Environmental Geotechnical Specialists

RGS

PHASE 2

GEO-ENVIRONMENTAL REPORT

job number	C5334/25/E/8207
date	28.11.2025
site address	Hinchliffe Mill Water Street Holmbridge HD9 2NY
written by	R. Palmer
checked by	S. Hale
issued by	R. Palmer

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Report on a Phase 2 Geo-environmental Investigation

Location:	Hinchcliffe Mill Water Street, Holmbridge HD9 2NY
For:	Holdroyd Homes (Yorkshire) Ltd
Agent:	Robert Halstead Chartered Surveyors & Town Planners
Report No.	C5334/25/E/8207 Report date: November 2025

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

Rob Palmer MSc FGS ACIEH Engineering Director	**Steven Hale** BSc FGS Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Development	Construction of 19No. residential units, 7No. of which shall be formed within the existing mill building.	1.
Geology	Upper Kinderscout Grit – sandstone member of the Millstone Grit Group.	5.
Strata Conditions	Variable thickness of made ground overlying the weathered fraction of the underlying sandstone bedrock. In some areas, the bedrock is as shallow as 0.5m.	6.
Groundwater	None encountered during investigation.	6.2
Foundation Design	Strip footings should be suitable in most locations, albeit a pragmatic approach will be required during footing excavation to ensure competent strata is encountered. Localised piling may be necessary.	10.1
Effect of Sulphates	DC-1 concrete.	10.5
Contamination	Arsenic and PAH contamination revealed at some locations within the made ground. Natural strata is suitable.	11.
Ground Gas	Low levels of carbon dioxide and methane. Site is within a radon risk area. Basic radon protection measures required.	11.1.3

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

1. Introduction

It is understood that the former Hinchliffe Mill is to be redeveloped resulting in the creation of 19 residential units. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations for the proposed development. This investigation also takes into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between borehole positions, these are for guidance only and no liability can be accepted for their accuracy. This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study & Previous Investigations

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number C5334/25/E/8268 in September 2025. This report has been used extensively during the current intrusive investigation.

The configuration of the mill and associated mill dam was prevalent from at least 1906 up to 2003. Over the next 20 years or so, certain buildings have been demolished. However, the dam and adjacent mill building (to the east of the dam) remain in place.

An extensive ground investigation has previously been undertaken Arc Environmental. The results were presented as Phase 2 Ground Investigation Report 10-015, dated 21st October 2011. The report was issued to RGS over email by the client and previously been uploaded to the Kirklees Planning Portal under application number 2021/62/90800/W[2].

The Arc Environmental report refers to an older ground investigation completed on site, which was completed by Card Geotechnics in May 2004. RGS have not had access to that specific report and therefore can only review the summary produced within the Arc Environmental report itself.

It should be appreciated that a desk study was also completed by Arc Environmental in October 2017 and this was also uploaded under application number 2021/62/90800/W. The desk study refers to a gas monitoring addendum report dated November 2011 that presented 6 rounds of gas monitoring. The addendum report was produced as only 2No visits were included within the Phase 2 Ground Investigation Report.

[2] Sources: Kirklees Planning and Development; Planning Application Search; 2021/62/90800/W https://www.kirklees.gov.uk/beta/planning-applications/search-for-planning-applications/detail.aspx?id=2021/90800 accessed on 26.11.2025

The reliance on the Arc Environmental and Card Geotechnics reports are unconfirmed. Notwithstanding this, the Arc Environmental report is present within the public domain and will therefore be referred to for both geotechnical and environmental assessments.

The investigatory locations of the Arc Environmental ground investigation have been reproduced on the most current satellite imagery and are presented in Appendix 1.

4. Fieldworks

The fieldworks were undertaken on the 24th October 2025 and included the following:

- Five windowless sample boreholes.
- Standard penetration tests.
- Installation of three gas monitoring standpipes.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report. It should be appreciated that post site walkover (phase 1), the site was cleared of vegetation and the ground regraded to enable access for the drilling rig.

4.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter from 87mm for the first 1m through 77mm, 67mm and 57mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

4.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within the windowless sample boreholes. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

4.3 Gas Monitoring Standpipes

Gas monitoring standpipes were installed in boreholes RGS01, RGS02 and RGS03. The installation details are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to 0.5m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal above, and the installation was capped with a stop box cover in a concrete surround.

5. Geology

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

Table 1: Geological Data for the Site

Strata Type	Strata Name[3]	Parent Unit[4]	Description[3]
Superficial Geology	-	-	None recorded to be present beneath the site.
Solid Geology	Upper Kinderscout Grit (UKG)	Hebden Formation	Cross-bedded, fine to very coars-grained and pebbly, feldspathic sandstone.
	Marsden Formation	Millstone Grit Group	Fine- to very coarse-grained and pebbly feldspathic sandstone, interbedded with grey siltstone and mudstone, and subordinate marine black shales, thin coals and seatearths.

The geological map does not have any record of superficial soils on site. It should be appreciated however that the River Holme is present a short distance to the north of the site, therefore some river deposits should be anticipated.

The majority of the site is indicated to be underlain by the Upper Kinderscout Grit, a named sandstone member of the Hebden Formation. A lithological/stratigraphic boundary is present on the most south-eastern section of the site, therefore a lithological change between sandstone, siltstone and mudstone may be observed on this boundary.

6. Strata Conditions

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

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Encountered (RGS)**	**Groundwater Strikes** m below ground level
0.05 – 0.15	TOPSOIL	01, 02, 04	-
0.40 – 2.00	MADE GROUND (Granular)	02, 03, 04, 05	-
+4.00	SILT	04	-
0.65 – 1.85	WEATHERED UKG (CLAY)	02, 03, 05	-
+0.75 – +3.00	WEATHERED UKG (GRAVEL)	01, 02, 03, 05	-

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

[3] Sources: British Geological Survey (NERC) Map Sheet 86; Glossop; Solid and Drift Edition, and Onshore Geoindex [*online resource from www.bgs.ac.uk*]
[4] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

6.1 Groundwater

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

7. Insitu Testing

7.1 Gas and Water Level Monitoring

The standpipes were monitored between the 5th and 27th November 2025. The results of the gas monitoring undertaken to date are tabulated below and full results are presented in Appendix 3.

Table 3: Gas Monitoring

Location	Date	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow (l/h)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS01	05.11.2025	0.0	0.5	20.3	0.0	1004↔	Dry	1.22
	12.11.2025	0.0	0.6	20.3	0.0	998↔	Dry	
	19.11.2025	0.0	0.6	19.7	0.0	1008↑	Dry	
	27.11.2025	0.0	0.6	19.1	0.0	1016↑	Dry	
WS02	05.11.2025	0.0	0.7	19.9	0.0	1004↔	0.25	0.90
	12.11.2025	0.0	1.0	19.2	0.0	998↔	0.35	
	19.11.2025	0.0	0.8	19.5	0.0	1008↑	0.15	
	27.11.2025	0.0	0.5	19.0	0.0	1016↑	0.20	
WS03	05.11.2025	0.0	0.9	14.3	0.0	1004↔	1.14	1.17
	12.11.2025	0.0	2.0	11.1	0.0	998↔	1.11	
	19.11.2025	0.0	1.7	12.4	0.0	1008↑	0.79	
	27.11.2025	0.0	1.5	13.8	0.4	1016↑	1.00	

↑ - rising pressure ↓ - falling pressure ↔ -steady pressure

This work was undertaken using a GFM Series (serial No 13747/270525) which was last calibrated on the 27th May 2025.

8. Laboratory Testing - Geotechnical

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

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

The test results are presented in Appendix 4 and are summarised below:

Table 4: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	2	29% & 31%		
Index properties (1 Point)	2	LL PL PI	36% & 55% 24% & 29% 12% & 26%	Clay of intermediate plasticity. Consistency index 0.6 to 0.9 NHBC Class – Low and Medium.
Soluble sulphate & pH	6	SO_4 pH	17.4 to 155 mg/l 6.4 to 7.5	ACEC Classification AC-1.

9. Laboratory Testing - Environmental

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

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

This testing was undertaken by i2 Analytical Ltd and the results of all of the chemical testing are presented in Appendix 4 of this report.

10. Discussion of Ground Conditions - Geotechnical

It is understood that the site is to be developed by the construction of a 19No. residential units. 7 of these residential properties shall be situated within the former mill building. Indeed, the mill building shall be converted to form 3 storey terraced properties. Elsewhere on site, 12No. detached properties shall be built. At the time of writing this report the precise layout and method of construction is not known, thus the discussion below is of a generalised nature, but is primarily based on Drawing No 3372(0-)623 issued by One17 in January 2021.

As demonstrated within the desk study and both the current and previous ground investigations, the site has been subject to redevelopment in recent years with the majority of former buildings demolished between 2009 and 2016. The satellite imagery reveals that post-demolition, the topographic profile has not changed until the enabling works in October this year i.e. the site remained redundant. As such, this would suggest that the geotechnical and environmental elements discussed within the Arc Environmental report should ultimately have not changed.

Indeed, this appears to be the case with the RGS boreholes finding similar ground conditions to those identified in the Arc Environmental reports. The site slopes up to the south-east, with a former retaining wall trending north-east to the south-west to the south of the former mill buildings. This has resulted in a ‘plateau’ within the south-eastern section.

The investigations have generally found that the rock is very shallow on the plateau, therefore Plots to 17 to 19 should be constructed with traditional shallow strip footings.

In the remaining areas of the site, the ground is variable, with made ground generally becoming thicker to the north and west. It is anticipated that shallow footings will be suitable for Plots 10 to 16, albeit a pragmatic approach will be required when excavating footings trenches to ensure competent strata is present at the base. As the made ground becomes deeper towards the north, the associated garages for these particular plots may require piling or be placed on rafts above an engineered layer of fill. It is recommended that some trial pits are undertaken in Plots 13 through 16 to assess the level of the rockhead.

A similar pragmatic approach shall also be required for Plots 1 and 2, and at the time of writing this report, it is recommended that some trial pits are conducted to assess the anomalous results identified within that particular area. Indeed, it would appear that suitable shallow strata is present on the southern boundary of these plots, however this promptly deepens to the north. For budgetary purposes, it would be prudent to assume that these Plots require piles until further inspection. It is of note that no investigation has been undertaken where a garage is proposed for Plot 1.

