

**Environmental
Geotechnical
Specialists**



PHASE 2 GEO-ENVIRONMENTAL
REPORT

job number J4491/18/E/GE	date 29/05/2020
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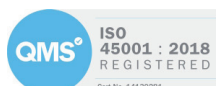
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GEO-TECHNICAL
ENVIRONMENTAL



Contents

		Page
1.	Introduction	2
2.	Limitations	2
3.	Desk Study	2
4.	Fieldworks	2
4.1	Windowless Sample Boreholes	3
4.2	Standard Penetration Tests	3
4.3	Dynamic Probes	3
5.	Geology	4
6.	Strata Conditions	4
6.1	General Strata	5
6.2	Groundwater	5
7.	Insitu Testing	5
7.1	Standard Penetration Tests	5
7.2	Dynamic Penetration Tests	6
8.	Laboratory Testing - Geotechnical	6
8.1	Geotechnical Properties	7
9.	Laboratory Testing - Environmental	7
10.	Discussion of Ground Conditions - Geotechnical	7
10.1	Geotechnical Considerations	7
10.2	Strip or Pad Footings	8
10.3	Piled Foundation Solution	9
10.4	General Comments for Excavations	10
10.5	Ground Floors	10
10.6	Effect of Sulphates	10
11.	Discussion of Ground Conditions - Environmental	11
11.1	Discussion of Test Results	11
11.1.1	Soil Samples	11
11.2	Site Specific Risk Assessment	11
11.2.1	Approach	11
11.2.2	Conceptual Ground Model and Risk Assessment	12
11.3	Development Requirements	15
11.3.1	General Approach to Construction	15
11.4	Fill Materials	15



11.5	Verification Report	17
12.	Recommendations for Further Work	18
13.	References	18

Appendices

1.	Site Plan
2.	Borehole Records
3.	Dynamic Probing Records
4.	Laboratory Testing
5.	Fill Screening Values



Report on a Phase 2 Geo-environmental Investigation

Location: 79 Hall Ing Lane
Honley, HD9 6QW.

For: Mr. Ian Goulding

Consultants: ONE17 Design

Report No. J4491/18/E/GE

Report No. May 2020

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

Dr. Mike Cook BSc PhD
Environmental Engineer

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Geo-environmental Engineer

Report Summary¹

Item	Comments	Section
Development	Demolition of the existing property and the construction of a large new residential dwelling with a garage, gardens and a driveway.	1.
Geology	Superficial geology – None. Solid geology – Pennine Lower Coal Measures Formation.	5.
Strata Conditions	Localised and variable thickness of made ground and reworked materials overlying the weathered fraction of the Pennine Lower Coal Measures Formation.	6.
Groundwater	One groundwater strike was observed at 5.1m within WS2.	6.2
Foundation Design	Shallow foundation solution.	10.1
Effect of Sulphates	DC-1 concrete.	10.5
Contamination	No contamination observed.	11.

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 land at 79 Hall Ing Lane, Honley, HD9 6QW is to be developed by the demolition of the existing property and the construction of a large new residential dwelling with a garage, gardens and a driveway. 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

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number J4491/18/E/EDS in February 2020. This report has been used extensively during the current intrusive investigation. In addition, it should be appreciated that a desk based Coal Mining Risk Assessment (presented as report number J4491/18/E/CRA in December 2018) and a Rotary Probing Investigation (results presented as report number J4491/18/E/C in May 2019) have been previously undertaken by RGS at the site.

4. Fieldworks

The fieldworks were undertaken on the 25th April 2020 and included the following:

- Three windowless sample boreholes.
- Standard penetration tests within one borehole.
- Three dynamic probes.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.



4.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and generally reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm 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 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 windowless sample borehole WS02. 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. It may be appreciated that the approximate cohesion of clay soils may be obtained by multiplying the equivalent SPT value by approximately 4.5 (after Stroud, 1975).

4.3 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 3.



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

BGS MAPPING DATA			
Strata Type	Strata Name ²	Previous Name ⁴	Description ³
Made Ground/Fill	N/A	N/A	Not indicated on site although previous construction may have resulted in the presence of made ground.
Superficial Geology	N/A	N/A	Not indicated to underlie the site.
Solid Geology	Pennine Lower Coal Measures Formation	-	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with mudstones containing marine fossils in the lower part, and more numerous and thicker coal seams in the upper part.

In addition it should be appreciated that the site slopes generally downhill from southwest to northeast.

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	Groundwater Strikes m below ground level
0.1 – 0.2	TOPSOIL	WS01, WS02, WS03	None.
0.7 – 3.5	Brown and dark brown gravelly silty CLAY (Reworked Materials).	WS02, WS03	None.
1.7 – 2.2	Brown and brownish grey, gravelly, silty CLAY	WS01, WS03	None.
2.0 – 2.3	Brown and orangish brown silty CLAY	WS01, WS03	None.
+3.9 – +5.2	Dark grey and black GRAVEL of mudstone. With occasional clay lenses (Very weathered rock)	WS01, WS02, WS03	5.1m (WS02)

s 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

2 Sources: British Geological Survey (NERC) Map Sheets 86; Glossop; Solid and Drift Edition, and Geology of Britain Viewer [online resource from www.bgs.ac.uk]

3 Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [online resource from www.bgs.ac.uk]



6.1 General Strata

In general, the windowless sample records indicate that beneath a 0.1m to 0.2m capping of granular made ground, reworked gravelly silty clays were revealed to depths of between 0.7m and 3.5m below ground level (bgl) within WS2 and WS3. Given the topography of the phase 1 desk study and the topography of the local area, it is considered that these soils could represent deposits that have been subject to movement (i.e. landslip)

Beneath the reworked materials at WS3 as well as below the topsoil at WS1, predominantly firm gravelly silty clays and silty clays were then revealed to depths of between 2.0m and 2.3m bgl. Underneath which, mudstone gravel with clay lenses was revealed to the termination depths of the borehole positions. It is anticipated that these strata represent the weathered fraction of the Pennine Lower Coal Measures Formation that is indicated to underlie the site.

6.2 Groundwater

One groundwater strike was observed at 5.1m within WS2 during the site investigation, it is anticipated that this may represent the groundwater table. 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 Standard Penetration Tests

The standard penetration tests carried out in WS02 are summarised in the following table:

Table 3: Summary of Standard Penetration Tests

Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
Gravelly silty CLAY (Reworked Materials).	1.0 to 3.5	–	10 – 16	SPT's indicate a firm in-situ condition
Gravel of MUDSTONE with clay lenses	4.0 to 5.25	35 – 50	–	SPT's indicate granular material is in a dense in-situ condition



7.2 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to the windowless sample borehole positions. A summary of the results is presented below:

Table 4: Summary of Dynamic Penetration Tests

Position	Blows/100mm			Refusal type (Effective/ Abrupt) ⁴	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP1	1.1	3.6	4.1	Abrupt	Initial low results to 1.1m, followed by results of between 2 and 11 to 3.6m. Followed by gradual increase in blow count until refusal at 4.1m.
DP2	1.2	5.1	5.6	Abrupt	Initial low results to 1.1m, followed by results of typically between 2 and 9 to 5.1m. Followed by gradual increase in blow count until refusal at 5.6m.
DP3	2.1	2.9	3.6	Abrupt	Initial low results to 2.1m. Followed by gradual increase in blow count until refusal at 3.6m.

8. Laboratory Testing - Geotechnical

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

- | | |
|-----------------------------------|------------------------------------|
| ▪ Moisture content determinations | BS 1377: 1990: Pt2: 3.2 |
| ▪ Index properties (1 point) | BS 1377: 1990: Pt2: 4.3, 5.3 & 5.4 |
| ▪ Linear shrinkage | BS 1377: 1990: Pt2: 6.3 |
| ▪ Soluble sulphate content | BS 1377: 1990: Pt3: 5 |
| ▪ pH value | BS 1377: 1990: Pt3: 9 |
| ▪ One-dimensional consolidation | BS 1377: 1990: Pt5: 3 |

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

Table 5: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Moisture content determinations	4	13 to 65%		Sample WS01 at 1.2m was noted to be exceptionally gravelly.
Index properties (1 Point)	3	LL	32 to 73%	Clay of variable plasticity. Consistency index -2.5 to 1.5 NHBC Class – Low to Medium
		PL	19 to 38%	
		PI	13 to 35%	
		LS	08 to 15%	
Soluble sulphate & pH	3	SO ₄ pH	28 to 160 mg/l 6.0 to 7.9	
One-dimensional consolidation	1	c _v	6.4 m ² /yr	Rapid rate of settlement. High compressibility.
		m _v	0.37 m ² /MN	

⁴ Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.



8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 6: Summary of Geotechnical Properties

Property	Range of values		Comments
Volume change potential (NHBC)	Low to Medium		High silt content observed within some of the samples tested.
Shear strength parameters (at foundation level)	c_u	45kN/m ²	Assumed parameter on the basis of dynamic probe results, SPT testing and observations made during logging.
Concrete classification	DC1		Natural ground locations (Static water)

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 SO₄²⁻.
- Asbestos identification.

This testing was undertaken by Chemtest 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 large new residential dwelling with a garage, gardens and a driveway. 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.

10.1 Geotechnical Considerations

As stated above, the development site generally slopes in a north easterly direction. In light of the sloping nature of the site, current plans are for the house to be constructed on a series of terraces, which will likely comprise some levelling and excavation in order to ensure each section at the house is at an amenable level for construction.

From a geotechnical perspective, the ground conditions beneath the site do exhibit some lateral and vertical variability. This is anticipated to be attributed to the topography of the slope itself, along with differential weathering of the upper weathered fraction of the rock, and the potential for soils associated with past movements to be present. In addition, it is evident that the depth to rockhead level across the site falls in accordance with the topography, becoming progressively deeper towards the north east.



It cannot be recommended that foundations be constructed directly within the reworked materials or weak near surface soils at the site. These soils in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading.

Due to slight variability of ground conditions and rockhead level encountered on site, it is recommended that a pragmatic approach be taken to the foundations for the proposed development. In broad terms, it is considered that the foundation solutions could include the provision of strip and spread footings in areas where cohesive residual soils are present in a 'firm' in-situ condition, or rockhead (recovered as gravel) is encountered at relatively shallow depth.

