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PHASE 2

GEO-ENVIRONMENTAL REPORT

job number	C3779/23/E/5733	date	14/10/2024
site address	Longley Farm, Longley Lane, Holmfirth, West Yorkshire, HD9 2JD		
written by	S. Hale	checked by	I. Sakoor
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Report on a Phase 2 Geo-environmental Investigation

Location:	Longley Farm Longley Lane, Holmfirth, West Yorkshire, HD9 2JD	
For:	J&E Dickinson	
Report No.	C3779/23/E/5733	Report date: October 2024

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

REDACTED		REDACTED	
Steven Hale BSc FGS Geo-environmental Technician		Imran Sakoor BEng FGS Geo-environmental Engineer	

Report Summary¹

Item	Comments	Section
Development	Extension of the existing building.	1.
Geology	Superficial geology – none. Solid geology – Marsden Formation.	5.
Strata Conditions	Topsoil and made ground overlying weathered fraction of the Marsden Formation.	6.
Groundwater	None encountered during investigation.	6.2
Foundation Design	Shallow foundation solution.	10.1
Effect of Sulphates	DC-1 concrete.	10.5
Contamination	No contamination identified with respect to the proposed commercial end use.	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 Longley Farm is to be developed by the construction of an extension to the existing building. 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. Fieldworks

The fieldworks were undertaken on the 5th September 2024 and included the following:

- Three windowless sample boreholes with standard penetration tests.
- One dynamic probe adjacent to WS02.

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

3.1 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.

3.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within all 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.

3.3 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to windowless sample borehole WS02 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.

4. Geology

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

Strata Type	Strata Name ²	Previous Name ³	Description ³
Superficial Geology	-	-	None indicated to underlie the site.
Solid Geology	Marsden Formation	Middle 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.

² Sources: British Geological Survey (NERC) Map Sheet 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]

5. 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
0.25 – 0.30	TOPSOIL (Soft, organic, brown, slightly sandy, slightly gravelly, clayey SILT)	All	None
0.85 – 1.00	MADE GROUND – REWORKED MATERIAL (Soft to firm, brown, slightly sandy, slightly gravelly, silty CLAY)	WS02 & WS03	None
1.00 – 1.40	WEATHERED MARSDEN FORMATION (Soft becoming firm, brown mottled grey and orangish brown, slightly gravelly, silty CLAY)	WS01 & WS03	None
1.60	WEATHERED MARSDEN FORMATION (Soft, light brown mottled grey, silty CLAY)	WS02	None
1.70	WEATHERED MARSDEN FORMATION (Soft becoming firm, thinly laminated, grey mottled orangish brown, slightly gravelly, silty CLAY)	WS01	None
1.65	WEATHERED MARSDEN FORMATION (Medium-dense, dark grey, clayey, silty GRAVEL)	WS03	None
2.60 – 4.00	WEATHERED MARSDEN FORMATION (Firm, thinly laminated, dark grey, slightly gravelly, silty CLAY)	WS01 & WS02	None
2.00	WEATHERED MARSDEN FORMATION (Firm, brown mottled grey and orangish brown, slightly gravelly, silty CLAY)	WS03	None
+2.10 – +4.10	MARSDEN FORMATION (Brown, weak and extremely weak SANDSTONE)	All	None

'+' 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

5.1 General Strata

The borehole records indicate that beneath a 0.25m to 0.30m capping of topsoil, made ground consisting of reworked soft to firm, brown, slightly sandy and gravelly clay was revealed to depths of between 0.85m and 1.00m below ground level (begl) within WS02 and WS03. Underlying the topsoil within borehole WS01 and from beneath the made ground within boreholes WS02 and WS03, soils comprising generally slightly gravelly, silty clays were observed to depths of between 2.00m and 4.00m begl. It is considered that this material indicates the weathered fraction of the underlying Marsden Formation. Beneath these soils, extremely weak to weak brown sandstone was encountered to termination depth in all boreholes. This sandstone is considered to represent the Marsden Formation, albeit in a less weathered insitu condition.