In all cases, it cannot be recommended that foundations be constructed directly within the made ground at the site. These soils are present in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading. On the whole, the rockhead has been identified across the site. This material should be targeted as a founding strata.

A site plan with a colour scheme associated with foundation depths is presented in Appendix 1. The following table presents a summary of anticipated foundation depths on a plot by plot basis:

Table 5: Proposed Foundation Depths & Founding Strata

Plot No.	RGS Locations	ARC Locations	Founding Strata	Depth	Bearing Capacity
1 to 2	RGS02	TP12 BH11 BH12	Possible Rockhead	0.8m to 2.2m	100 kN/m²
10 to 12	RGS03	TP08 BH10	Rockhead	0.8m to 1.2m	150 kN/m²
Garages	RGS04	TP04 BH07	Rockhead	1.5m to 4.0m*	-
13 to 16	-	-	Rockhead	-	150 kN/m²
Garages	RGS05	TP03 BH04	Gravel/Rockhead	2.0m	100 kN/m²
17 to 19	RGS01	TP06 TP09 TP10	Rockhead	0.8m	150 kN/m²

*piling likely required.

The bearing capacity given above assumes a factor of safety of 3 against general shear failure. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils and rockhead are carefully inspected immediately once final trimming has taken place. Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil.

Where extensive thicknesses of fill have been identified (RGS04), a piled foundation should be adopted. Moreover, in areas where footings need to be installed to depths of say 2.0m or beyond, a costing exercise should be undertaken to assess whether piles would be more cost-effective than deep strip footings.

The stability of excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In

this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

Should the excavations be required to stand open, it is considered that a blinding layer of lean-mixed concrete be placed over the sub-grade. This expedient will reduce loosening or softening of the underling soil due to both physical disturbance and the ingress of surface water.

Should seepage of groundwater be encountered it is considered that it could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

10.1 Volume Change Potential

It should be appreciated that the cohesive soils revealed at this site possess a medium volume change potential under the guidance of the NHBC standards. Therefore, it is will be necessary to ensure that the depths of the foundations are designed in accordance with the Chapter 4.2 of the NHBC standards[5]. The methodology provided in the guidance will require the identification of any trees, still present at, or recently removed from, the site and the distance from the proposed foundations. This may result in foundation depths greater than those given above and the requirement for heave protection to be employed against footings and below the underside of the floors and beams.

10.2 Ground-floors

In light of the weak near surface soils, which were revealed to depths of up to 3m, it is not recommended that ground bearing ground floor slabs be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

Ground bearing floor slabs may be viable for plots 17 to 19 where shallow rock has been proven.

10.3 Hard-standing Areas

It is considered that any hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of 3% could be employed in the pavement design[6], albeit insitu CBR testing is recommended once formation levels have been reached. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

[5] NHBC Standards, Chapter 4.2, *Building near trees*
[6] Table 11.1, *Reproduction of TRRL Report LR1132 (1984)*, Smith (2006), Smith's Elements of Soil Mechanics, 8th ed.

10.4 Effect of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2[7], which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-2 requirements. Assuming mobile groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1[8], which can be found in Part D, *Specifying concrete for general cast-in-situ use,* of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

11. Discussion of Ground Conditions - Environmental

11.1 Discussion of Test Results

It is understood that the site is to be developed by the construction of residential properties with hard-standing and soft landscaped areas. Consequently, the site may be classified as residential with plant uptake. It should be appreciated that both the ARC and RGS tests results have been utilised for the contamination assessment. A site plan with colour scheme to assess the extent of contamination is presented in Appendix 1.

11.1.1 ARC Contamination Testing

A summary of the samples that exceeded SSVs in the Arc Environmental Phase 2 report have been summarised below:

Table 6: Summary of ARC Contamination Testing

Location	Depth (m)	Strata	Contaminants found to be exceeding CLEA SSVs (Residential)
TP01B	0 – 0.35	Made Ground*	Arsenic, PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(b)fluoranthene, chrysene indeno(1,2,3-cd)pyrene).
TP01B	0.35 – 0.6	Made Ground**	Arsenic, PAHs (benzo(a)pyrene).
TP02A	0.0 – 1.0	Made Ground**	Arsenic.
TP03	0.0 – 0.35	Made Ground**	Lead.
TP12	0.0 – 0.8	Made Ground**	Lead.

*bituminous gravels **ash and clinker

It should be appreciated that 17No. metal suites and 36No. PAH tests were completed. 5No. samples exceeded screening criteria in samples within the made ground. All natural soils were found to be suitable for the intended end use (residential).

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

11.1.2 RGS Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 0.7% and 4.5%. On this basis, it is considered that the screening values associated with 6% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website[9] and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 5. These results indicate the following:

Table 7: Summary of Contaminated Areas

Location	Depth (m)	Strata	Contaminants found to be exceeding SSVs (Residential with plant uptake)
RGS01	0.2	Weathered Rock	None
RGS04	1.5	Made Ground	Arsenic, PAHs (benzo(g,h,i)perylene)
RGS05	0.8	Made Ground	PAHs (naphthalene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene)

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

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

Table 8: Summary of Areas Contaminated by PAHs

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with Plant Uptake)
RGS01	0.2	None
RGS04	1.5	None
RGS05	0.8	PAHs (naphthalene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene)

On the basis of the above information, the results of the investigation have concluded that the made ground present at the site is contaminated by arsenic and PAHs. The contamination identified within the made ground in the RGS ground investigation matches the contamination profile identified within

[9] http://www.atrisksoil.co.uk/pages/general/subscribers.asp
[10] Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 6% SOM, Residential with home grown produce land use, 23.06.17.

the ARC ground investigation. It should be noted that the underlying natural strata is considered to be uncontaminated and suitable for the intended end use.

11.1.3 Gas Concentrations

With respect to ground gas, the results of the monitoring visits for the RGS standpipes indicated nominal methane, with concentrations of carbon dioxide ranging between 0.5% and 2.0%, in association with oxygen levels of between 11.1% and 20.3%. It should be appreciated that on non-contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.4 litres per hour was recorded and will be employed in the following calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 998mb and 1016mb.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0% methane was recorded along with 2.0% (0.02) carbon dioxide, in association with a maximum flow rate of 0.4 l/hr. This results in a GSV of 0 l/hr for methane and a GSV of 0.008 l/hr for carbon dioxide.

In accordance with Table 2 of BS8485: 2015*, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings,* the site may be characterised as *Characteristic Situation Level 1*. It is therefore considered that there is a very low risk of harm to end users and site operatives and no special precautionary measures are required in accordance to Table 8.6, *Typical scope of gas protection measures,* of CIRIA report C665.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)[11]. Accepting that the proposed development is of moderate sensitivity and that the generation potential is very low, these tables suggest that 6 readings could be undertaken over a period of 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b.*

In this case, a total of 4 monitoring visits were undertaken over a 1 month time period and for the purpose of this assessment, it is considered that the site can be provisionally classified as Characteristic Situation Level 1.

It should be appreciated that a similar classification was concluded within the Arc Environmental Phase 2 report a gas monitoring addendum report. Indeed, Characteristic Situation Level 1 was recommended after 6 visits. This monitoring was undertaken in 2011, however.

In light of the above, it is considered that 2 additional gas monitoring visits should be undertaken to reinforce the above. Following the additional monitoring visits, should there be no significant change in ground gas conditions, the site can be fully classified as Characteristic Situation Level 1.

[11] Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings, p60.*

11.2 Site Specific Risk Assessment

11.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency[12] advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.[13] This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'[14]

11.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 9. Sources of contamination include the following:

On-site – Made Ground (Arsenic and PAHs).

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

N/A -	A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.
Low -	A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
Moderate -	The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary
High -	The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

The results of the risk assessment are presented in Table 9.

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

Table 9: Conceptual Site Model and Site-Specific Risk Assessment

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	**Receptor**	**Linkage Present?**	**Risk Rating**	**Actions Required**
Direct contact/dermal absorption/soil ingestion	Operative	Yes – contamination found to be present at the site and contact with soil likely during works.	High	Yes – precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways.
	End User	Yes – contamination found to be present at the site. Landscaped areas form part of the development.	High	
	Neighbours	Yes – contamination found to be present at the site and a populated residential area surrounds the site. However, site is anticipated to be secured during the development phase. Contamination is not anticipated to affect neighbours.	Low	
Inhalation of Dust/Vapours	Operative	Yes – dust may be derived from contaminated soils. In addition, some PAH contamination found is likely to represent a vapour risk.	High	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways.
	End User	Yes – dust may be derived from contaminated soils. In addition, some PAH contamination found is likely to represent a vapour risk.	High	
	Neighbours	Yes – contamination found to be present at the site and residential and commercial properties located within 250m radius of the site and possible inhalation of dust during the works.	Moderate	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	Some contamination is present underlying the site. Precautionary measures will be required during the construction phase. Remediation will be required to either remove the contamination or break pathways. However, the contamination at the site is considered to be of limited mobility, therefore the likelihood of contamination affecting neighbouring gardens is considered low risk.
	End User	Yes – contamination found to be present at the site and site to be developed into residential development.	Moderate	
	Neighbours	Yes – contamination found to be present at the site and residential area adjoins the site.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – low concentrations of methane and carbon dioxide have been found to be present at the site (assuming *Characteristic Situation Level 1*).	Low	Low concentrations of harmful gases (methane and carbon dioxide) were detected at the site. If ground gas conditions remain the same, no special precautionary measures are deemed to be required.
	End User		Low	