Typically, it cannot be recommended that footings be founded on a mixture of cohesive soil and rock due to the potential for differential settlements to occur across the structure. In this case, due to the topography of the site, the fact that the building will be constructed on a series of levels, and the variable nature of the soils beneath the site, it is likely to be un-economical to ensure that footings for the entire structure are founded wholly on residual rockhead (recovered as gravels). For instance, this would mean that the north eastern terrace (near WS01), would require footings to extend through firm clays, to a depth of 2.3m bgl.

As such, it is considered pragmatic to ensure that the footings for each individual terrace are founded on materials of similar competencies. Should the ground conditions stipulate that variable materials would be encountered beneath an individual terrace, it will be necessary to locally deepen footings to ensure that all footings are on rockhead of similar competencies. This will likely be necessary for the central quadrant of the build (surrounding WS02), in which weak, potentially reworked cohesive soils were encountered. It is therefore recommended that careful inspection takes place during the excavation of footings to ensure that foundations are indeed placed wholly within rockhead, or soils of a similar competency.

Should this solution be adopted, some differential settlement between the terraces would still be anticipated. In this event, suitable construction joints should be employed in the 'link areas' between terraces.

In addition, moisture content tests undertaken were comparatively low, which may suggest that some desiccations could be occurring at shallow depths; soils were also noted to have medium volume change potential, in the most onerous case. The potential for desiccations may be considered likely due to the presence of mature trees and shrubs across the site and within the vicinity of the proposed development. As such, it will be necessary to ensure all foundations are designed in accordance with the Chapter 4.2 of the NHBC standards⁵.

Alternatively, consideration could be directed towards utilizing a mini-piled foundation solution, which would have the advantage of limiting differential settlement across the structure. This is discussed in more detail in section 10.3

10.2 Strip or Pad Footings

The results of this investigation indicate that cohesive fraction of the weathered Pennine Lower Coal Measures comprising firm becoming stiff clay, will be present in a firm insitu condition at depths ration for traditional footings within the north-eastern quadrant of the build. It is considered that this horizon will provide a suitable bearing stratum, provided that the foundations are placed within soil generally described as being present in a firm insitu condition. It is considered that strip or spread

⁵ NHBC Standards, Chapter 4.2, *Building near trees*



foundations constructed within this material, at a minimum depth of say 1.4m, could be designed assuming an allowable increase in stress given in the following table:

Table 7: Allowable increase in stress

Foundation type		Strip Footings			Spread Footings		
Foundation Breadth	B (m)	0.6	0.9	1.2	0.5	1.0	2.0
Foundation Depth	D (m)		1.4			1.4	
Allowable Increase in Stress	(kN/m ²)	105	100	95	130	120	110

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure, with cohesion of 45kN/m² at the foundation depths. Settlements at the above loading intensities should remain within tolerable limits for the type of structure proposed provided that the underlying soils are carefully inspected immediately final trimming has taken place.

In areas of the site in which foundations are required to be deepened to ensure that the terraces are founded on material of similar competencies, the results of this investigation indicate that extremely weak mudstone will be revealed at depths of around 2.0m to 3.5m. This material would possess a significant bearing capacity, probably being in excess of 250kN/m². Therefore, at a typical foundation load for a house the factor of safety against general shear failure will be high, probably exceeding 10. In addition, it is considered that nominal settlements will occur under the action of the proposed increase in load.

10.3 Piled Foundation Soliton

In light of the potential difficulties surrounding the construction of traditional footings on similar soil types, and volume change potential, consideration could be directed to utilising a mini-piled foundation solution to transfer the loads of the development to competent soils at depths. This soliton would also have the advantage of limiting differential settlement across the structure.

Given the shallow rockhead level within some areas of the site a piling contractor may stipulate that drilled piles are utilised. These methods employ down the hole hammers which have the capacity to bore through obstructions and into the underlying hard stratum to form a rock socket. Through the overburden, the drill bit is attached to casing which prevents the pile borehole collapsing. When rock is encountered the drilling can continue using open hole drilling techniques. On completion of the boring operations concrete is then pumped into the hole and a steel reinforcing cage can be installed. The steel casing can be removed or left in place.

Irrespective of the method of pile installation a working platform must be provided, the thickness of which will be determined by the type of piling rig employed and the strength of the near surface soils. The design of the platform should be undertaken in accordance with the procedures and specification given in the BRE publication entitled *Working platforms for tracked plant*.

Further investigation work may be requested by piling contractors in order to establish the precise nature of the underlying rockhead. Such work would need to employ the use of machine capable of rotary drilling techniques, although, windowless sampling, cable percussion or rotary open-hole drilling methods could be utilised through the overburden. The depth of such investigations may be required to extend below estimated pile toe levels by 3 times the base width of the largest individual pile, the largest pile group width or 5m, whichever the greater. However, this could be reduced to 2m below the estimated pile toe level if distinct competent strata are revealed.



10.4 General Comments for Excavations

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.

10.5 Ground-floors

In light of the weak near surface soils, 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.

Further to the above, due to the volume change potential at the site, should the floor be placed within the zone of influence of any existing, or proposed, trees and shrubs, an allowance for soil volume change should be included. Further guidance is available in the NHBC standards, however, soil volume change can typically be catered for by providing a suitable void or utilize proprietary materials beneath the floor slab.

10.6 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 C2⁶, 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-1 requirements. Assuming static 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 D1⁷, 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.

⁶ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*

⁷ 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. 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 a large new residential dwelling with a garage, gardens and a driveway. Consequently, the site may be classified as residential with plant uptake.

11.1.1 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 2.1% and 6.7%. On this basis, it is considered that the screening values associated with 1% 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 website⁸ 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 4. These results indicate the following:

Table 8: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
WS01	0.3 – 0.45	None.
WS02	0.1 – 0.2	None.
WS02	0.7 – 0.8	None.
WS03	0.1 – 0.3	None.

Concentrations of chromium(VI), cyanide, phenols (total), some PAHs and total petroleum hydrocarbons (aliphatic C5 to C44; aromatic C5 to C44) 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.

On the basis of the above information, the results of the investigation have concluded that the site is generally uncontaminated with regards to the intended residential with plant uptake end use.

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

⁸ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>



Environment Agency⁹ advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.¹⁰ 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.'¹¹

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 8. Sources of contamination include the following:

On-site – None.

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.

⁹ 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'.

¹⁰ 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.

¹¹ 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 [Contamination: None]**

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	No – no significant contamination found to be present at the site.	Low	
	End User		Low	
	Neighbours		Low	
Inhalation of Dust/Vapours	Operative	No – no significant contamination found to be present at the site.	Low	
	End User		Low	
	Neighbours		Low	
Ingestion of fruit/vegetables and/or waters	Operative	No – no significant contamination found to be present at the site.	Low	
	End User		Low	
	Neighbours		Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	No – the Phase 1 Desk Study did not identify any credible off-site sources based upon proximity and topography. Furthermore, no significant made ground considered capable of producing high levels of gas was encountered during the intrusive investigation.	Low	
	End User		Low	
	Neighbours		Low	



Spillage/loss/run off direct to receiving water	Controlled Waters		Low	
Migration via permeable unsaturated strata	Controlled Waters	No – no significant contamination found to be present at the site.	Low	
Run off via drainage/sewers etc	Controlled Waters		Low	
Direct contact with contaminated soils			Low	
Uptake via root system	Plants	No – no significant contamination found to be present on site.	Low	
Direct contact with contaminated soils			Low (plastic services)	Please see section 11.3.3 for information on good building practice.
Direct contact with contaminated groundwater	Building Materials	Yes – however, no significant contamination has been revealed on site. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Low (buried concrete)	
Exposure to Radon	Operative End User	No – between 1 and 3% of properties are above the Action Level.	Low	The publication BR211 states that no protection measures are necessary.
Mining Instability	End User	Yes – workings were identified below the site by previous intrusive investigations, however these were present at a depth in which they are not anticipated to affect the stability of the development	Low	No further action required. See report ref: J4491/18/E/C, dated May 2019.



11.3 Development Requirements

In view of the site specific risk assessment it is considered that it will not be necessary to undertake any specific remediation at this site. It should be appreciated, however, that careful inspection of the subgrade should be made during the groundworks. Should areas of contamination be detected then further testing may become necessary.

11.3.1 General Approach to Construction

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the fundamental principles of identifying potentially contaminated soils and the hazards of working with such soils not identified by the ground investigation.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- Where vehicles are transferring soil to landfill site they should be covered to prevent any potential contamination of the surrounding area by dust.
- Any stockpiles of contaminated soil that maybe subsequently be found on site should be sheeted over to prevent excessive amounts of airborne dust and may require Waste Assessment Criteria (WAC) testing before transfer to an appropriate licensed landfill site.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer any potential contamination to surrounding areas.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.

Construction

During the construction phase of the development the following items are required;

- During the construction phase of the project, it is recommended that beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.



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 BS3883 (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 YALPAG¹² 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 (to confirm the inert nature of the material)	Standard metals/metalloids (As, Cd, Cr, Cr(VI), Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m ³	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Greenfield/ Manufactured Soils	The greater of a minimum of 3 or 1 per 250m ³	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Brownfield/ Screened Soils	The greater of a minimum of 6 or 1 per 100m ³	Standard metals/metalloids as above plus PAH (16 USEPA), TPH (CWG banded) and Asbestos Any additional analysis dependant on the history of the donor site.

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

¹² YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V3.3 Appendix 1a, October 2016.

**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 5 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 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

Should fill materials be imported, it will be necessary to produce a verification report for submission to any statutory authorities.

It will be necessary for this report to include the following:

- Characterisation of the suitability of the imported clean material including the derivation of the material, comments from a visual screen, the tests results of chemical screening, delivery tickets where appropriate and the conditions by which the clean material has been stored and handled on site.

The report detailed above should be produced by a suitably qualified engineer.



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.
- 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.
- Detailed design of the sub-structure.

