample from TP06 at 0.80m, where an elevated lead concentration, in excess of the recommended C4SL, was recorded.

The following contaminants were not assessed with respect to risks posed to Human Health as they are not generally considered to represent a significant risk to Human Health (CLR 8); sulphate and sulphide.

For contaminants not covered by the Defra C4SLs, reference is made to the Suitable for Use Levels (S4ULs) derived by The Land Quality Management Ltd (LQM) & Chartered Institute of Environmental Health[(2015)](CIEH), and summarised in Table 5 overleaf. For each land use, LQM and CIEH S4ULs for organic contaminants have been derived for three Soil Organic Matter contents: 1%, 2.5% and 6% by weight. For the purposes of this report, the S4ULs based on 2.5% SOM will be used as this is the closest value to the average of all SOM results recorded within the soil samples obtained.

Table 5: Soil Results Comparison with LQM/CIEH S4UL

Determinand	Suitable 4 Use Levels (mg/kg)*			No. of Samples	Min. (mg/kg)	Max. (mg/kg)	No of Exceedances
	Residential		Commercial (3)				
	with home-grown produce (1)	without home-grown produce (2)					
Metals							
Beryllium	1.7	1.7	12	16	<0.5	7.6	6
Boron	290	11000	240000	16	<1	3.6	0
Chromium	910	910	8600	16	4	18	0
Copper	2400	7100	68000	16	<4	70	0
Mercury	1.2	1.2	58	16	<1	<1	0
Nickel	180	180	980	16	<3	24	0
Selenium	250	430	12000	16	<3	<3	0
Vanadium	410	1200	9000	16	7	32	0
Zinc	3700	4000	730000	16	23	463	0
Polycyclic Aromatic Hydrocarbons							
Naphthalene	5.6	5.6	460	16	<0.1	<0.1	0
Acenaphthylene	420	4600	97000	16	<0.1	<0.1	0
Acenaphthene	510	4700	97000	16	<0.1	<0.1	0
Fluorene	400	3800	68000	16	<0.1	<0.1	0
Phenanthrene	220	1500	22000	16	<0.1	1.71	0
Anthracene	5400	35000	540000	16	<0.1	0.52	0
Fluoranthene	560	1600	23000	16	<0.1	3.64	0
Pyrene	1200	3800	54000	16	<0.1	3.13	0
Benz(a)anthracene	11	14	170	16	<0.1	1.59	0
Chrysene	22	31	350	16	<0.1	2.10	0
Benzo(b)fluoranthene	3.3	4.0	44	16	<0.1	2.50	0
Benzo(k)fluoranthene	93	110	1200	16	<0.1	0.86	0
Indeno(1,2,3-cd)pyrene	36	46	510	16	<0.1	1.03	0
Dibenz(a,h)anthracene	0.28	0.32	3.6	16	<0.1	0.23	0
Benzo(ghi)perylene	340	360	4000	16	<0.1	1.23	0
Phenols							
Phenol	550	1300	1500	16	<2	<2	0
Petroleum Hydrocarbons							
Aliphatic C5-C6	78	78	5900	10	<0.01	<0.01	0
Aliphatic >C6-C8	230	230	17000	10	<0.05	<0.05	0
Aliphatic >C8-C10	65	65	4800	10	<2	<2	0
Aliphatic >C10-C12	330	330	23000	10	<2	<2	0
Aliphatic >C12-C16	2400	2400	82000	10	<3	<3	0
Aliphatic >C16-C21	92000	92000	170000	10	<3	<3	0
Aliphatic >C21-C35	92000	92000	170000	10	<10	177	0
Aromatic C5-C7 (Benzene)	140	690	46000	10	<0.01	<0.01	0
Aromatic >C7-C8 (Toluene)	290	1800	110000	10	<0.05	<0.05	0
Aromatic >C8-C10	83	110	8100	10	<2	<2	0
Aromatic >C10-C12	180	590	28000	10	<2	<2	0
Aromatic >C12-C16	330	2300	37000	10	<2	<2	0
Aromatic >C16-C21	540	1900	28000	10	<3	44	0
Aromatic >C21-C35	1500	1900	28000	10	<10	290	0

The samples have shown contaminants at levels below the S4ULs for residential end use (without plant uptake), with the exception of beryllium concentrations measured in 6 soil samples taken from the made ground within TP01 (0.3m), TP02 (1.2m), TP04 (1.0m), TP05 (0.6m), TP06 (0.8m) and TP09 (1.1m).

The beryllium is considered to be from a natural source associated with iron waste slag.