	Neighbours	No – whilst concentrations of ground gas have been found to be present at the site (assuming *Characteristic Situation Level 1*), no structures directly adjoin the site, therefore gases migrating from the site would vent to atmosphere before reaching neighbouring structures. Moreover, carbon dioxide may be derived from the chalk below the site.	N/A	
Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – the River Holme is present adjacent to the site. However, contamination by arsenic and PAHs is not anticipated to be significantly mobile. Existing source-pathway-receptor model unlikely to change.	Low	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways. Old services to be removed or capped.
Migration via permeable unsaturated strata	Controlled Waters	Yes – a secondary A aquifer is present beneath the site. However, contamination by arsenic and PAHs is not anticipated to be significantly mobile. Existing source-pathway-receptor model unlikely to change.	Low	
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. However, contamination by arsenic and PAHs is not anticipated to be significantly mobile.	Low	
Direct contact with contaminated soils	Plants	Yes – contamination present at the site which may affect plants.	Moderate	Some contamination is present underlying the site. Remediation will be required to either remove the contamination or break pathways.
Uptake via root system			Moderate	
Direct contact with contaminated soils	Building Materials	Yes – contamination revealed at the site may represent a risk to building materials or plastic water pipes. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1.	Moderate (plastic services) Low (buried concrete)	Please see section 11.3 for information on good building practice.
Direct contact with contaminated groundwater				
Exposure to Radon	Operative	Yes – in a radon affected area as between 5% and 10% are affected.	High	Basic radon protective measures are required. It should be appreciated that the radon maps have updated since the issue of the Phase 1 Desk Study, with the risk upgraded.
	End User			

11.3 Indicative Remediation Strategy

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

11.3.1 Remediation Objectives

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

- To protect the site operatives during the construction process from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect the end user from the ingestion of soil or dust, dermal contact with the soil and inhalation of dust and vapours.
- To protect neighbours from the inhalation and ingestion of dust during the construction process.
- To protect end users and neighbours from the ingestion of contaminated fruit and vegetables.
- To protect plants from direct contact with contamination and prevent uptake via root system.
- To ensure that contamination cannot enter the former services occupying the site which may return to controlled waters.
- To protect plastic services from being penetrated by, or degrading due to the presence of, contamination in the soil or groundwaters.
- To protect site operatives and the end user from vapours associated with local elevated levels of volatile PAHs within the made ground.

Garden areas will need to incorporate a clean cover system. Moreover, in areas where significant made ground is present, then a form of remediation shall be required to diminish the risk from vapours accumulating in structures above. At the time of writing this report, gas protection measures are not required, however basic radon protection measures will be required in any event. The remediation statement should be issued once gas monitoring has been completed.

11.4 Fill Materials

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

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

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

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG[15] documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 10: Validation Sampling and Testing

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m³ and 1 per 250m³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m³ and 1 per 100m³	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

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

Table 11: Fill Screening Values

Contaminant	Screening Value (Residential with Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	37	37	Atrisk^{SOIL} SSVs
Cd	22.1	22.1	Atrisk^{SOIL} SSVs
Cr(VI)	3.62	3.63	Atrisk^{SOIL} SSVs
Cu	4730	4790	Atrisk^{SOIL} SSVs
Hg	8.81	15.8	Atrisk^{SOIL} SSVs
Ni	136	136	Atrisk^{SOIL} SSVs
Pb	200	200	Atrisk^{SOIL} SSVs
V	136	138	Atrisk^{SOIL} SSVs
Zn	20000	20300	Atrisk^{SOIL} SSVs

Please see summary sheet within Appendix 6 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing

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

should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

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

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

11.5 Verification Report

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

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

12. Recommendations for Further Work

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

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

13. References

- British Geological Survey (NERC) (2025), BGS, Keyworth.
  - Geology of Britain Viewer: (*http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)*
  - Lexicon of Named Rock Units:
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- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes,* B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test,* B.S.I., London.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations,* B.S.I., London.
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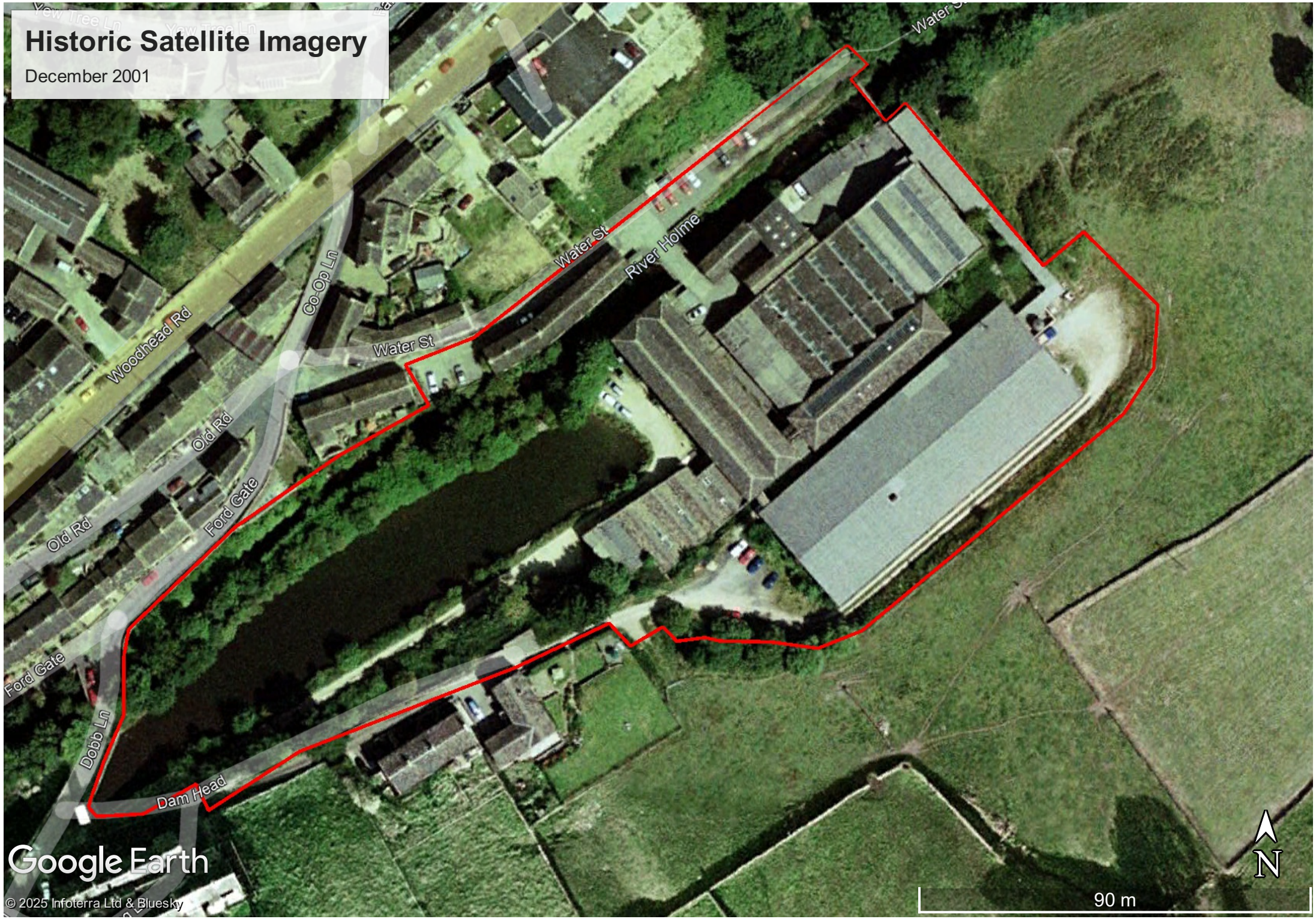
- British Standards Institution (2013), BS 8576 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground, BRE Press, Garston.
  - Part C: *Assessing the aggressive chemical environment.*
  - Part D: *Specifying concrete for general cast-in-situ use.*
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings,* CIRIA Report C665.