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) (2020), BGS, Keyworth.
 - Geology of Britain Viewer:
(http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Lexicon of Named Rock Units:
(<http://www.bgs.ac.uk/lexicon/>)
- 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 22476-2: *Geotechnical investigation and testing – Field testing, Part 2: Dynamic Probing*, 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) BS5930: *Code of practice for site investigations*, B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, B.S.I., London.
- 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



Plan not to scale and investigation positions approximated from site operative's notes.

Title: **Proposed Borehole Plans (Proposed Access Route In Purple)**



**Rogers Geotechnical Services
Ltd**

Project Name: 79 Hall Ing Lane, Honley, HD9 6QR

Job No:

J4491/18/E/C

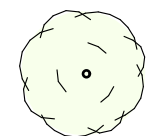
New Tree Schedule				
Type Ref	Quantity	Latin Name	Common Name	Scheduled Size
A	3	Malus tschonoskii	Crab Apple Tree	12-14cm girth, 3.5-4.5m ht
B	4	Carpinus betulus 'Fastigiata'	Heavy Standard Hornbeam	12-14cm Girth, Heavy Std 3.5-4.5m ht
C	2	Crataegus laevigata 'Paul Scarlet'	Double Crimson Flowering Hawthorn	12-14cm girth, 3.5-4.5m ht
D	2	Prunus serrula	Tibetan Flowering Cherry Tree	12-14cm girth, 3.5-4.5m ht

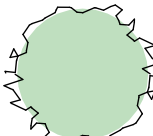
Notes

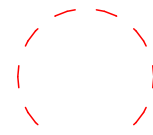
Do not scale from drawing, use figured dimensions only.
All dimensions must be checked and verified on site prior to commencement of work and architect to be notified of any discrepancies.
This drawing is intended to permit overall scheme proposals only and cannot be used for construction purposes without further information.

Rev	Drawn	Checked	Date

Key:

Existing trees to remain

Proposed Trees-
refer to Schedule

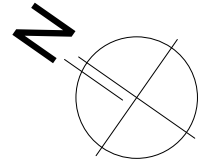
Trees to be removed
refer to tree survey

Surface Water Drainage

Foul Drainage



Proposed Site Plan 1:200



Job Title Replacement Dwelling, 79 Hall Ing Lane, Honley, Huddersfield	
Client Mr Ian Goulding & Ms Holly Guite	
Status Planning	Company AD
Drawing Proposed Site Plan	
Scale @ A1 1:200	
Date September 2019	Drawn MUN
Drawing No. 3273 (0-) 02	
Revision	

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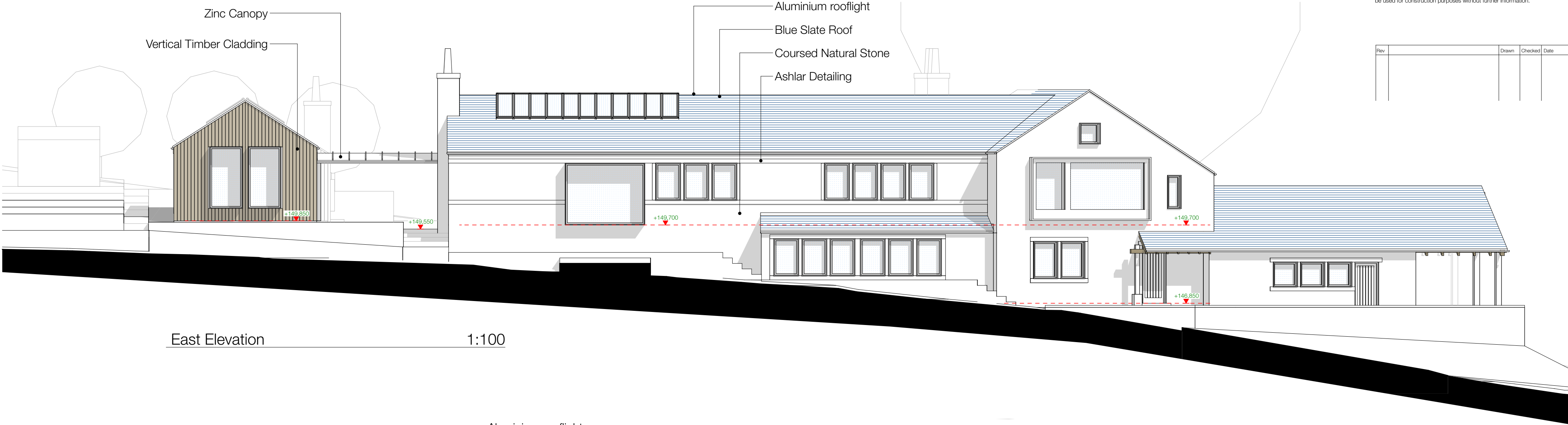
Notes

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.