5.2 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.

Table 5: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	8	15% to 48%		
Index properties (4 Point)	8	LL PL PI	39 to 89% 23 to 43% 12 to 52%	Clay of variably intermediate to very high plasticity. Consistency index 0.6 to 1.7 NHBC Class - High
Soluble sulphate & pH	4	SO ₄ pH	0.07 to 0.50g/l 3.83 to 5.68	

In cohesive soil the approximate cohesion, c_u , and coefficient of consolidation, m_v , may be obtained from the equivalent SPT 'N' value using the following expressions (Stroud 1975).

$$c_u = f_1 N$$

where:

c = cohesion (kN/m²).

m_v = Coefficient of consolidation (m²/MN).

f_1 & f_2 = factors based on plasticity index.

N = SPT 'N₃₀₀' value.

$$m_v = \frac{1}{f_2 N}$$

For the cohesive soils revealed at this site the highest (worst case) plasticity index⁵ of 52% could be employed, which suggests an f_1 value of 4.2 and an f_2 value of 0.44.

7.1 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)	High		Slightly gravelly, silty CLAY
Shear strength parameters (at 2.0m depth)	c_u	55kN/m ²	Stroud (1974) where $c_u = f_1 N$ assuming an N of 14
Consolidation characteristics	m_v	0.162m ² /MN	Stroud (1974) where $m_v = 1/f_2 N$ assuming an N of 14
Concrete classification	DC-1		Brownfield locations (Static water)

⁵ See paragraph 6.2 'Index Property Tests'

8. 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.

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.

9. Discussion of Ground Conditions - Geotechnical

It is understood that the site is to be developed by the construction of an extension to the existing building. 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. In addition, it is understood that the proposed extension will overlies part of the existing pond. It should be understood that at the time of writing this report the pond has not been investigated so discussions in regards to it will also be general in nature.

In general terms, it cannot be recommended that foundations be constructed directly within the made ground or weak near surface soils. Although competent near surface soils are present within WS03, it should be appreciated that these soils are also present in a weak and variable condition to depths of at least 2.0m below within the remaining boreholes, such that excessive total and or differential settlement could occur under moderately light surface loading.

The results of this investigation indicate that the weathered fraction of the Marsden Formation, described as firm becoming stiff, dark grey, slightly gravelly, silty clay, will be revealed from depths ranging between 1.60m to 4.0m within borehole WS02. Additionally, sandstone was encountered within WS01 and WS03 at depths of 2.0m. It is considered that the clay within WS02 and the sandstone will provide suitable bearing strata, provided that the foundations are placed either on rockhead or within soil generally described as being present in a firm insitu condition. Due to the dissimilar settlement characteristics, it cannot be recommended that foundations be placed on a mixture of soil and rock types. Where bedrock is within foundation level, all foundations should be extended such that they have been placed on material of similar composition.

Notwithstanding the above, assuming cohesive soils, it is considered that strip or spread foundations constructed at a minimum depth of say 2.0m, could be designed assuming an allowable increase in stress given in the following table:

**Table 7: Allowable Increase in Stress
(Foundations constructed on Weathered Marsden Formation)**

Foundation Type		Strip Footings			Spread Footings		
		Foundation Breadth	B (m)	0.6	1.0	1.5	0.6
Foundation Depth	D (m)	2.0			2.0		
Allowable increase in stress	(kN/m ²)	135	130	125	110	100	95
Net Allowable Bearing Capacity ⁶	(kN/m ²)	155	150	145	130	120	115

The allowable increase in stress given above assumes a factor of safety of 3 against general shear failure of foundations placed within cohesive soils, with cohesion of 55kN/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. Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce softening or loosening of the sub-grade due to the ingress of surface water.

Should the foundations be placed onto the sandstone encountered in some locations at 2.0m, then this material would possess a significant bearing capacity, probably being in excess of 250kN/m². Therefore, at a typical foundation load 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. Cognisance should be given to the potential differential settlement of the foundations that are placed within the cohesive soils and any that are placed directly onto the sandstone encountered.