Appendix 1

Site Plan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December 2001
Yew Tree Ln
Water St
Co-Op Ln
Woodhead Rd
Water St
River Holme
Old Rd
Ford Gate
Old Rd
Ford Gate
Dobb Ln
Dam Head
Google Earth
© 2025 Infoterra Ltd & Bluesky
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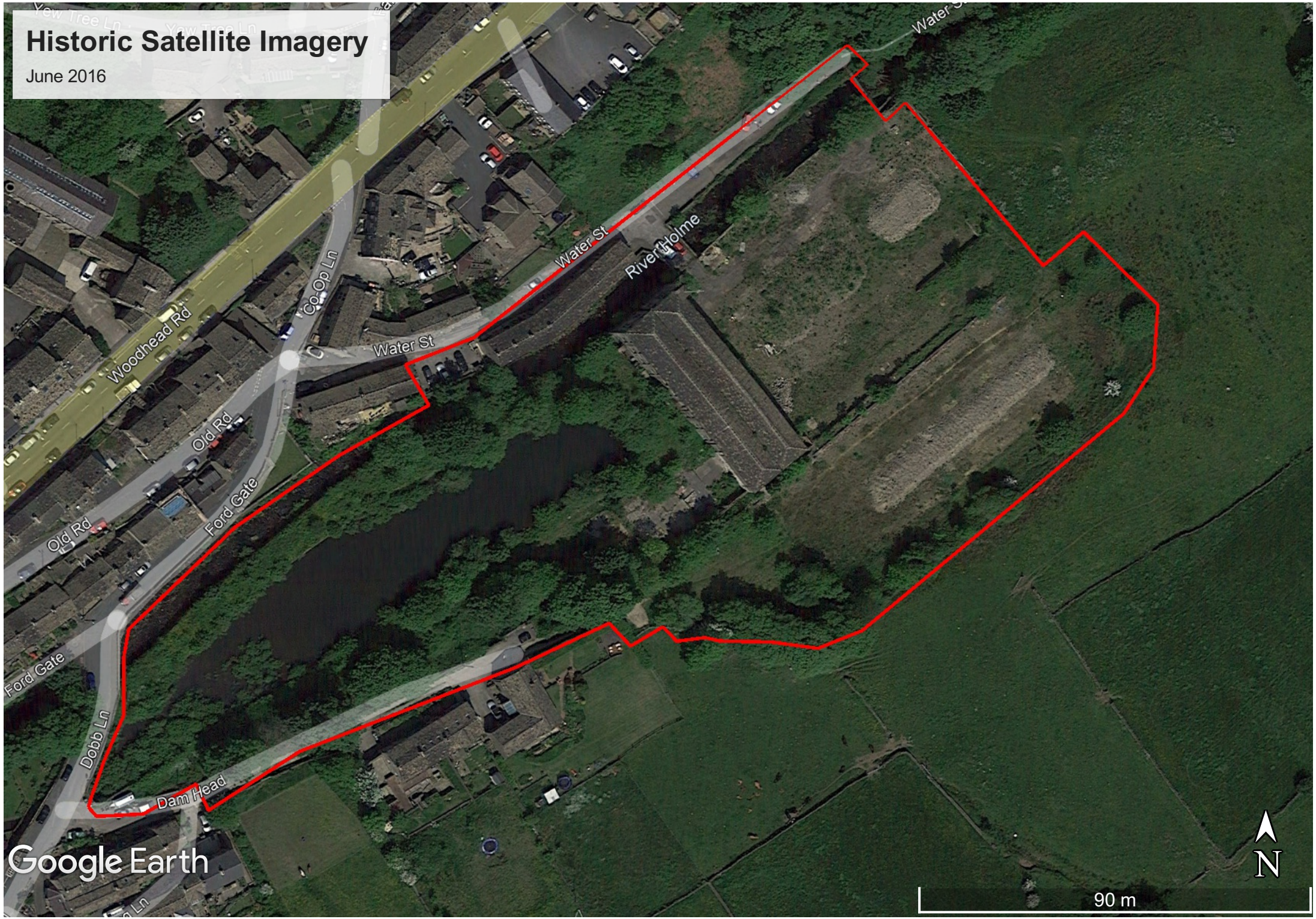
Historic Satellite Imagery
June 2016
Yew Tree Ln
Woodhead Rd
Co-Op Ln
Water St
River Holme
Old Rd
Ford Gate
Dobb Ln
Dam Head
Google Earth
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Historic Satellite Imagery
March 2025
Yew Tree Ln
Yew Tree Ln
Water St
Co-Op Ln
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Woodhead Rd
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Old Rd
Ford Gate
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Dam Head
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Image © 2025 Airbus
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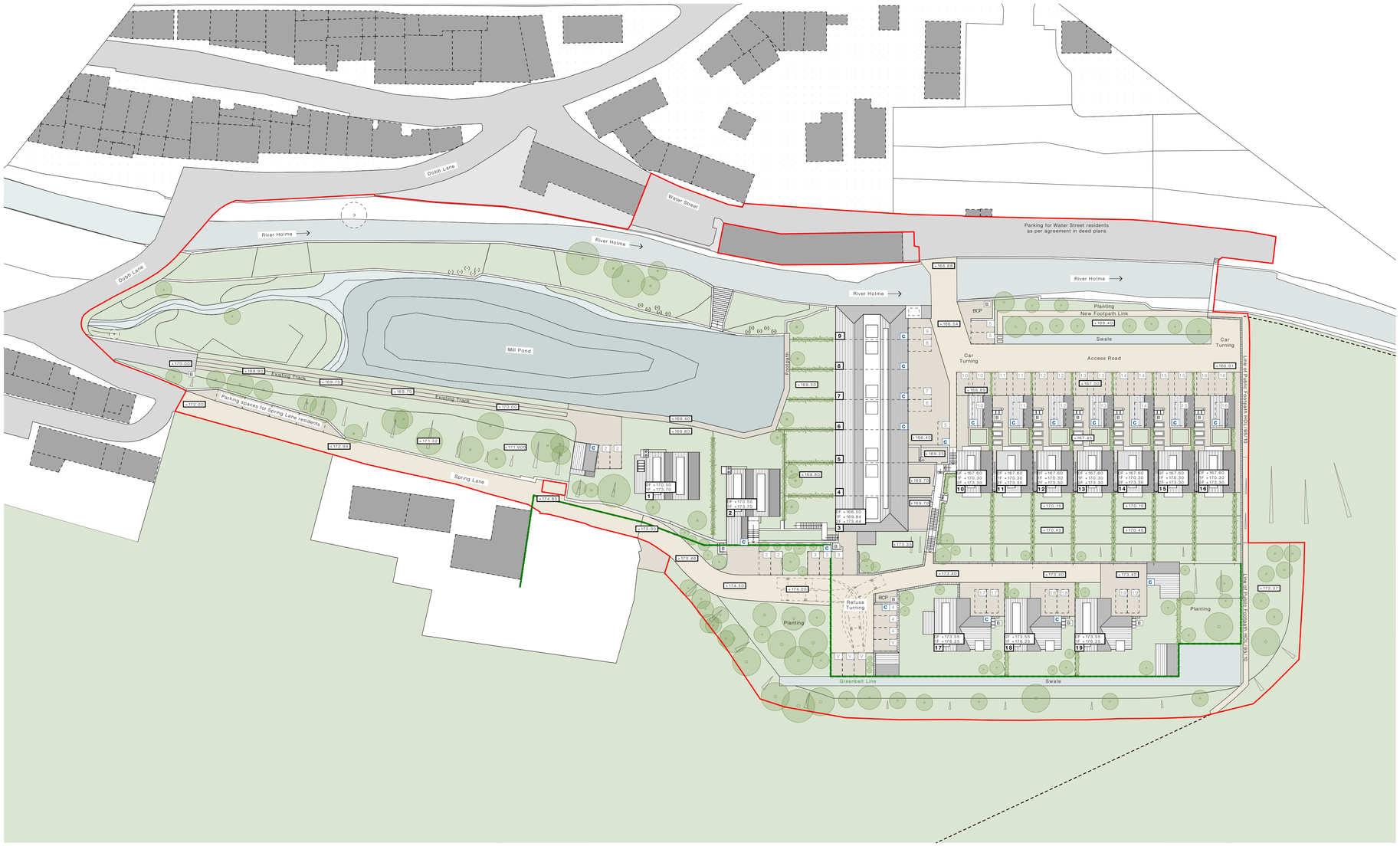

Proposed Overall Site Plan 1:500

Notes

Do not scale from drawing, use figured dimensions only.

All dimensions must be checked and verified on site prior to commencement of work and architect to be notified of any discrepancies.

This drawing is intended to permit overall scheme proposals only and cannot be used for construction purposes without further information.

Rev.		Drawn	Checked	Date
A	Scheme revised	FWG		31.08.2021
B	Scheme revised	FWG		08.10.2021
C	Scheme revised	FWG		29.11.2021
D	General updates to scheme prior to re-submission to planning	FWG		03.12.2021
E	Units 17 to 19 spread apart following feedback from planning	FWG		21.02.2022
F	General revisions	FWG		25.07.2022
G	General revisions following feedback from planning officer	FWG		19.08.2022
H	Drawings updated prior to issue to planning	FWG		19.09.2022
I	Bin stores added	FWG		19.10.2022

KEY

B Bin Collection Point

C Electric Car Charging Point

Job Title
Proposed Residential Development, Hinchcliffe Mill, Holmfirth, HD9 2NX

Client
MD One ltd

Status: Planning
Company: AD

Drawing: Overall Site Plan
Scale @ A1: 1:500

Date: Jan '21
Drawn: FWG
Checked:

Drawing No.: 3372 (0-) 623
Revision: I

ONE17
ARCHITECTS & INTERIOR DESIGNERS
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BH14
BH15
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BH02A
TP02A
TP01B
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RGS05
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TP03
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BH06A
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BH09
TP06
TP09
TP10
TP07
RGS01
Google Earth
Image © 2025 Airbus
40 m
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Foundation Summary: RGS vs ARC Investigatory Locations

Notes:

Investigation positions approximated from site operative's notes and from previous GI plans.

Shallow Foundations Viable

Deep Strip Footings/Piles

Piled Foundations Required

Uncertain - trial pits required

Buried obstruction, foundation or wall identified

RGS Environmental Geotechnical Specialists

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Near Bank,
Shelley,
Huddersfield,
HD8 8LU

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

Client:

Holroyd Homes

Job Number:

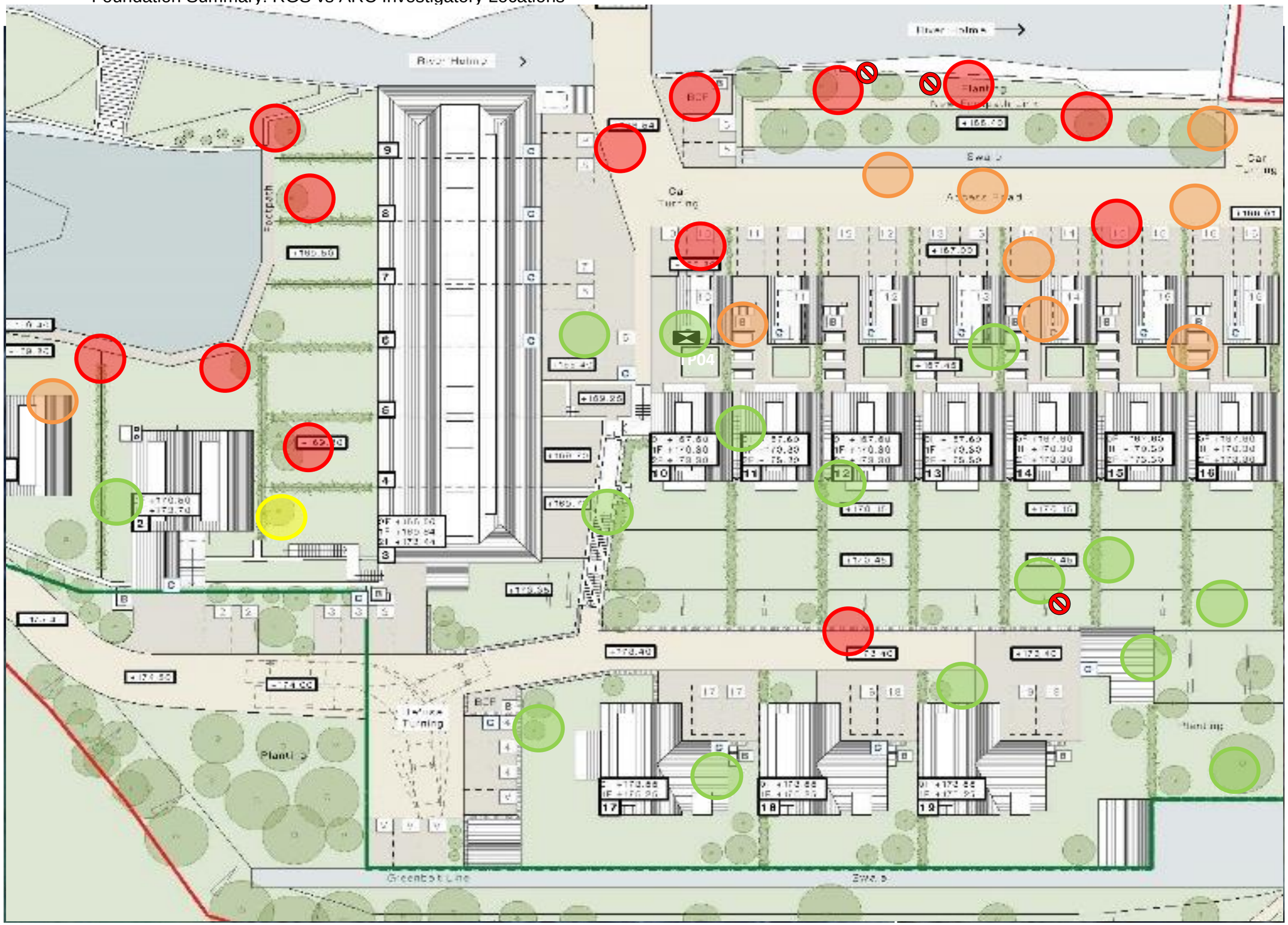
C5334/25/E/8207

Project Details:

Hinchliffe Mill

Scale:	Not to scale - reference only

Foundation Summary: RGS vs ARC Investigatory Locations



Notes:

Investigation positions approximated from site operative's notes and from previous GI plans.

- Shallow Foundations Viable
- Deep Strip Footings/Piles
- Piled Foundations Required
- Uncertain - trial pits required
- Buried obstruction, foundation or wall identified

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Holroyd Homes

Job Number:

C5334/25/E/8207

Project Details:

Hinchliffe Mill

Scale: Not to scale - reference only

Contamination Summary: RGS vs ARC Contamination Screening Levels

Notes:

Investigation positions approximated from site operative's notes and from previous GI plans.

Below ARC screening levels

Above ARC screening levels

Below RGS screening levels

Above RGS screening levels

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Client:

Holroyd Homes

Job Number:

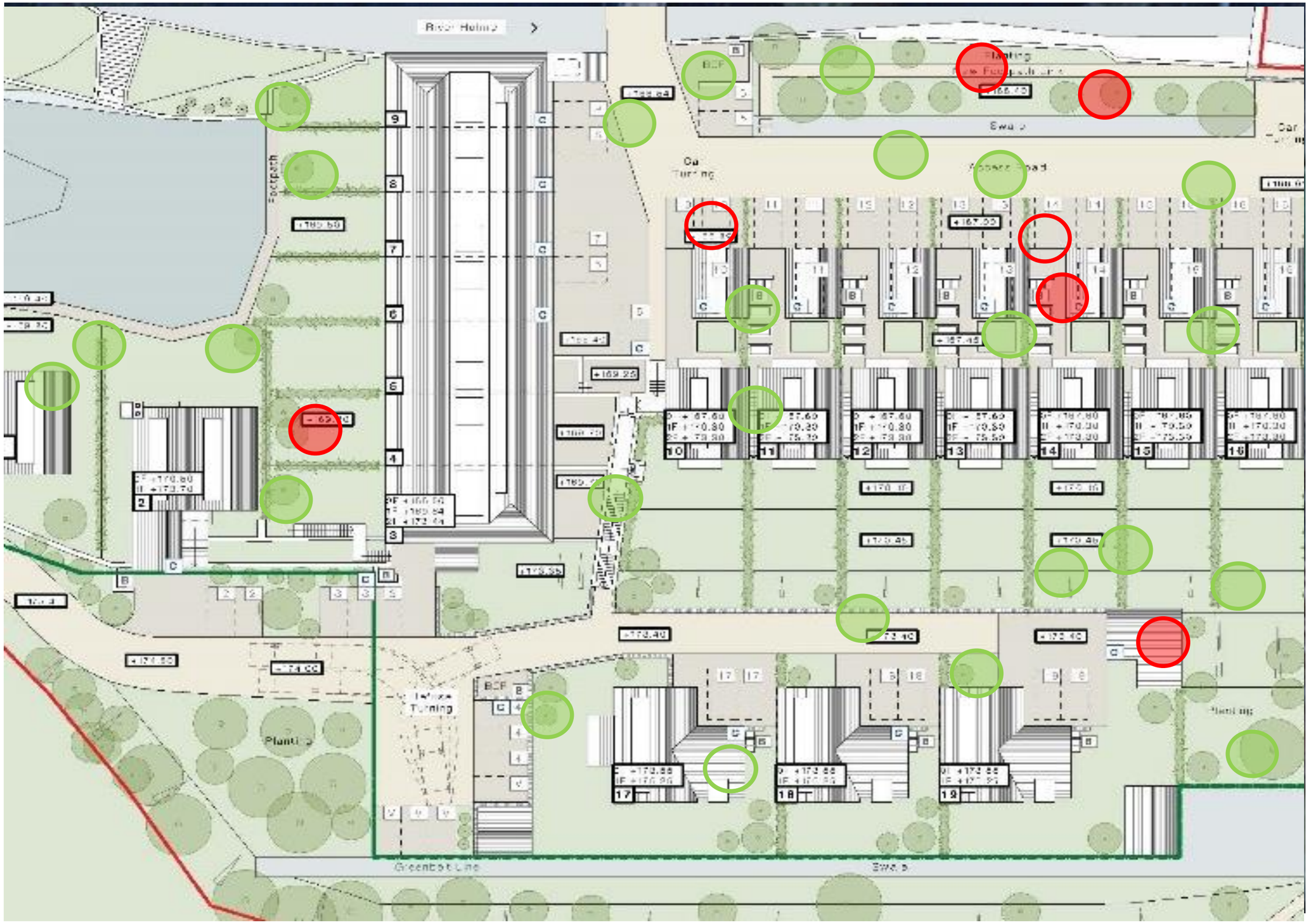
C5334/25/E/8207

Project Details:

Hinchliffe Mill

Scale: Not to scale - reference only

Contamination Summary: RGS vs ARC Contamination Screening Levels



Notes:

Investigation positions approximated from site operative's notes and from previous GI plans.

- Below ARC screening levels
- Above ARC screening levels
- Below RGS screening levels
- Above RGS screening levels

RGS Environmental Geotechnical Specialists

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Client:

Holroyd Homes

Job Number:

C5334/25/E/8207

Project Details:

Hinchliffe Mill

Scale: Not to scale - reference only

Appendix 2

Borehole Records

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RGS01**

Sheet 1 of 1

Project Name: Hinchliffe Mill	Project No. C5334/25/E/8207	Co-ords:	Hole Type WLS
Location: Water Street, Holmfirth, West Yorkshire, HD9 2NY		Level:	Scale 1:25
Client: Holroyd Homes (Yorkshire) Limited		Dates: 24/10/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.15			TOPSOIL (Soft, dark brown, gravelly, silty CLAY. Gravel is angular and fine to coarse of sandstone).
		1.00	D	87	100					Medium dense becoming dense Yellowish brown, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse.
		1.00	SPT	77	100	50 (9,13/50 for 140mm)	1.20			End of Borehole at 1.20m

1 2 3 4 5

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RGS02**

Sheet 1 of 1

Project Name:	Hinchliffe Mill	Project No. C5334/25/E/8207	Co-ords:	Hole Type WLS
Location:	Water Street, Holmfirth, West Yorkshire, HD9 2NY		Level:	Scale 1:25
Client:	Holroyd Homes (Yorkshire) Limited		Dates: 24/10/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.05			TOPSOIL (Soft, dark brown, gravelly, silty CLAY. Gravel is angular and fine to coarse of sandstone).
				87	100		0.40			MADE GROUND (Brown, clayey, silty, slightly sandy, angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse).
		0.50 0.60 0.70	D SPT			50 (10,7/50 for 220mm)	0.65 0.70			Soft, grey, sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is angular to sub-angular and fine to coarse of sandstone.
										Dense yellowish brown, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse.
										End of Borehole at 0.70m

1 2 3 4 5

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RGS03**

Sheet 1 of 1

Project Name: Hinchliffe Mill	Project No. C5334/25/E/8207	Co-ords:	Hole Type WLS
Location: Water Street, Holmfirth, West Yorkshire, HD9 2NY		Level:	Scale 1:25
Client: Holroyd Homes (Yorkshire) Limited		Dates: 24/10/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.40			MADE GROUND (Brown, clayey, silty, slightly sandy, angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse).
		0.80	D	87	100					Soft, grey, sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is angular to sub-angular and fine to coarse of sandstone.
		1.00	D							
		1.00	SPT	77	100	50 (4,21/50 for 30mm)	1.15			
							1.20			Dense yellowish brown, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse.
										End of Borehole at 1.20m

1 2 3 4 5

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RGS04**

Sheet 1 of 1

Project Name: Hinchliffe Mill	Project No. C5334/25/E/8207	Co-ords:	Hole Type WLS
Location: Water Street, Holmfirth, West Yorkshire, HD9 2NY		Level:	Scale 1:25
Client: Holroyd Homes (Yorkshire) Limited		Dates: 24/10/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.05			TOPSOIL (Soft, dark brown, gravelly, silty CLAY. Gravel is angular and fine to coarse of sandstone).
				87	100		0.50			MADE GROUND (Brown, silty, slightly sandy, angular and fine to coarse GRAVEL of sandstone. Sand is fine to coarse).
		1.00	SPT			N=8 (1,2/2,2,2,2)				MADE GROUND (Loose brown, clayey, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of ash, clinker, coal, concrete and sandstone. Sand is fine to coarse).
				77	45					
	▼	2.00	SPT			N=28 (3,3/4,11,10,3)	2.00			No recovery.
		2.00		67	0					
		3.00	SPT			N=1 (1,1/0,1,0,0)	3.00			Soft, dark brown, organic, clayey, slightly sandy SILT. Sand is fine to coarse.
				57	30					
		4.00	SPT			N=50 (1,0/1,12,10,27)	4.00			End of Borehole at 4.00m