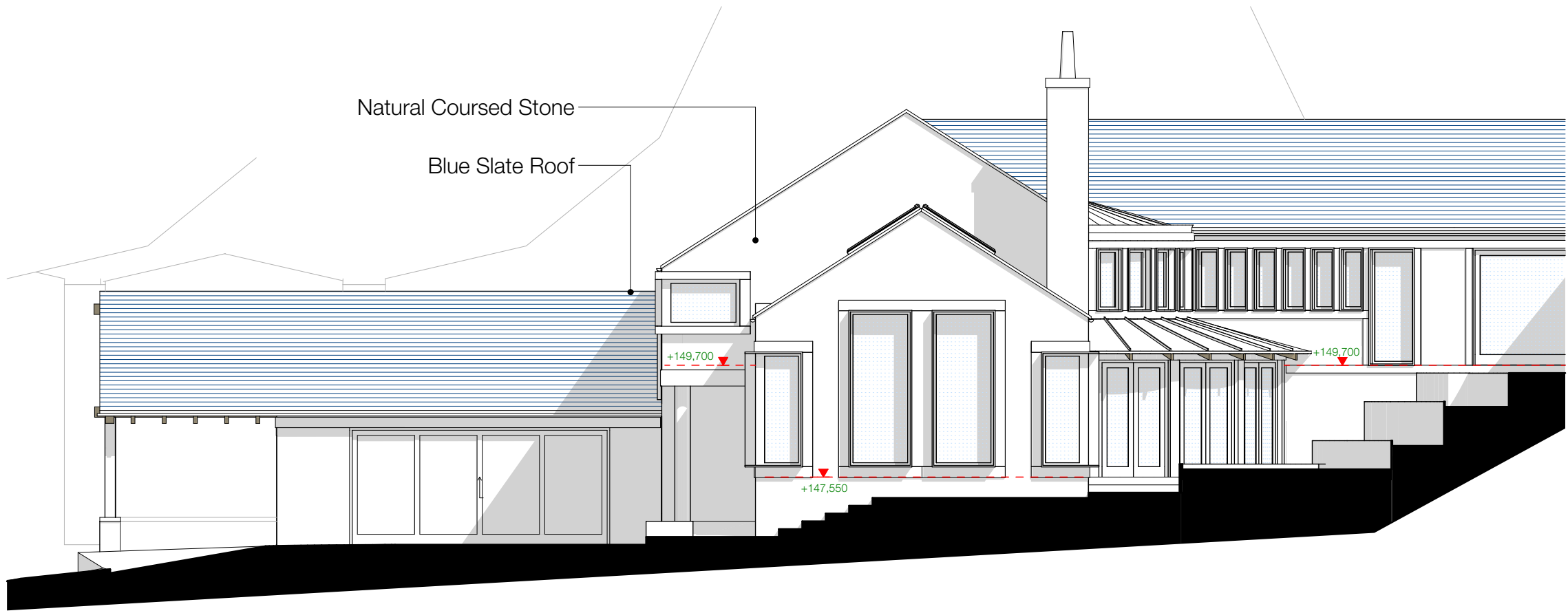
Rev	Drawn	Checked	Date



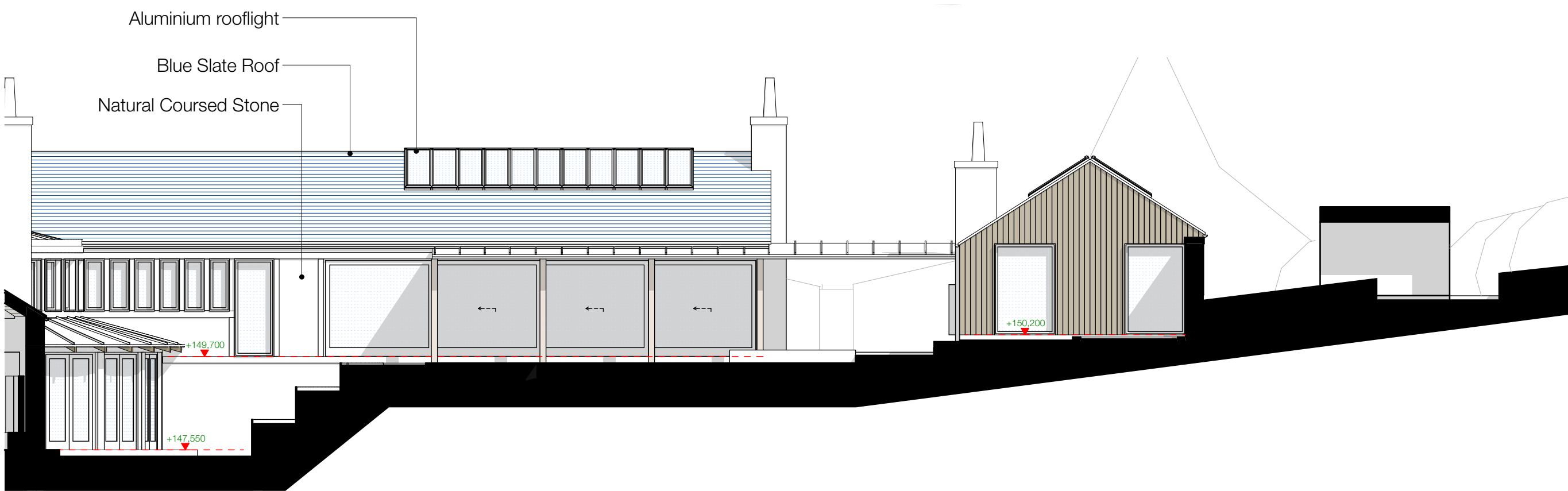
South Elevation 1:100



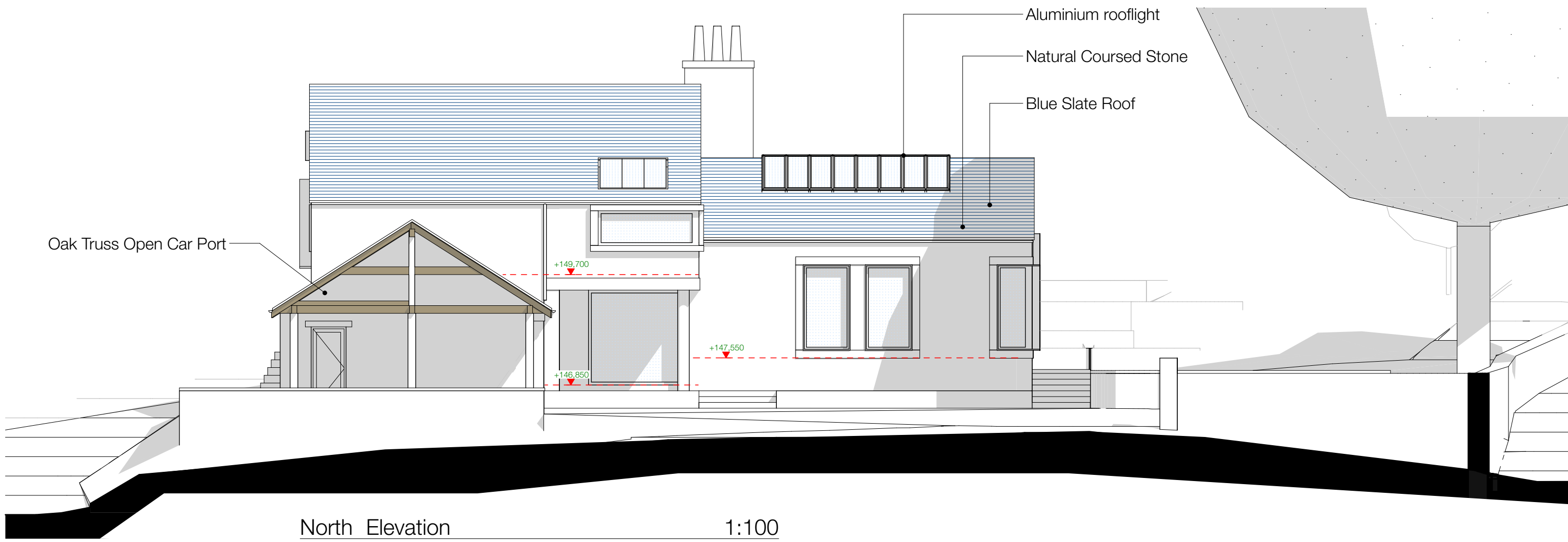
East Elevation 1:100



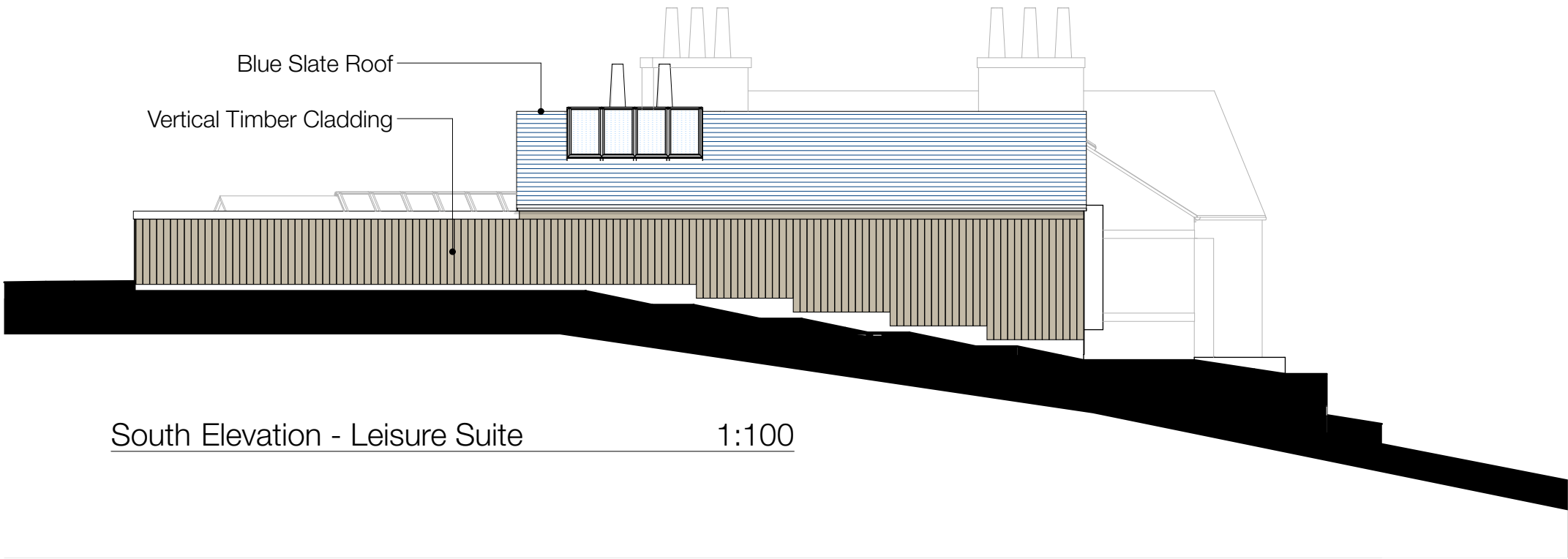
South West Elevation 1:100



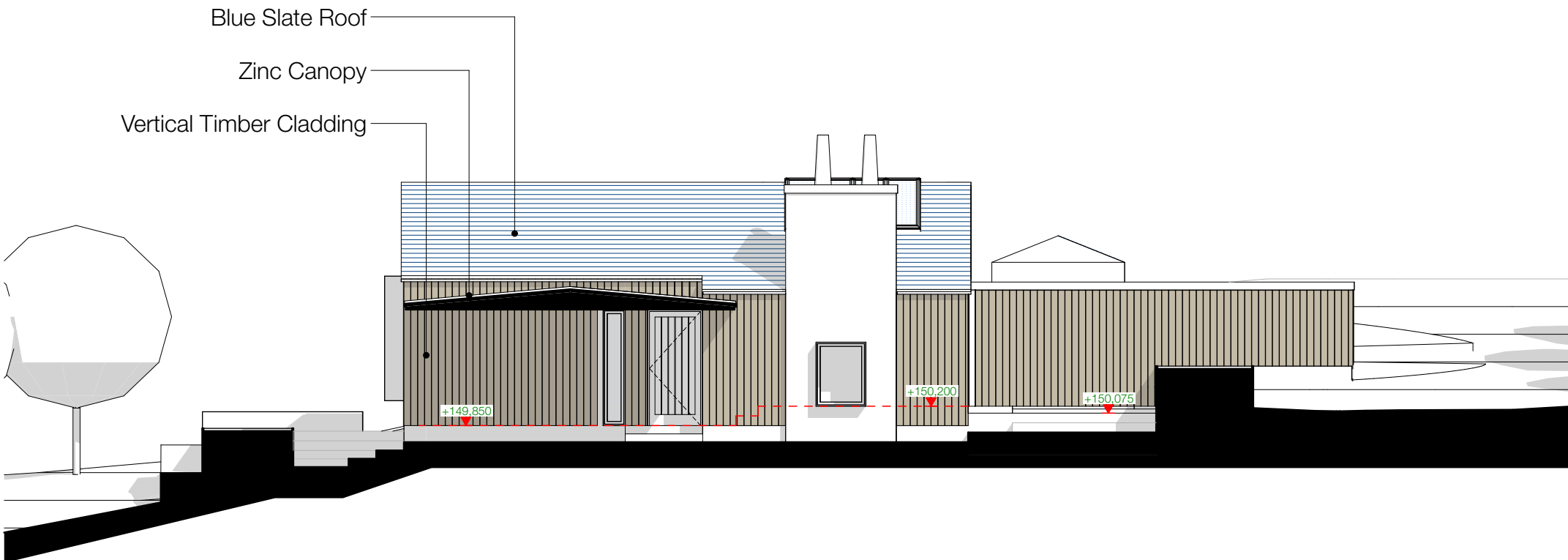
West Elevation 1:100



North Elevation 1:100



South Elevation - Leisure Suite 1:100



North Elevation - Leisure Suite 1:100

Job Title	Replacement Dwelling, 79 Hall Ing Lane, Honley, Huddersfield
Client	Mr Ian Goulding & Ms Holly Guite
Status	Planning
Company	AD
Drawing	Proposed Elevations
Scale @ A1	1:100
Date	September 2019
Drawn	MJN
Checked	
Drawing No.	3273 (0-) 05
Revision	

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Appendix 2

Borehole Records



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
WLS

Location: Honley, HD9 6QW

Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		1.20	D	90	100		0.15			TOPSOIL (Soft dark brown organic sandy silty CLAY with occasional gravel of sandstone and various lithologies)).	
				80	95					Firm brown and brownish grey gravelly silty CLAY with low sandstone cobble content. Gravel is sub-angular fine and medium fine- and medium-grained sandstone.	1
				70	90		2.20 2.30			Firm thinly laminated brown and orangish brown silty CLAY.	2
				60	100					Medium dense thinly laminated dark grey and black medium tabular GRAVEL of mudstone with occasional stiff gravelly CLAY lenses [Very weathered bedrock].	3
							3.90			3.4m: Becomes carbonaceous.	
										End of Borehole at 3.90m	4
											5
											6
											7
											8
											9
											10