Trace fibres of asbestos, identified as amosite, were encountered the sample obtained from TP04 at 1.00m below ground level. Asbestos was not identified within any of the other samples tested.

7.0 CONCLUSIONS AND RECOMMNEDATIONS

The following section provides a summary of the conclusions and recommendations based on the findings of the site investigation and contamination testing.

7.1 Soil Contamination

Based on available soil contamination test results there is a low-moderate potential risk from soil contamination to construction workers, ground workers and members of the public, and appropriate measures, such as PPE, site health plans, appropriate disposal of material arisings will mitigate this risk. The groundworks contractor must provide a soil management plan including methods of dealing with known areas of contamination and any unanticipated soil contamination encountered during groundworks.

As discussed in the above sections, the contamination tests indicate generally low concentrations of the potential contaminants compared to the proposed end use criteria. It is therefore considered that, based on the information available, remedial action should not generally be required at this site, with the exception of the importation of 300mm of clean topsoil within areas of soft landscaping in order to promote healthy plant growth.

7.2 Foundation Design

The area to be developed is the site of a former reservoir and cooling pond associated with the former Millom Iron Works.

The structures have been infilled with iron works waste which does not appear to have been afforded any compaction.

As the proposed new structures are intended to be lightweight (loading unknown) it is possible that the made ground may be able to support them. Further field testing will however be required to assess the bearing capacity of the made ground.

7.3 Site Personnel

As with all construction sites, personnel working on the site during the construction period should be encouraged to maintain a high standard of personal hygiene and on site washing facilities should be available.

7.4 Other Matters

Due diligence is required during the construction period, and should any further evidence of contamination be found, appropriate investigation and / or action should be taken. The significance of any contamination not discovered by this investigation is outside the scope of this report.

APPENDIX 1

EXPLORATORY HOLE LOGS

APPENDIX 2

CHEMICAL TESTING RESULTS

APPENDIX 3

REPORT LIMITATIONS

REPORT LIMITATIONS

This contract was completed by Earth Environmental & Geotechnical Ltd on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget and staff resources allocated to the project.

Other than that expressly contained in the above paragraph, Earth Environmental & Geotechnical Ltd provides no other representation or warranty whether express or implied, is made in relation to the services. Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon, or transferred to, by any other party without the written agreement of a Director of Earth Environmental & Geotechnical Ltd.

If a third party relies on this report, it does so wholly at its own and sole risk and Earth Environmental & Geotechnical Ltd disclaims any liability to such parties.

It is Earth Environmental & Geotechnical Ltd understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was an important factor in determining the scope and level of the services. Should the purpose for which the report is used, or the proposed use of the site change, this report will no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without Earth Environmental & Geotechnical Ltd review and advice shall be at the client's sole and own risk.

The report was written in 2017 and should be read in light of any subsequent changes in legislation, statutory requirements and industry best practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of Earth Environmental & Geotechnical Ltd. In the absence of such written advice of Earth Environmental & Geotechnical Ltd, reliance on the report in the future shall be at the client's own and sole risk. Should Earth Environmental & Geotechnical Ltd be requested to review the report in the future, Earth Environmental & Geotechnical Ltd shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between Earth Environmental & Geotechnical Ltd and the client.

The observations and conclusions described in this report are based solely upon the services that were provided pursuant to the agreement between the client and Earth Environmental & Geotechnical Ltd. Earth Environmental & Geotechnical Ltd has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report.

Earth Environmental & Geotechnical Ltd is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, Earth Environmental & Geotechnical Ltd did not seek to evaluate the presence on or off the site of electromagnetic fields, lead paint, radon gas or other radioactive materials.

The services are based upon Earth Environmental & Geotechnical Ltd observations of existing physical conditions at the site gained from a walkover survey of the site together with Earth

Environmental & Geotechnical Ltd interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst Earth Environmental & Geotechnical Ltd have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified.

No responsibility can be accepted for errors within third party items presented in this report. Further Earth Environmental & Geotechnical Ltd was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the services. Earth Environmental & Geotechnical Ltd is not liable for any inaccurate information, misrepresentation of data or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to Earth Environmental & Geotechnical Ltd and including the doing of any independent investigation of the information provided to Earth Environmental & Geotechnical Ltd save as otherwise provided in the terms of the contract between the client and Earth Environmental & Geotechnical Ltd.

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations. The potential exists for ground conditions to be encountered which are different to those considered in this report. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and Earth Environmental & Geotechnical Ltd] based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.