1 2 3 4 5

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RGS05**

Sheet 1 of 1

Project Name: Hinchliffe Mill	Project No. C5334/25/E/8207	Co-ords:	Hole Type WLS
Location: Water Street, Holmfirth, West Yorkshire, HD9 2NY		Level:	Scale 1:25
Client: Holroyd Homes (Yorkshire) Limited		Dates: 24/10/2025	Logged By SH

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
				87	100					MADE GROUND (Loose brown, clayey, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of ash, clinker, coal, concrete and sandstone. Sand is fine to coarse).
		1.00	SPT			N=3 (1,1/0,1,1,1)				
				77	100		1.30			Firm, brown, sandy, silty CLAY. Sand is fine to coarse.
		2.00	SPT			N=23 (1,1/5,5,7,6)	1.85			Medium dense rown and grey, silty, sandy, angular to sub-angular and fine to coarse GRAVEL of sandstone.
				67	100					
		3.00	D				3.00			End of Borehole at 3.00m
		3.00	SPT			50 (5,10/50 for 225mm)				

1 2 3 4 5

Remarks

AGS

Appendix 3

Gas Monitoring Sheets

Post Fieldworks Discrete Well Monitoring Site Record

Job No:	C/5334/25/E/8207	Client:		Visit:	1	Of	4
Site:	Hinchliffe Mill Hilmfirth HD9 2NY	Date:	05.11.2025				

Rogers Geotechnical Services Ltd , Offices 1 & 2
Barncliffe Business Park, Shelley, Huddersfield,
HD8 8LU

Tel: 01484 604 354
enquiries@rogersgeotech.co.uk

Location ID	Methane (%)		Carbon Dioxide (%)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		Oxygen (%)		VOCs (ppm)		Flowrate (l/hr)		Water Depth (m)	Well Depth (m)	Installed Depth (m)	Comments
	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady	Peak	Steady	Peak				
RGS01	-0.1		0.5		0		0		20.3				0.0		DRY		1.22	
RGS02	-0.1		0.7		0		0		19.9				0.0		0.25		0.90	
RGS03	0.0		0.9		0		0		14.3				0.0		1.14		1.17	
Max.	0.0	0.0	0.9	0.0	0	0	0	0	20.3	0.0	0	0	0.0	0.0	1.14			
Min.	-0.1	0.0	0.5	0.0	0	0	0	0	14.3	0.0	0	0	0.0	0.0	0.25			

ND - Not detected DRY - No water in well NM - Not Monitored (State Reason in comments)

Meteorological & Site Information	
General Ground Condition	Wet
Precipitation	3l/m2 in last 12 hours
Wind	4
Temperature	14
Barometric Pressure	1004
Pressure Trend	Steady

Monitor Technical Specifications								
Gas Monitor Used:	GFM Series							
Serial No:	13747/270525							
Monitor Gas Range	CH_4	5>60	CO_2	5<40	O_2	21.2		
Gas Flow Range	0-10 l/hr							
Date of Calibration	27.05.2025							
PID Monitor (If used)								
PID Monitor Serial No.								
Calibration Date.								

Monitoring Period Summary (All Visits)	Peak	Steady
Max CH_4	0.0	2.4
Max CO_2	0.9	0.0
Max CO	0	0
Max H_2S	0	0
Max O_2	20.3	0.0
Min O_2	14.3	0.0
Flow rate	0.0	0.4

	Start	End
Barometric Pressure	1004	1004

Operative Details.	M.Tuck

Post Fieldworks Discrete Well Monitoring Site Record

Job No:	C/5334/25/E/8207	Client:	0	Visit:	2	Of	4
Site:	Hinchliffe Mill Hilmfirth HD9 2NY	Date:	12.11.2025				

Rogers Geotechnical Services Ltd , Offices 1 & 2 Barncliffe Business Park, Shelley, Huddersfield, HD8 8LU

Tel: 01484 604 354
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Location ID	Methane (%)		Carbon Dioxide (%)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		Oxygen (%)		VOCs (ppm)		Flowrate (l/hr)		Water Depth (m)	Well Depth (m)	Installed Depth (m)	Comments
	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady	Peak	Steady	Peak				
1	0.0		0.6		0		0		20.3				0.0		DRY		1.22	
2	-0.1		1.0		0		0		19.2				0.0		0.35		0.90	
3	0.0		2.0		0		0		11.1				0.0		1.11		1.19	
Max.	0.0	0.0	2.0	0.0	0	0	0	0	20.3	0.0	0	0	0.0	0.0	1.11			
Min.	-0.1	0.0	0.6	0.0	0	0	0	0	11.1	0.0	0	0	0.0	0.0	0.35			

ND - Not detected DRY - No water in well NM - Not Monitored (State Reason in comments)

Meteorological & Site Information	
General Ground Condition	Wet
Precipitation	0l/m2 in last 6 hours
Wind	12
Temperature	13
Barometric Pressure	998
Pressure Trend	Steady

Monitor Technical Specifications									
Gas Monitor Used:	GFM Series								
Serial No:	13747/270525								
Monitor Gas Range	CH_4	5>60	CO_2	5<40	O_2	21.2			
Gas Flow Range	0-10 l/hr								
Date of Calibration	27.05.2025								
PID Monitor (If used)									
PID Monitor Serial No.									
Calibration Date.									

Monitoring Period Summary (All Visits)	Peak	Steady
Max CH_4	0.0	2.4
Max CO_2	2.0	0.0
Max CO	0	0
Max H_2S	0	0
Max O_2	20.3	0.0
Min O_2	13.8	0.0
Flow rate	0.0	0.4

	Start	End
Barometric Pressure	998	998

Operative Details.	S. Hale

Post Fieldworks Discrete Well Monitoring Site Record

Job No:	C/5334/25/E/8207	Client:	0	Visit:	3	Of	4
Site:	Hinchliffe Mill Hilmfirth HD9 2NY	Date:	19.11.2025				

Rogers Geotechnical Services Ltd , Offices 1 & 2 Barncliffe Business Park, Shelley, Huddersfield, HD8 8LU

Tel: 01484 604 354
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Location ID	Methane (%)		Carbon Dioxide (%)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		Oxygen (%)		VOCs (ppm)		Flowrate (l/hr)		Water Depth (m)	Well Depth (m)	Installed Depth (m)	Comments
	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady	Peak	Steady	Peak				
1	-0.1	-0.1	0.6		0.0		0		19.7				0.0		DRY		1.22	
2	-0.1	-0.1	0.8		0.0		0		19.5				N/A		0.15		0.90	Blue install pipe flooded to the bung.
3	0.0	2.4	1.7		0.0		0		12.4				0.0		0.79		1.19	
Max	0.0	2.4	1.7	0.0	0.0	0.0	0	0	19.7	0.0	0	0	0.0	0.0				
Min.	-0.1	-0.1	0.6	0.0	0.0	0.0	0	0	12.4	0.0	0	0	0.0	0.0				

ND - Not detected DRY - No water in well NM - Not Monitored (State Reason in comments)

Meteorological & Site Information	
General Ground Condition	Wet
Precipitation	4l/m2 in last 12 hours
Wind	4
Temperature	2
Barometric Pressure	1008
Pressure Trend	Rising

Monitor Technical Specifications								
Gas Monitor Used:	GFM Series							
Serial No:	13747/270525							
Monitor Gas Range	CH_4	5>60	CO_2	5<40	O_2	21.2		
Gas Flow Range	0-10 l/hr							
Date of Calibration	27.05.2025							
PID Monitor (If used)								
PID Monitor Serial No.								
Calibration Date.								

Monitoring Period Summary (All Visits)	Peak	Steady
Max CH_4	0.0	2.4
Max CO_2	2.0	0.0
Max CO	0	0
Max H_2S	0	0
Max O_2	20.3	0.0
Min O_2	13.8	0.0
Flow rate	0.0	0.4

	Start	End
Barometric Pressure	1008	1008

Operative Details.	M.Tuck

Post Fieldworks Discrete Well Monitoring Site Record

Job No:	C/5334/25/E/8207	Client:	0	Visit:	4	Of	4
Site:	Hinchliffe Mill Hilmfirth HD9 2NY	Date:	26.11.25				

Rogers Geotechnical Services Ltd , Offices 1 & 2 Barncliffe Business Park, Shelley, Huddersfield, HD8 8LU

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Location ID	Methane (%)		Carbon Dioxide (%)		Carbon Monoxide (ppm)		Hydrogen Sulphide (ppm)		Oxygen (%)		VOCs (ppm)		Flowrate (l/hr)		Water Depth (m)	Well Depth (m)	Installed Depth (m)	Comments
	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Minimum	Steady	Peak	Steady	Peak				
RGS01	0		0.6		0		0		19.1				0	0	DRY		1.22	
RGS02	0		0.5		0		0		19				0	0	0.2		0.9	
RGS03	0		1.5		0		0		13.8				0	0.4	1		1.19	
Max	0	0	1.5	0	0	0	0	0	19.1	0	0	0	0	0.4	1			
Min.	0	0	0.5	0	0	0	0	0	13.8	0	0	0	0	0	0.2			

ND - Not detected

DRY - No water in well

NM - Not Monitored (State Reason in comments)

Meteorological & Site Information	
General Ground Condition	DRY
Precipitation	0
Wind	4
Temperature	12
Barometric Pressure	1016
Pressure Trend	Steady

Monitor Technical Specifications								
Gas Monitor Used:	GFM Series							
Serial No:	13747/270525							
Monitor Gas Range	CH_4	5>60	CO_2	5<40	O_2	21.2		
Gas Flow Range	0-10 l/hr							
Date of Calibration	27.05.2025							
PID Monitor (If used)								
PID Monitor Serial No.								
Calibration Date.								