It is understood that part of the proposed extension will overlie the existing pond, however, finalised drawings are not yet available. The proposed drawing provided by HolmeArchitecture (Drawing Ref: 110) shows that the pond will be infilled with the extension placed over the infill. In such an instance, settlement calculations should be undertaken to determine the magnitude of total settlement, as well as the differential movements between the existing structure, and the parts of the extension construction both on and off the footprint of the pond. It is possible that the use of piled foundations may prove to be the most cost-effective solution. If a piled foundation is preferred, then further investigation of the strata at depth will be required in order to complete a suitable pile design.

9.1 Infilling of the Pond

It is understood that the proposed extension will be placed over a section of the pond that is to be infilled. As the bases of ponds tend to consist of soft, highly compressible soils the method of infilling and bringing up to level would include:

- The pond would need to be drained of water and any soft material would likely need to be removed to reveal either competent ground or bedrock beneath.
- The formation level would be subject to compaction using a suitable vibratory roller.
- A suitable granular fill is brought up and compacted in layers not exceeding say 200mm.
- Each layer is subject to insitu density testing to ensure that it has been adequately compacted.

⁶ Assumes bulk density of material removed from footing excavations to be 20kN/m³

The pond infill should comprise an engineered material and will need to be undertaken to a design.

9.2 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.

9.3 Ground-floors

In light of the made ground and weak near surface soils, which were revealed to depths of up to 2.0m, 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.

9.4 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 design⁷. 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.

9.5 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 C2⁸, which is provided in BRE Special Digest 1, *Concrete in*

⁷ Table 11.1, *Reproduction of TRRL Report LR1132 (1984)*, Smith (2006), Smith's Elements of Soil Mechanics, 8th ed.

⁸ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*

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 D1⁹, 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.

10. Discussion of Ground Conditions - Environmental

10.1 Discussion of Test Results

It is understood that the site is to be developed by the construction of an extension to the existing building. Consequently, the site may be classified as commercial.

10.1.1 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 3.2% and 4.5%. 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 website¹⁰ 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 8: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Commercial)
WS01	0.20	PAHs: Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene & Benzo(g,h,i)perylene
WS02	0.50	PAHs: Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-c,d)Pyrene, Dibenz(a,h)Anthracene & Benzo(g,h,i)perylene
WS03	0.50	None

Concentrations of chromium^{VI}, mercury, selenium, free cyanide, phenols (total) and total petroleum hydrocarbons (aliphatic C5 to C35; aromatic C5 to C21) 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

⁹ 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.*

¹⁰ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>

total exposure, which is unlikely to significantly affect the combined assessment criterion¹¹. 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:

Location	Depth (m)	Contaminants found to be exceeding SSVs (Commercial)
WS01	0.20	None
WS02	0.50	None
WS03	0.50	None

On the basis of the above information, the results of the investigation have concluded that the site is not contaminated with regard to the proposed end use.

10.2 Site Specific Risk Assessment

10.2.1 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 Agency¹² 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

10.2.2 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 10.

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

¹¹ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Commercial land use, 23.06.17.

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.

- 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 10.

Table 10: 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	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	No further action required.
	End User	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	
	Neighbours	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	
Inhalation of Dust/Vapours	Operative	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	No further action required.
	End User	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	
	Neighbours	Yes – no significant contamination found during the investigation as all determinands were found below the relevant SSVs.	Low	
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	No further action required.
	End User	No – no soft landscaping proposed as part of the new development and no contamination was found during the investigation.	N/A	
	Neighbours	No – no contamination found during the investigation.	N/A	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – whilst some made ground is present, no deleterious materials have been encountered. Moreover, no historic or authorised landfills present within 250m.	Low	No further action required.
	End User		Low	
	Neighbours		Low	