Remarks





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
WLS

Location: Honley, HD9 6QW

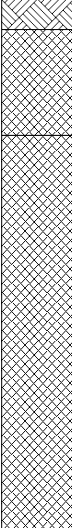
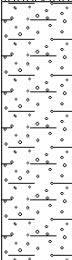
Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.80	D	90	100	N=16 (1,3/3,4,4,5)	0.20			TOPSOIL (Soft dark brown organic sandy silty CLAY with occasional gravel of sandstone and various lithologies)). Soft to firm brown slightly gravelly silty CLAY. Gravel is fine and medium sub-angular and angular mudstone (Probably re-worked). Firm brown and dark brown gravelly silty CLAY. Gravel is randomly orientated fine and medium sub-angular and angular mudstone and sandstone (Probably re-worked).	1
		1.00	SPT				0.90				
		1.20	D								
				80	100	N=15 (2,3/3,5,3,4)					2
		2.00	SPT								
				70	100	N=10 (3,2/2,2,3,3)					3
		3.00	SPT								
				60	100	N=35 (6,7/7,8,10,10)	3.50				4
		4.00	SPT								
				60	100	26 (14,21/26 for 75mm)					5
		5.00	SPT				5.23				
										End of Borehole at 5.23m	
											6
											7
											8
											9
											10

Remarks





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
WLS

Location: Honley, HD9 6QW

Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		1.30	D	90	100		0.10			TOPSOIL (Soft dark brown organic sandy CLAY/SILT with frequent wood fragments (bark)).	
							0.70			Soft to firm brown and dark brown slightly gravelly silty CLAY. Gravel is randomly orientated fine and medium sub-angular and angular coal mudstone and sandstone (Probably re-worked).	1
				80	95		1.70			Soft and soft to firm brownish grey mottled orangish brown slightly gravelly silty CLAY. Gravel is sub-angular fine and medium fine-grained micaceous sandstone.	
				70	100		2.00			Firm thinly laminated brown and orangish brown silty CLAY.	2
							2.90			Medium dense thinly laminated dark grey medium tabular GRAVEL of mudstone with occasional stiff gravelly CLAY lenses [Very weathered bedrock].	
										End of Borehole at 2.90m	3
											4
											5
											6
											7
											8
											9
											10

Remarks





Appendix 3

Dynamic Probing Records



Probe Log

Probe No.

DP1

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
DCP

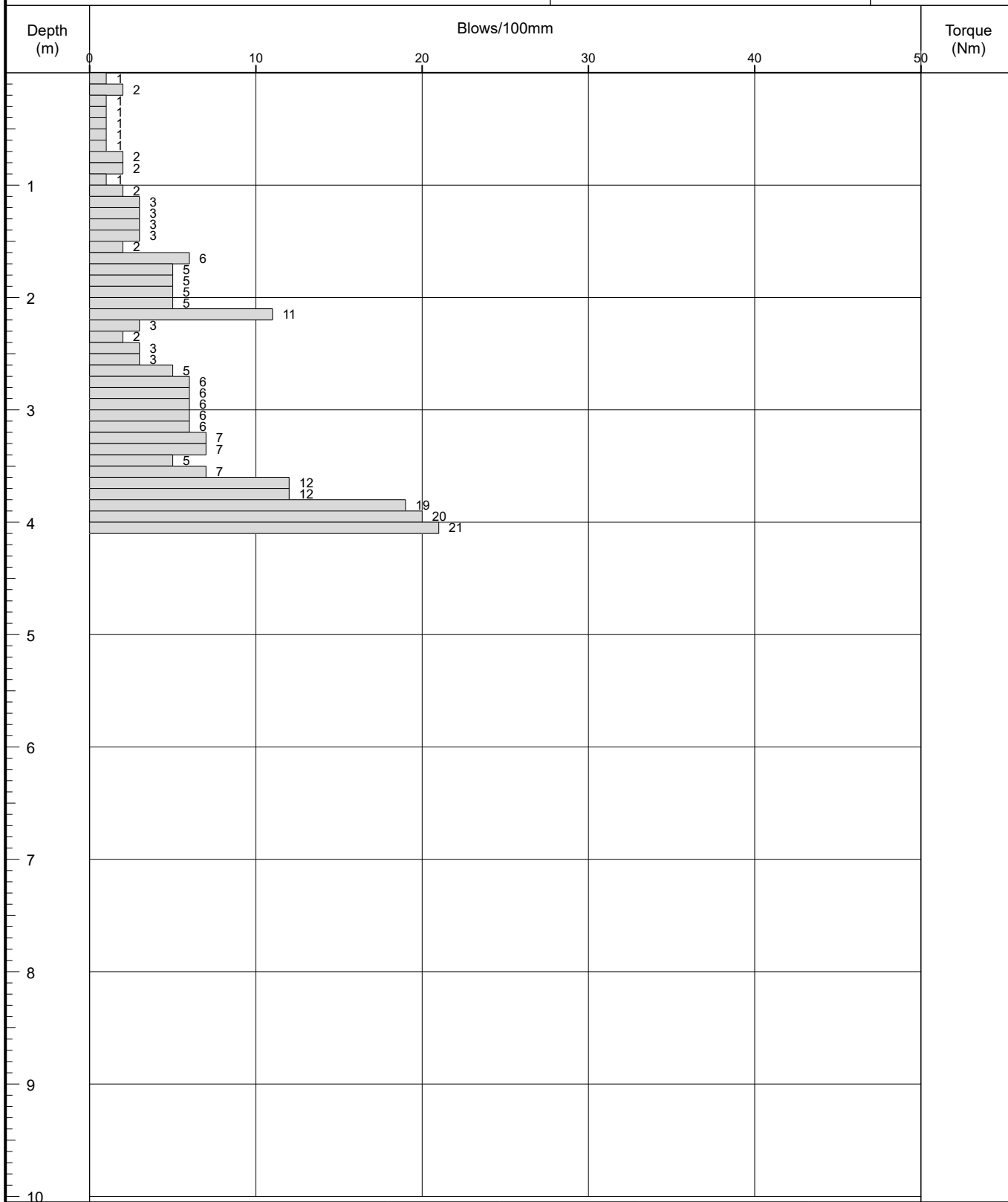
Location: Honley, HD9 6QW

Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
MC

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 4.1m

Probe Type DPSH-B





Probe Log

Probe No.

DP2

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
DCP

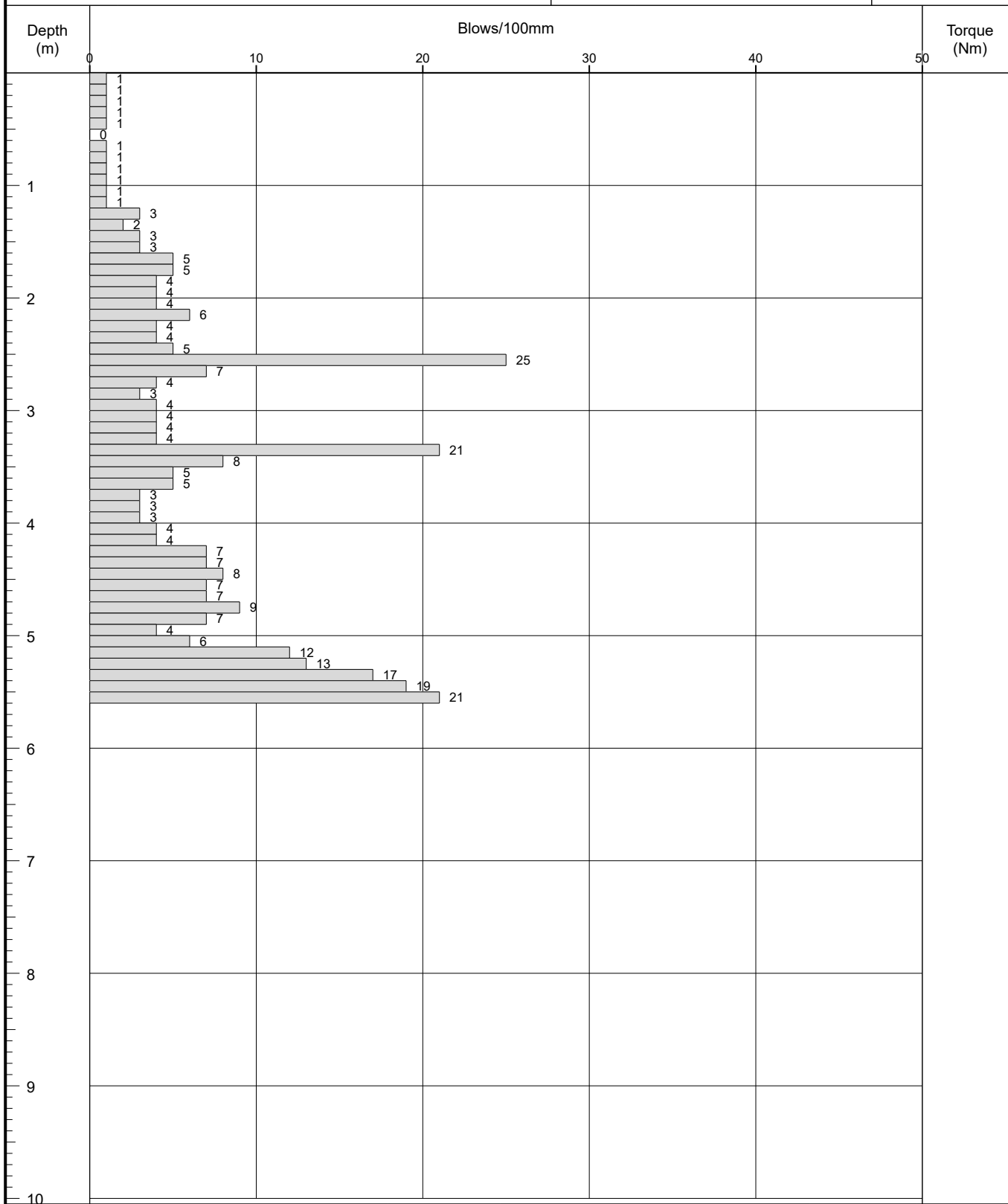
Location: Honley, HD9 6QW

Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
MC

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 5.6m

Probe Type DPSH-B





Probe Log

Probe No.