Monitoring Period Summary (All Visits)	Peak	Steady
Max CH_4	0.0	2.4
Max CO_2	2.0	0.0
Max CO	0	0
Max H_2S	0	0
Max O_2	20.3	0.0
Min O_2	13.8	0.0
Flow rate	0.0	0.4

	Start	End
Barometric Pressure	1016	1016

Operative Details.	M.Tuck

Appendix 4

Laboratory Testing

Environmental
Geotechnical
Specialists

LABORATORY REPORT

job number C5334/25/E/8207	client ref

site address Hinchliffe Mill Water Street, Holmfirth, West Yorkshire, HD9 2NY	client address Robert Halstead Bridge Mills, Holmfirth, West Yorkshire, HD9 3TW

consultant

date scheduled 05/11/2025	date issued 20/11/2025
issued by H J Letch	job title Laboratory Manage

Rogers Geotechnical Services Ltd Telephone **01484 607 977**
Email **harry.letch@rogersgeotech.co.uk** **www.rogersgeotech.co.uk** Unit
Unit 1 Manor Croft Works
Skelmanthorpe
HD89DS

GEOTECHNICAL ENVIRONMENTAL

UKAS
United Kingdom Accreditation Service

8948

Schedule of UKAS Accredited Laboratory Tests

RGS

1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN 150 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2 : 3.2	Pt 1 : 2014 Pt 12 : 2018 : 5.3 / 5.5		U
ii. Saturation m/c of chalk	Pt 2 : 3.3			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2 : 4.3			U
ii. Plastic limit	Pt 2 : 5.3			U
iii. Shrinkage limit	Pt 2 : 6.3			U
iv. Linear shrinkage	Pt 2 : 6.5			U
1.3 Particle Density				
i. Gas jar	Pt 2 : 8.2			U
ii. Large pyknometer	Pt 2 : 8.3			U
iii. Small pyknometer	Pt 2 : 8.4	Pt 3 : 2015 : 5.1		U
1.4 Density Tests				
i. Linear measurement	Pt 2 : 7.2	Pt 2 : 2014 : 5.1		U
ii. Immersion in water	Pt 2 : 7.3	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2 : 7.4	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9 : 2.1, 2.2			U
v. Core cutter	Pt 9 : 2.4			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2 : 9.2	Pt 4 : 2016 : 5.2		U
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2		U
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4		U
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS	**BS 1377-3:2018**			
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS	**BS 1377-4:1990**			
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
3.2 Moisture Condition Value				
i. Single point test	Pt 4 : 5.4			U
ii. MCV/moisture content relationship	Pt 4 : 5.5			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 5 : 7			U
ii. Recompacted sample	Pt 5 : 7			U
iii. Soaked, inc measurement of swell	Pt 5 : 7			U
4. COMPRESSIBILITY OF SOIL	**BS 1377-5:1990**			
i. One dimensional consolidation	Pt 5 : 3			U
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL	**BS 1377-7:1990**			
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9			U
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U

Disclaimer

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

Environmental
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RGS

GEOTECHNICAL
LAB RESULTS

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Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864

Summary of Classification Test Results

Project No.	Project Name
C5334/25/E/8207	Hinchliffe Mill

Hole No.	Sample				Soil Description	Density		*w*	Passing 425µm	LL	PL	PI	Particle density	1pt/4pt	Date	Increase/Decrease
	Ref	Top	Base	Type		bulk Mg/m^3	dry Mg/m^3	%	%	%	%	%	Mg/m^3			
RGS02	1	0.60		D	Soft, grey, sandy, slightly gravelly, silty CLAY			31	89	55	29	26		4pt	05-Nov	Increase
RGS03	1	0.80		D	Soft, grey, sandy, slightly gravelly, silty CLAY.			29	97	36	24	12		4pt	05-Nov	Increase

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

Key

Density test	Liquid Limit	Particle density
Linear measurement unless :	4pt cone unless :	sp - small pyknometer
wd - water displacement	cas - Casagrande method	gj - gas jar
wi - immersion in water	1pt - single point test	

Date Printed	Approved By	Table
18/11/2025	EC	1
		sheet 1

Rogers Geotechnical Services Ltd.
Offices 1&2,
Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield,
HD8 8LU

Classification of Index Properties

C5334/25/E/8207

Project Name: Hinchliffe Mill

BS EN ISO 17892-12 2018+A2:2022

Fig. 2 | Sheet. 1

Location:

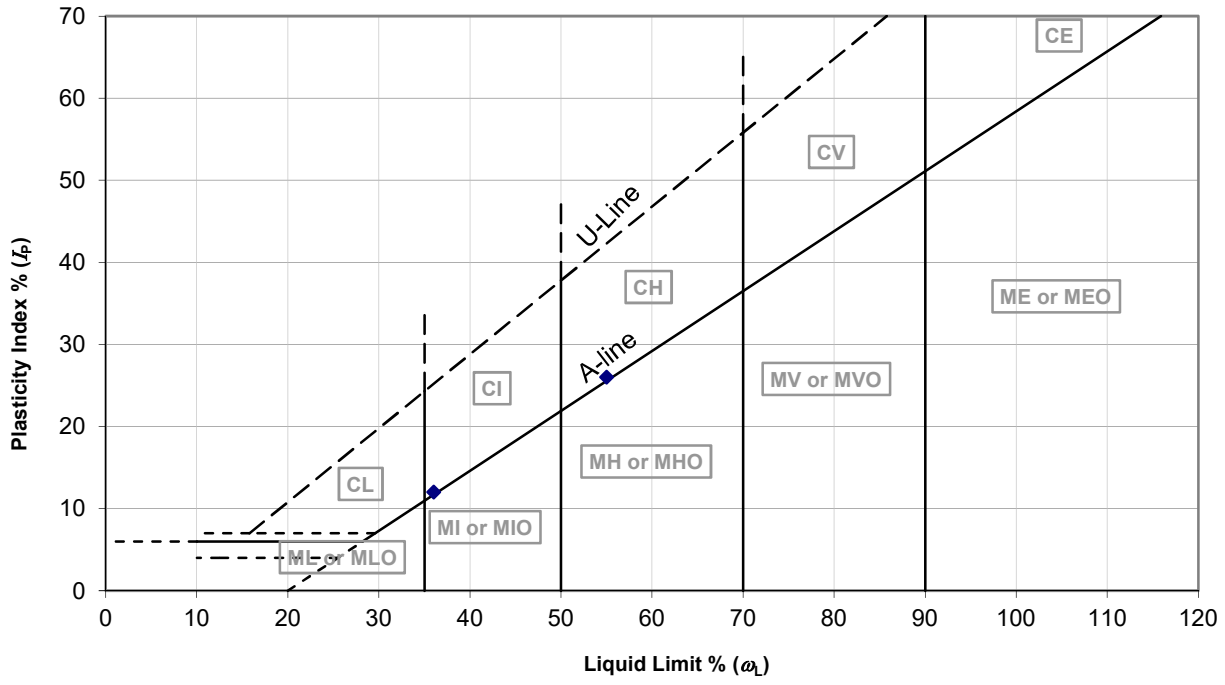
Input By: Harry

Client: Holroyd Homes (Yorkshire) Limited

Check By: EC

Location	Depth (m)	Water Content (ω) (%)	Liquid Limit (ω_L) (%)	Plastic Limit (ω_P) (%)	Plasticity Index (I_P) (%)	Retained by 0.425mm (%)	Modified (ω) (ω') (%)	Modified (I_P) (I_P') (%)	Liquidity/ Consistency (I_L) (%)	Liquidity/ Consistency (I_C) (%)	Casagrande Class	N.H.B.C Class (%)
RGS02	0.60	31	55	29	26	11	35	23	0.1	0.9	C H	MEDIUM
RGS03	0.80	29	36	24	12	3	30	12	0.4	0.6	C I	LOW

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



Summary of Geotechnical Chemical Test Results

Project No.	Project Name
C5334/25/E/8207	Hinchliffe Mill

Hole No.	Sample				Soil Description	Org	LOI	pH	Sulphate as SO_4			Chloride, Cl		CO_2	TDS	<2mm	Remarks
	Ref	Top	Base	Type					Total acid sol.	2:1 water :soil	ground water	water sol.	acid sol.				
						%	%		%	g/l	g/l	%	%	%	mg/l	%	
RGS01	1	1.00		D	Brown silty sandy GRAVEL.			6.48		0.06						36	
RGS03	2	1.00		D	Grey silty sandy CLAY.			6.67		0.03						100	
RGS05	1	3.00		D	Brownish grey silty gGRAVEL/			6.87		0.04						57	

Key

Tests performed in accordance with BS 1377 unless annotated otherwise

Org	Organic matter content	Cl	Chloride content
LOI	Mass loss on ignition at 440°C	CO_2	Carbonate content (rapid titration)
		TDS	Total Dissolved Solids

Date Printed	Approved By	Table
18/11/2025	HJL	3
		sheet 1

Rogers Geotechnical Services Ltd
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7 Woodshots Meadow,
Croxley Green
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Watford,
Herts,
WD18 8YS

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Analytical Report Number : 25-060282

Project / Site name:	Hinchliffe Mill	**Samples received on:**	06/11/2025
Your job number:	C5334	**Samples instructed on/ Analysis started on:**	06/11/2025
Your order number:		**Analysis completed by:**	19/11/2025
Report Issue Number:	1	**Report issued on:**	19/11/2025
Samples Analysed:	3 soil samples		

Signed:

Joanna Biolik
Senior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

Analytical Report Number: 25-060282
Project / Site name: Hinchliffe Mill

Lab Sample Number				742114	742115	742116
Sample Reference				RGS01	RGS04	RGS05
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A
Depth (m)				0.20	1.50	0.80
Date Sampled				05/11/2025	05/11/2025	05/11/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status			
Stone Content	%	0.1	NONE	15.9	31.7	< 0.1
Moisture Content	%	0.01	NONE	8.3	13	13
Total mass of sample received	kg	0.1	NONE	1	1	1
Asbestos						
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	PDO	PDO	PDO
Analysis completed	N/A	N/A	N/A	13/11/2025	13/11/2025	13/11/2025
General Inorganics						
pH (L099)	pH Units	N/A	MCERTS	6.4	7.5	7.4
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO_4	%	0.005	MCERTS	0.035	0.065	0.148
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	88	35	310
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	44.2	17.4	155
Organic Matter (automated)	%	0.1	MCERTS	0.7	3.7	4.5
Total Phenols						
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Speciated PAHs						
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.2	23
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	9.3
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	3.2
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	13
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	0.19	150
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	9.5
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	0.16	150
Pyrene	mg/kg	0.05	MCERTS	< 0.05	0.16	120
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.11	40
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.15	57
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.26	51
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05	0.08	31
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.25	45
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	0.16	21
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	5.2
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	0.21	23
Total PAH						
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80	1.92	762