Spillage/loss/run off direct to receiving water	Controlled Waters	No – controlled waters within 250m. However, no contamination was found during the investigation.	N/A	No further action required.
Migration via permeable unsaturated strata	Controlled Waters	No – a Secondary A aquifer is present beneath the site. However, no contamination was found during the investigation.	N/A	
Run off via drainage/sewers etc	Controlled Waters	No – old services may be present on site, however, no contamination was found during the investigation.	N/A	
Direct contact with contaminated soils	Plants	No – no contamination found during the investigation.	N/A	No further action required.
Uptake via root system			N/A	
Direct contact with contaminated soils	Building Materials	Yes – some levels of PAH 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-1s.	Moderate (plastic services)	Please see section 11.3.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative	Yes – the site is located within a radon affected area.	High	Between 5%-10% of properties are affected by radon. Basic radon protection measures required.
	End User			
UXO Risk	Operative	No – it is considered that the activities of the end users are unlikely to affect any UXO devices that may be present below the site.	Low	No further action required.
	End User			

10.3 Indicative Remediation Strategy

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.

10.3.1 General Approach to Construction

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

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.

- Personal hygiene facilities, including washing and messing, must be provided and site operatives be 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.
- In order for soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.
- Any stockpiles of soil on site should be sheeted over to prevent excessive amounts of airborne dust.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- 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 soil 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 contract the following items are required to protect the end user from the potential contaminants revealed at this site.

- Beneath buildings, pavements and hard-standings clean inert granular sub-base should be employed.
- Any redundant services revealed at this site should be de-commissioned and piped services sealed. Any existing services that are to be employed in the new development should be carefully inspected to ensure that they are serviceable.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research

(UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. However, further determinand specification contamination testing may be necessary.

- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.

10.3.2 Radon

The site area is indicated on the UKradon map to be located within an area where 5-10% of properties are affected by radon. The risk of harm to end users from Radon is therefore considered to be high. As such, the requirements for precautionary measures should be checked with building control.

10.4 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 YALPAG¹⁵ 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).

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 500m ³	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	Standard metals/metalloids (as above), PAH (16 USEPA speciation),

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

	Dependent on source and receptor, between 1 per 50m ³ and 1 per 250m ³	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 50m ³ and 1 per 100m ³	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 12: Fill Screening Values

Contaminant	Screening Value (Commercial) (mg/kg)				Reference
	1% SOM		6% SOM		
As	635		635		Atrisk ^{SOIL} SSVs
Cd	410		410		Atrisk ^{SOIL} SSVs
Cr(VI)	19.7	49.1	19.7	49.1	Atrisk ^{SOIL} SSVs
Cu	106000		106000		Atrisk ^{SOIL} SSVs
Hg	350		405		Atrisk ^{SOIL} SSVs
Ni	1770		1770		Atrisk ^{SOIL} SSVs
Pb	2310		2310		Atrisk ^{SOIL} SSVs
V	7490		7490		Atrisk ^{SOIL} SSVs
Zn	1100000		1100000		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 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. 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 drilling for the section of the building that will overlie the existing pond.
- Discussions with piling contractors regarding their method for installing piles.
- Discussions with ground work contractors regarding a design for the partial infilling of the pond.
- 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 Building Control and contractors in relation to the suitability of materials and installation methods for radon barriers.
- Detailed design of the sub-structure.