DP3

Sheet 1 of 1

Project Name: 17 Hall Ing Lane

Project No.
J4491/18/E

Co-ords:

Hole Type
DCP

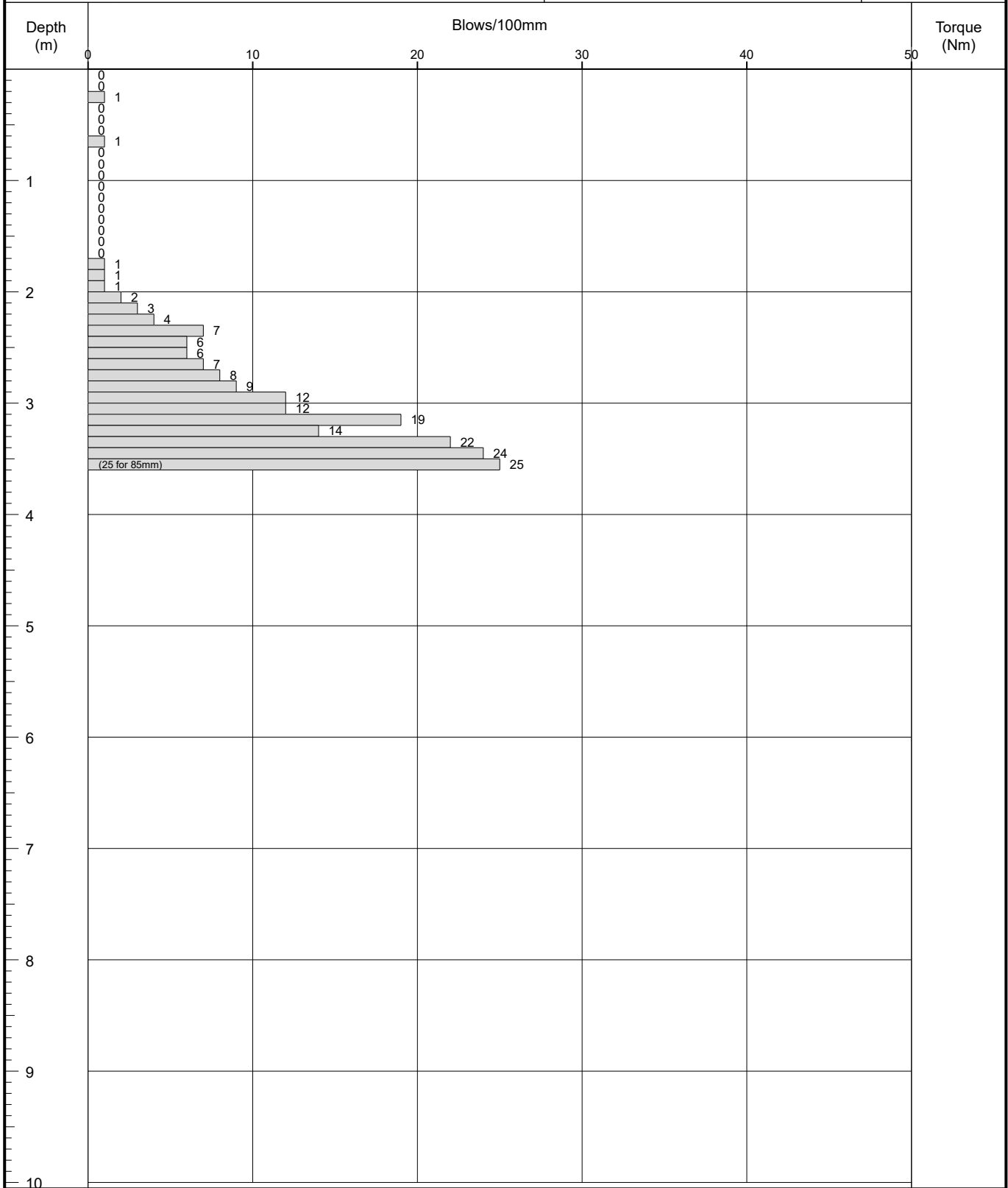
Location: Honley, HD9 6QW

Level:

Scale
1:50

Client: Mr Ian Goulding

Dates: 24/04/2020

Logged By
MC

Remarks:

Fall Height 750mm

Cone Base Diameter 50.5mm

Hammer Wt 63.5kg

Final Depth 3.6m

Probe Type DPSH-B





Appendix 4

Laboratory Testing

**Environmental
Geotechnical
Specialists**



LABORATORY REPORT

GEOTECHNICAL
ENVIRONMENTAL

job number C525/20/E/1026	client ref
site address 79 Hall Ing Lane Honley, Holmfirth, HD9 6QW	client address Mr Ian Goulding 4 St Davids Court, Scotgate Road, Honley, West Yorkshire, HD9 6RE
consultant	
date scheduled 29/04/2020	date issued 12/05/2020
issued by S P Rogers	job title Technical Director

Rogers Geotechnical Services Ltd Telephone 01484 607 977
Email jude.norcliffe@rogersgeotech.co.uk www.rogersgeotech.co.uk
 Offices 1 & 2, Barncliffe Business Park, Near Bank, Shelley,
 Huddersfield, West Yorkshire HD8 8LU.





8948

Environmental
Geotechnical
Specialists



Schedule of UKAS Accredited Laboratory Tests

		Accredited (A)	Unaccredited (U)
1. CLASSIFICATION OF SOIL		BS 1377-2:1990	
1.1 Moisture content determination			
i) Oven drying	Pt 2 : 3.2	A	
ii) Saturation m/c of chalk	Pt 2 : 3.3		U
1.2 Index Properties			
i) Liquid limit – cone penetrometer	Pt 2 : 4.3	A	
ii) Plastic limit	Pt 2 : 5.3	A	
iii) Shrinkage limit	Pt 2 : 6.3		U
iv) Linear shrinkage	Pt 2 : 6.5	A	
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		U
1.4 Density Tests			
i) Linear measurement	Pt 2 : 7.2	A	
ii) Immersion in water	Pt 2 : 7.3		U
iii) Water displacement	Pt 2 : 7.4		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	A	
ii) Wet Sieve	Pt 2 : 9.3	A	
iii) Sedimentation by pipette	Pt 2 : 9.4	A	
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

GEOTECHNICAL
ENVIRONMENTAL



GEOTECHNICAL LAB RESULTS

GEOTECHNICAL
ENVIRONMENTAL



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GEOTECHNICAL
ENVIRONMENTAL

[illegible]



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

Classification of Index Properties

C525/20/E/1026

Project Name: 79 Hall Ing Lane

B.S 1377: Part 2: 1990: 3.2, 4 and 5

Fig. 3
Sheet. 1

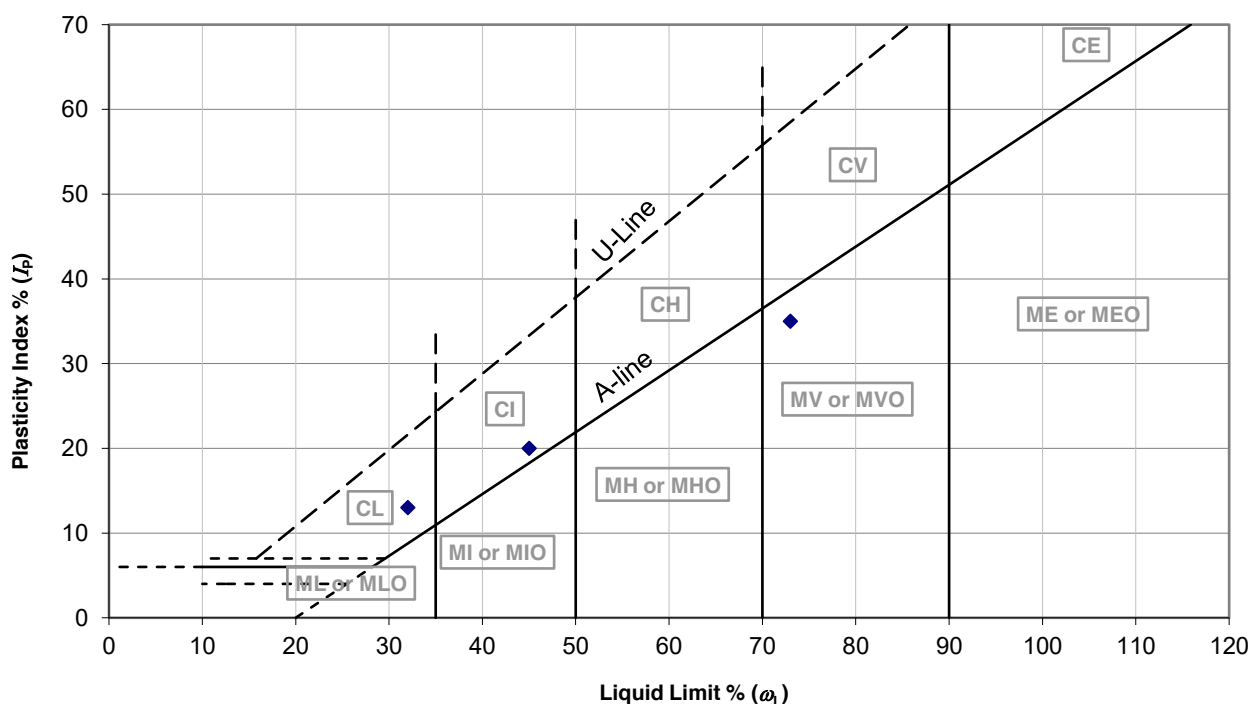
Location:

Input By: Steve

Client: Mr Ian Goulding

Check By: Harry

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class (%)
									(IL) (%)	(IC) (%)		
WS01	1.20	20	32	19	13	48	38	7	0.1	0.9	C L	*
WS02	1.20	13	45	25	20	28	18	14	-0.6	1.6	C I	LOW
WS03	1.30	65	73	38	35	0	65	35	0.8	0.2	M V	MEDIUM



DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT
--

Project location	<i>Honley</i>	Sample depth (m)	<i>1.20</i>
Project reference	<i>C525/20/E/1026</i>	Sample type	<i>Undisturbed</i>
Borehole number	<i>WS3</i>	Specimen orientation	<i>Vertical</i>
Sample number	<i>C2</i>	Specimen depth (m)	<i>1.20</i>
Sample description	<i>Very soft brown slightly silty CLAY</i>		
Preparation method	<i>Prepared from a sample tube in accordance with BS 1377:2016:Part 1:Clause 9.6</i>		
Particle density (Mg/m ³)	<i>2.65 (Assumed)</i>	Swelling pressure (kPa)	