Analytical Report Number: 25-060282
Project / Site name: Hinchliffe Mill

Lab Sample Number				742114	742115	742116
Sample Reference				RGS01	RGS04	RGS05
Sample Number				None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A
Depth (m)				0.20	1.50	0.80
Date Sampled				05/11/2025	05/11/2025	05/11/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status			
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.5	81	36
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.9	0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	26	55
Copper (aqua regia extractable)	mg/kg	1	MCERTS	15	70	61
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12	110	110
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.4	0.8
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	49	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	1.9
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	22	54	58
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	45	140	80
Petroleum Hydrocarbons						
TPHCWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	MCERTS	< 1.0	< 1.0	1.8
TPHCWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	MCERTS	< 2.0	< 2.0	3.7
TPHCWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	MCERTS	< 8.0	< 8.0	74
TPHCWG - Aliphatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	< 10	79
TPHCWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	MCERTS	< 1.0	< 1.0	14
TPHCWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	MCERTS	< 2.0	< 2.0	58
TPHCWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	370
TPHCWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	MCERTS	< 10	< 10	560
TPHCWG - Aromatic >EC5 - EC35 $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	1000
VOCs						
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0

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

Analytical Report Number : 25-060282
Project / Site name: Hinchliffe Mill

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
742114	WS01-ES1	None Supplied	0.2	Brown loam and clay with gravel and stones
742115	WS04-ES2	None Supplied	1.5	Brown loam and clay with vegetation and stones
742116	WS05-ES3	None Supplied	0.8	Brown loam and clay with gravel

Analytical Report Number : 25-060282
Project / Site name: Hinchliffe Mill

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES	In-house method	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID with carbon banding aliphatic and aromatic	In-house method	L076B	D	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil (Summed Bands)	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic (Summed Bands).	Calculation	L076B/L088-PL	D/W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total petroleum hydrocarbons with carbon banding by HS-GC/MS in soil	Determination of total petroleum hydrocarbons in soil by HS-GC/MS with carbon banding aliphatic and aromatic	In-house method	L088-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS

Analytical Report Number : 25-060282
Project / Site name: Hinchliffe Mill

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

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

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

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

Environmental
Geotechnical
Specialists

End of Report

GEOTECHNICAL
ENVIRONMENTAL

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Appendix 5

Contamination Summary

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet

Job Number	C5334/25/E/8207
Job Name	Hinchliffe Mill
Date	19.11.2025
Client	Holroyd Homes (Yorkshire) Limited

A = WS Atkins PLC, Atrisk Soil Screening Values.
A+ = Values updated June 2017.
A* = Atrisk's SSV is lower than i2's detectable limit for this compound.
B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.
C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter.
D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.

KEY
- Exceeds SSV
- Exceeds 2017, Below 2015
- Below limit of detection (LOD)

Determinand	Units	Ref	LOD	Residential With Plant Uptake 6%		Sample Location	RGS01	RGS04	RGS05							
				Atrisk 2015 (No Free Product	Atrisk 2017	Depth Top	0.20	1.50	0.80							
						Depth Base										
Cadmium	mg/kg	C	0.2		22.1		< 0.2	0.90	0.20							
Chromium (Hexavalent)	mg/kg	B/C	1.8	20.5	3.62		< 1.8	< 1.8	< 1.8							
Copper	mg/kg	A+	1.0		4790		15.00	70.00	61.00							
Mercury	mg/kg	A/D	0.3		15.8		< 0.3	0.40	0.80							
Nickel	mg/kg	A+	1.0		136		19.00	49.00	27.00							
Lead	mg/kg	C	1.0		200		12.00	110.00	110.00							
Zinc	mg/kg	A+	1.0		20300		45.00	140.00	80.00							
Vanadium	mg/kg	A+	1.0		138		22.00	54.00	58.00							
Arsenic	mg/kg	C	1.0		37		3.50	81.00	36.00							
Selenium	mg/kg	A	1.0		375		< 1.0	< 1.0	1.90							
Cyanide (Free)	mg/kg	A	1.0		34		< 1.0	< 1.0	< 1.0							
Total Phenols	mg/kg	A	1.0		1200		< 1.0	< 1.0	< 1.0							
Naphthalene	mg/kg	A+	0.05	0	12.2		< 0.05	0.20	23.00							
Acenaphthylene	mg/kg		0.05				< 0.05	< 0.05	9.30							
Acenaphthene	mg/kg	A+	0.05	0	2760		< 0.05	< 0.05	3.20							
Fluorene	mg/kg	A+	0.05	0	2610		< 0.05	< 0.05	13.00							
Phenanthrene	mg/kg		0.05				< 0.05	0.19	150.00							
Anthracene	mg/kg	A+	0.05	0	26200		< 0.05	< 0.05	9.50							
Fluoranthene	mg/kg	A+	0.05		2980		< 0.05	0.16	150.00							
Pyrene	mg/kg	A+	0.05		2120		< 0.05	0.16	120.00							
Benzo[a]anthracene	mg/kg	A	0.05	0	8.54		< 0.05	0.11	40.00							
Chrysene	mg/kg	A	0.05	927	2.64		< 0.05	0.15	57.00							
Benzo[b]fluoranthene	mg/kg	A	0.05	9.86	7.29		< 0.05	0.26	51.00							
Benzo[k]fluoranthene	mg/kg	A	0.05	100	4.12		< 0.05	0.08	31.00							
Benzo[a]pyrene	mg/kg	B/C	0.05	5	0.998		< 0.05	0.25	45.00							
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.05	9.75	0.368		< 0.05	0.16	21.00							
Dibenz(a,h)Anthracene	mg/kg	A	0.05	4.95	2.05		< 0.05	< 0.05	5.20							
Benzo[g,h,i]perylene	mg/kg	A	0.05	103	0.112		< 0.05	0.21	23.00							
Total Of 16 PAH's	mg/kg		0.8				< 0.80	1.92	762.00							
Aliphatic TPH >C5-C6	mg/kg	A+	0.01	0	369		< 0.010	< 0.010	< 0.010							
Aliphatic TPH >C6-C8	mg/kg	A+	0.01	1240	768		< 0.010	< 0.010	< 0.010							
Aliphatic TPH >C8-C10	mg/kg	A+	0.01	0	204		< 0.010	< 0.010	< 0.010							
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	1180	297		< 1.0	< 1.0	1.80							
Aliphatic TPH >C12-C16	mg/kg	A+	2.0	4130	125		< 2.0	< 2.0	3.70							
Aliphatic TPH >C16-C21	mg/kg	A+	8.0		210100		< 8.0	< 8.0	< 8.0							
Aliphatic TPH >C21-C35	mg/kg	A+	8.0		210100		< 8.0	< 8.0	74.00							
Aliphatic TPH >C35-C44	mg/kg		10.0													
Total Aliphatic Hydrocarbons	mg/kg		10.0													
Aromatic TPH >C5-C7	mg/kg	A+	0.01		0.871		< 0.010	< 0.010	< 0.010							
Aromatic TPH >C7-C8	mg/kg	A+	0.01	0	780		< 0.010	< 0.010	< 0.010							
Aromatic TPH >C8-C10	mg/kg	A+	0.02	0	232		< 0.020	< 0.020	< 0.020							

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet

Job Number	C5334/25/E/8207
Job Name	Hinchliffe Mill

A = WS Atkins PLC, Atrisk Soil Screening Values.
A+ = Values updated June 2017.
A* = Atrisk's SSV is lower than i2's detectable limit for this compound.
B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.
C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter.
D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.

KEY
- Exceeds SSV
- Exceeds 2017, Below 2015
- Below limit of detection (LOD)

Date	19.11.2025			**Sample Location**		RGS01	RGS04	RGS05								
Client	Holroyd Homes (Yorkshire) Limited			Depth Top		0.20	1.50	0.80								
				Depth Base												
Determinand	**Units**	**Ref**	**LOD**	**Residential With Plant Uptake 6%**												
Aromatic TPH >C10-C12	mg/kg	A+	1.0		468	< 1.0	< 1.0	14.00								
Aromatic TPH >C12-C16	mg/kg	A+	2.0	830	830	< 2.0	< 2.0	58.00								
Aromatic TPH >C16-C21	mg/kg	A+	10.0		1040	< 10	< 10	370.00								
Aromatic TPH >C21-C35	mg/kg	A+	10.0		1710	< 10	< 10	560.00								
Aromatic TPH >C35-C44	mg/kg		10.0													
Total Aromatic Hydrocarbons	mg/kg		10.0													
Total Petroleum Hydrocarbons	mg/kg		10.0													
pH			N/A			**6.40**	**7.50**	7.40								
Sulphate (2:1 Water Soluble) as SO4	g/l		0.00125			0.044	**0.017**	**0.155**								
ACM Type			N/A			Not detected	Not detected	Not detected								
Asbestos Identification	%					-	-	-								
ACM Detection Stage			N/A			-	-	-								
Moisture	%		0.01			8.30	13.00	13.00								
Soil Colour			N/A													
Other Material			N/A													
Soil Texture			N/A													
Sulphate (Total)	%		0.005			0.04	0.07	0.15								
Organic Matter	%		0.1			**0.70**	3.70	**4.50**								

Appendix 6

Fill Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
	Metals	**SOM: 1%**		**SOM: 6%**		
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.63	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
	Semi and Non Metals					
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
	Poly Aromatic Hydrocarbons	Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52			A
2	Chrysene	0.44	585			A
2	Benzo(b)fluoranthene	1.22	7.72			A
2	Benzo(k)fluoranthene	0.686	84.4			A
2	Benzo(a)pyrene	1.51	4.95	2.05	4.95	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838			A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31			A
2	Benzo(g,h,i)perylene	0.0187	96.2			A
	Petroleum Hydrocarbons					
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
Others						
Asbestos Not Detected						
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Catergory 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						