INITIAL CONDITIONS	
Height (mm)	<i>20</i>
Diameter (mm)	<i>50.47</i>
Moisture content (trimmings) (%)	<i>65</i>
Bulk density (Mg/m ³)	<i>1.61</i>
Dry density (Mg/m ³)	<i>0.97</i>
Voids ratio	<i>1.731</i>
Degree of saturation (%)	<i>100</i>

Comments / variations from procedures:

Tested	<i>HJL</i>	Checked	<i>SPR</i>	Approved	<i>SPR</i>
Date	<i>01/05/2020</i>	Date	<i>05/05/2020</i>	Date	<i>05/05/2020</i>

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES Tested in accordance with BS 1377:1990:Part 5:Clause 3 TEST REPORT

Project location	<i>Honley</i>	Sample depth (m)	<i>1.20</i>
Project reference	<i>C525/20/E/1026</i>	Sample type	<i>Undisturbed</i>
Borehole number	<i>WS3</i>	Specimen orientation	<i>Vertical</i>
Sample number	<i>C2</i>		

Average laboratory temperature (°C)		18	Method of time fitting	<i>Log time</i>
Pressure stage	Coefficient of consolidation	Coefficient of volume compressibility	Coefficient of secondary compression	
(kPa)	c_v (m ² /year)	m_v (m ² /MN)	c_{sec} (-)	
<i>0 - 21</i>	<i>7.9</i>	<i>0.40</i>	-	
<i>21 - 42</i>	<i>7.6</i>	<i>0.53</i>	-	
<i>42 - 84</i>	<i>6.4</i>	<i>0.37</i>	-	
<i>84 - 168</i>	<i>5.9</i>	<i>0.25</i>	-	
<i>168 - 21</i>	-	-	-	

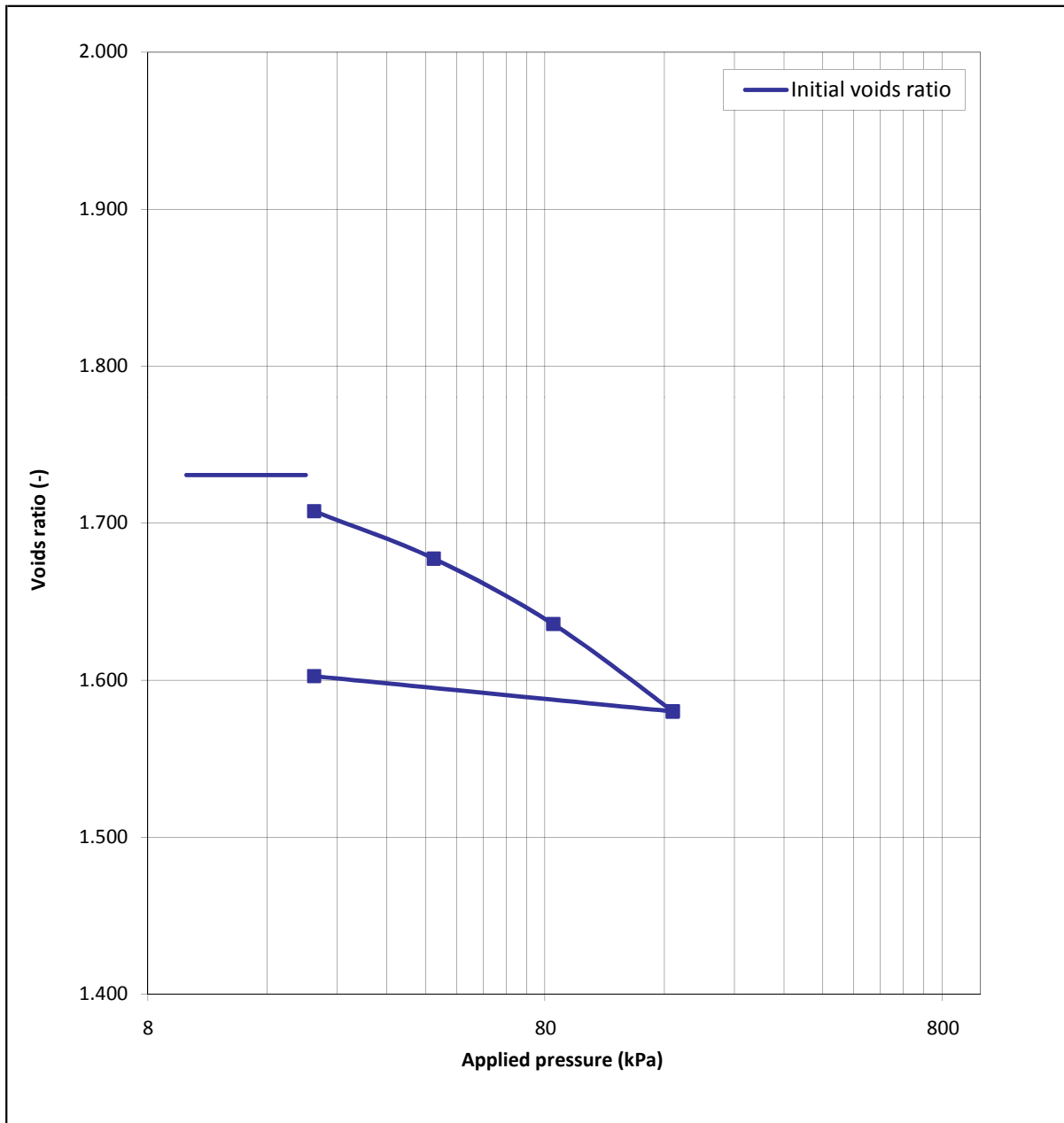
Tested	<i>HJL</i>	Checked	<i>SPR</i>	Approved	<i>SPR</i>
Date	<i>01/05/2020</i>	Date	<i>05/05/2020</i>	Date	<i>05/05/2020</i>

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in accordance with BS 1377:1990:Part 5:Clause 3

TEST REPORT

Project location	Honley	Sample depth (m)	1.20
Project reference	C525/20/E/1026	Sample type	Undisturbed
Borehole number	WS3	Specimen orientation	Vertical
Sample number	C2		



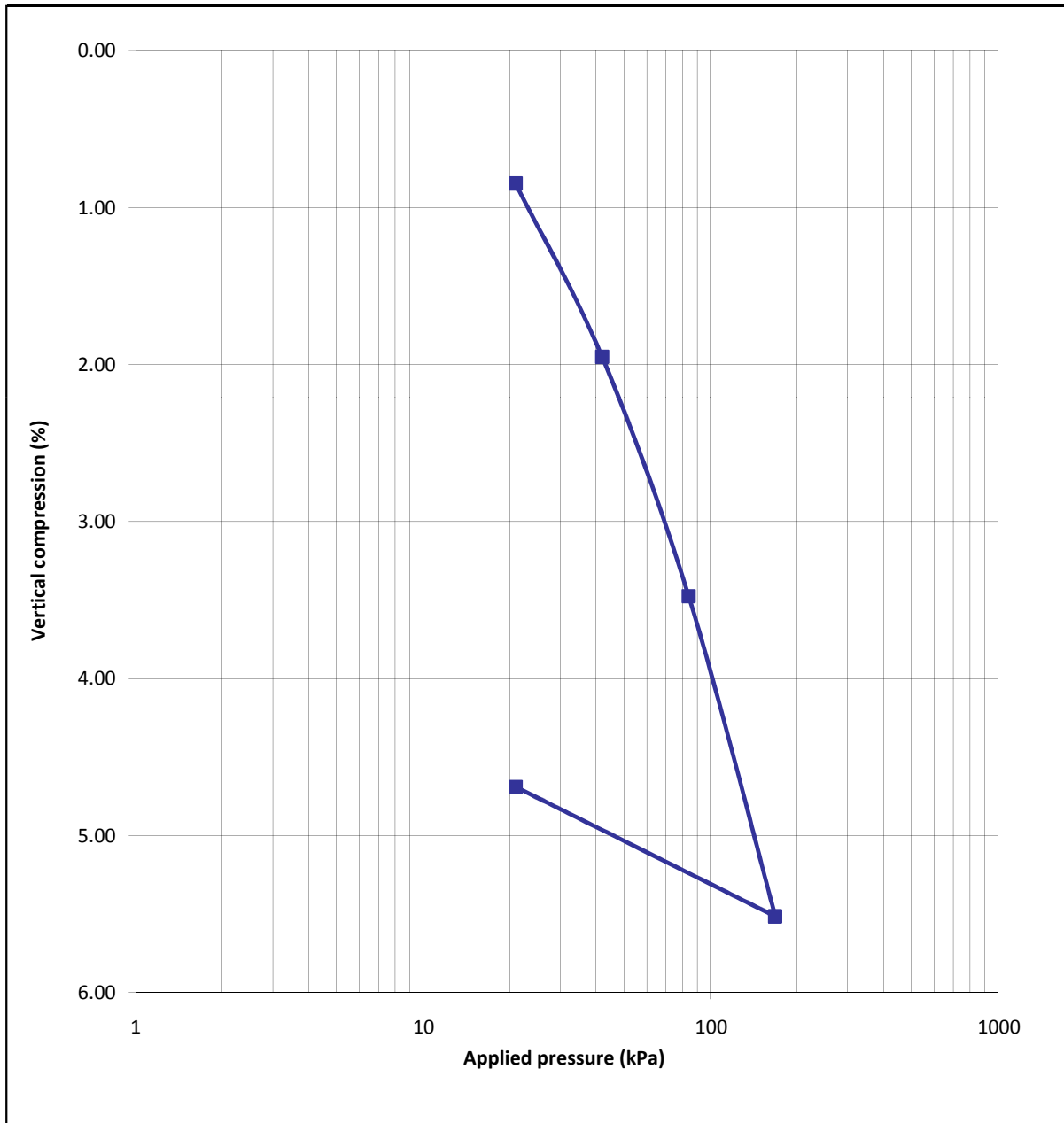
Tested	HJL	Checked	SPR	Approved	SPR
Date	01/05/2020	Date	05/05/2020	Date	05/05/2020

DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in accordance with BS 1377:1990:Part 5:Clause 3

TEST REPORT

Project location	Honley	Sample depth (m)	1.20
Project reference	C525/20/E/1026	Sample type	Undisturbed
Borehole number	WS3	Specimen orientation	Vertical
Sample number	C2		



Tested	HJL	Checked	SPR	Approved	SPR
Date	01/05/2020	Date	05/05/2020	Date	05/05/2020



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GEOTECHNICAL
ENVIRONMENTAL



ENVIRONMENTAL LAB RESULTS

GEOTECHNICAL
ENVIRONMENTAL



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GEOTECHNICAL
ENVIRONMENTAL



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C525/20/E/1026			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest'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 KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)							
Job Name	79 Hall Ing Lane										
Date	12/05/2020			Sample Location	WS1	WS2	WS2	WS3			
Client	Mr Ian Goulding			Depth Top	0.30	0.10	0.70	0.12			
				Depth Base	0.45	0.20	0.80	0.30			
Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%							
				Atrisk 2015 (No Free Product)	Atrisk 2017						
Cadmium	mg/kg	C	0.10		22.1	0.95	0.54	0.46	0.37		
Chromium (Hexavalent)	mg/kg	B/C	0.5	20.5	3.62	< 0.50	< 0.50	< 0.50	< 0.50		
Copper	mg/kg	A+	0.50		4730	64	64	53	43		
Mercury	mg/kg	A/D	0.10		8.81	0.42	0.49	0.39	1.3		
Nickel	mg/kg	A+	0.50		136	45	45	31	32		
Lead	mg/kg	C	0.50		200	63	71	58	50		
Zinc	mg/kg	A+	0.50		20000	120	100	98	82		
Vanadium	mg/kg	A+	5.0		136	32	38	38	30		
Arsenic	mg/kg	C	1.0		37	10	16	10	12		
Selenium	mg/kg	A	0.20		375	0.64	0.82	0.64	0.64		
Cyanide (Free)	mg/kg	A	0.50		34	< 0.50	< 0.50	< 0.50	< 0.50		
Total Phenols	mg/kg	A	0.30		267	< 0.30	< 0.30		< 0.30		
Naphthalene	mg/kg	A+	0.10		0.829	< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthylene	mg/kg		0.10			< 0.10	< 0.10	< 0.10	< 0.10		
Acenaphthene	mg/kg	A+	0.10	608	157	< 0.10	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	A+	0.10		735	< 0.10	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg		0.10			0.31	2.0	0.89	0.77		
Anthracene	mg/kg	A+	0.10	0	10200	0.14	0.36	0.20	< 0.10		
Fluoranthene	mg/kg	A+	0.10		983	0.45	2.2	0.80	0.68		
Pyrene	mg/kg	A+	0.10		668	0.46	2.2	0.79	0.73		
Benzo[a]anthracene	mg/kg	A	0.10	4.52	1.71	0.16	0.69	0.21	< 0.10		
Chrysene	mg/kg	A	0.10	585	0.44	0.29	0.97	0.18	< 0.10		
Benzo[b]fluoranthene	mg/kg	A	0.10	7.72	1.22	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[k]fluoranthene	mg/kg	A	0.10	84.4	0.686	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[a]pyrene	mg/kg	B/C	0.10	4.95	1.51	< 0.10	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10	7.31	0.0614	< 0.10	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)Anthracene	mg/kg	A	0.10	0.838	0.00393	< 0.10	< 0.10	< 0.10	< 0.10		
Benzo[g,h,i]perylene	mg/kg	A	0.10	96.2	0.0187	< 0.10	< 0.10	< 0.10	< 0.10		
Total Of 16 PAH's	mg/kg		2.0			< 2.0	8.4	3.1	2.2		
Aliphatic TPH >C5-C6	mg/kg	A+	1.0	0	42.7	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C6-C8	mg/kg	A+	1.0	0	99.3	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C8-C10	mg/kg	A+	1.0	0	13.9	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	81.7	49.9	< 1.0	< 1.0		< 1.0		

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C525/20/E/1026			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest'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							
Job Name	79 Hall Ing Lane			KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)							
Date	12/05/2020			Sample Location	WS1	WS2	WS2	WS3			
Client	Mr Ian Goulding			Depth Top	0.30	0.10	0.70	0.12			
				Depth Base	0.45	0.20	0.80	0.30			
Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%							
Aliphatic TPH >C12-C16	mg/kg	A+	1.0	385	20.9	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C16-C21	mg/kg	A+	1.0		210000	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C21-C35	mg/kg	A+	1.0		210000	< 1.0	< 1.0		< 1.0		
Aliphatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0		< 1.0		
Total Aliphatic Hydrocarbons	mg/kg		5.0			< 5.0	< 5.0		< 5.0		
Aromatic TPH >C5-C7	mg/kg	A+	1.0		0.137	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C7-C8	mg/kg	A+	1.0		113	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C8-C10	mg/kg	A+	1.0		20.5	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C10-C12	mg/kg	A+	1.0		70	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C12-C16	mg/kg	A+	1.0	165	155	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C16-C21	mg/kg	A+	1.0		319	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C21-C35	mg/kg	A+	1.0		1120	< 1.0	< 1.0		< 1.0		
Aromatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0		< 1.0		
Total Aromatic Hydrocarbons	mg/kg		5.0			< 5.0	< 5.0		< 5.0		
Total Petroleum Hydrocarbons	mg/kg		10.0			< 10	< 10		< 10		
pH			N/A			7.9	6.0		6.2		
Sulphate (2:1 Water Soluble) as SO ₄	g/l		0.010			0.16	0.028		0.056		
ACM Type			N/A			-	-	-	-		
Asbestos Identification	%		0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
ACM Detection Stage			N/A			-	-	-	-		
Moisture	%		0.020			18	22	22	22		
Soil Colour			N/A			Brown	Brown		Brown		
Other Material			N/A			Roots	5% Stones and		Stones		
Soil Texture			N/A			Clay	Sand		Sand		
Sulphate (Total)	%		0.010			0.091	0.090		0.083		
Organic Matter	%		0.40			2.1	6.7	2.4	6.7		



2183



Final Report

Report No.: 20-11497-1
Initial Date of Issue: 06-May-2020
Client Rogers Geotechnical Services Ltd

Client Address: Unit 4, Barncliffe Business Park
Near Bank
Shelley
Huddersfield
West Yorkshire
HD8 8LU

Contact(s): Jude Norcliffe

Project C525/20/E Honley

Quotation No.: **Date Received:** 01-May-2020

Order No.: PO-0692 **Date Instructed:** 01-May-2020

No. of Samples: 4

Turnaround (Wkdays): 5 **Results Due:** 07-May-2020

Date Approved: 06-May-2020

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				20-11497	20-11497	20-11497	20-11497
Quotation No.:	Chemtest Sample ID.:				1001076	1001077	1001078	1001079
	Client Sample ID.:				D1	D1	D2	D1
	Sample Location:				WS1	WS2	WS2	WS3
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.30	0.10	0.70	0.12
	Bottom Depth (m):				0.45	0.20	0.80	0.30
	Date Sampled:				29-Apr-2020	29-Apr-2020	29-Apr-2020	29-Apr-2020
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Cadmium	M	2450	mg/kg	0.10	0.95	0.54	0.46	0.37
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Copper	M	2450	mg/kg	0.50	64	64	53	43
Mercury	M	2450	mg/kg	0.10	0.42	0.49	0.39	1.3
Nickel	M	2450	mg/kg	0.50	45	45	31	32
Lead	M	2450	mg/kg	0.50	63	71	58	50
Zinc	M	2450	mg/kg	0.50	120	100	98	82
Vanadium	U	2450	mg/kg	5.0	32	38	38	30
Arsenic	M	2450	mg/kg	1.0	10	16	10	12
Selenium	M	2450	mg/kg	0.20	0.64	0.82	0.64	0.64
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total Phenols	M	2920	mg/kg	0.30	< 0.30	< 0.30		< 0.30
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	0.31	2.0	0.89	0.77
Anthracene	M	2700	mg/kg	0.10	0.14	0.36	0.20	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	0.45	2.2	0.80	0.68
Pyrene	M	2700	mg/kg	0.10	0.46	2.2	0.79	0.73
Benzo[a]anthracene	M	2700	mg/kg	0.10	0.16	0.69	0.21	< 0.10
Chrysene	M	2700	mg/kg	0.10	0.29	0.97	0.18	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	< 2.0	8.4	3.1	2.2
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0

Results - Soil

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				20-11497	20-11497	20-11497	20-11497
Quotation No.:	Chemtest Sample ID.:				1001076	1001077	1001078	1001079
	Client Sample ID.:				D1	D1	D2	D1
	Sample Location:				WS1	WS2	WS2	WS3
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.30	0.10	0.70	0.12
	Bottom Depth (m):				0.45	0.20	0.80	0.30
	Date Sampled:				29-Apr-2020	29-Apr-2020	29-Apr-2020	29-Apr-2020
	Asbestos Lab:				COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD				
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0		< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0		< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0		< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10		< 10
pH	M	2010		4.0	7.9	6.0		6.2
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.16	0.028		0.056
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-
Moisture	N	2030	%	0.020	18	22	22	22
Soil Colour	N	2040		N/A	Brown	Brown		Brown
Other Material	N	2040		N/A	Roots	5% Stones and Roots		Stones
Soil Texture	N	2040		N/A	Clay	Sand		Sand
Sulphate (Total)	M	2430	%	0.010	0.091	0.090		0.083
Chromium	M	2450	mg/kg	1.0			34	
Organic Matter	M	2625	%	0.40	2.1	6.7	2.4	6.7

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



End of Report

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Appendix 5

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
	<i>Metals</i>	SOM: 1%		SOM: 6%		
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.62	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+
	<i>Semi and Non Metals</i>					
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
	<i>Poly Aromatic Hydrocarbons</i>	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	8.54		A
2	Chrysene	0.44	585	2.64	927	A
2	Benzo(b)fluoranthene	1.22	7.72	7.29	9.86	A
2	Benzo(k)fluoranthene	0.686	84.4	4.12	100	A
2	Benzo(a)pyrene	1.51	4.95	0.998	5	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838	2.05	4.95	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.0187	96.2	0.112	103	A
	<i>Petroleum Hydrocarbons</i>					
	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+
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 = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						