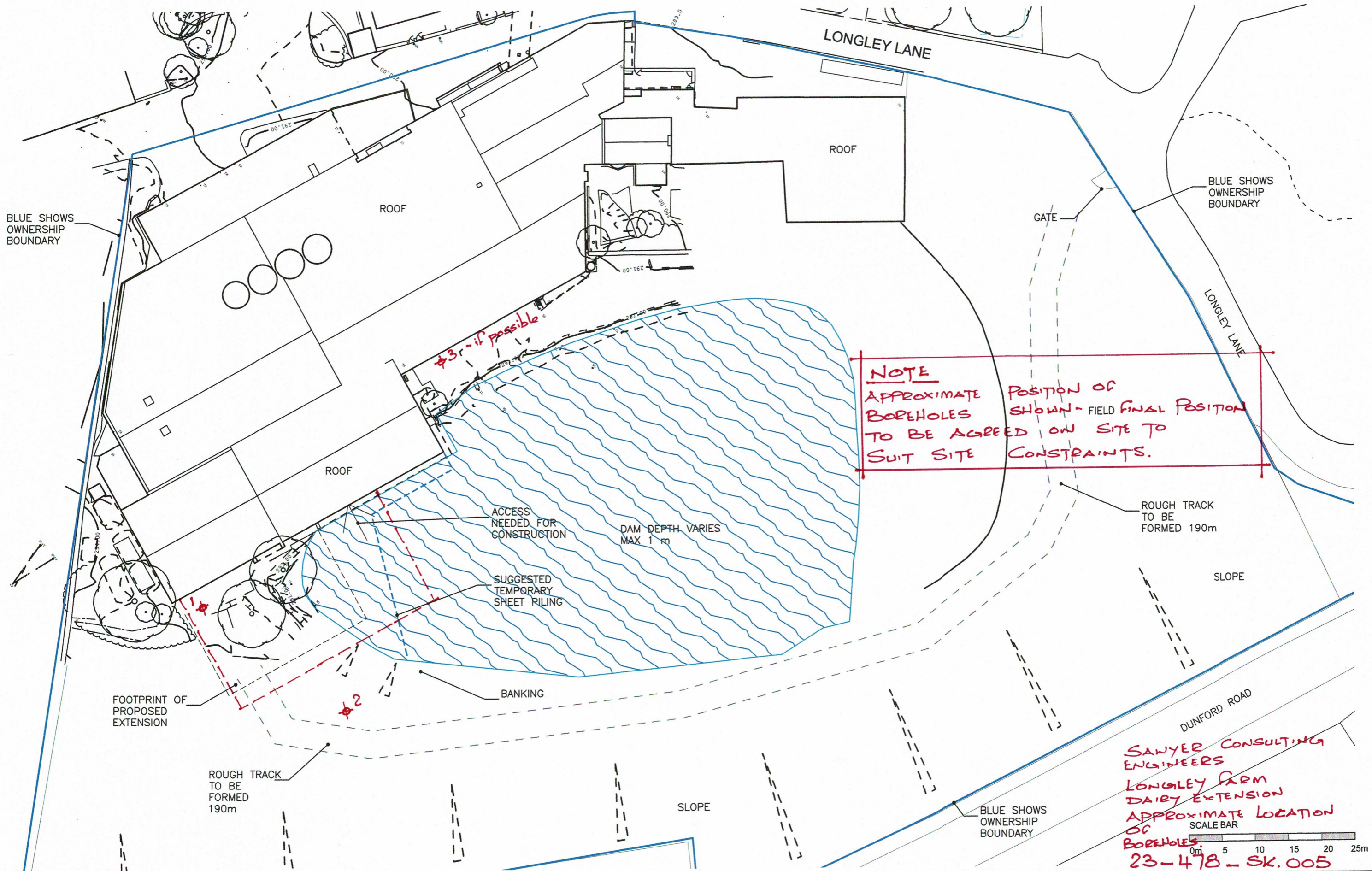
Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.

12. References

- British Geological Survey (NERC) (2024), 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.
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- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground 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



NOTE
 APPROXIMATE POSITION OF BOREHOLES TO BE AGREED ON SITE TO SUIT SITE CONSTRAINTS.

SAWYER CONSULTING ENGINEERS
 LONGLEY FARM DAIRY EXTENSION
 APPROXIMATE LOCATION OF BOREHOLES.
 SCALE BAR
 0m 5 10 15 20 25m
 23-478 - SK.005

Construction staff and operatives must ensure the principal contractor has provided thorough and accurate information on all health and safety aspects relating to the designs identified on this drawing including the review of:

- Designers/contractors risk assessments
- Method statements
- Permit to work
- Pre construction information

The designers note that the following health and safety risks relating to this drawing have not been eliminated during the design process:

revision	date	by	chk

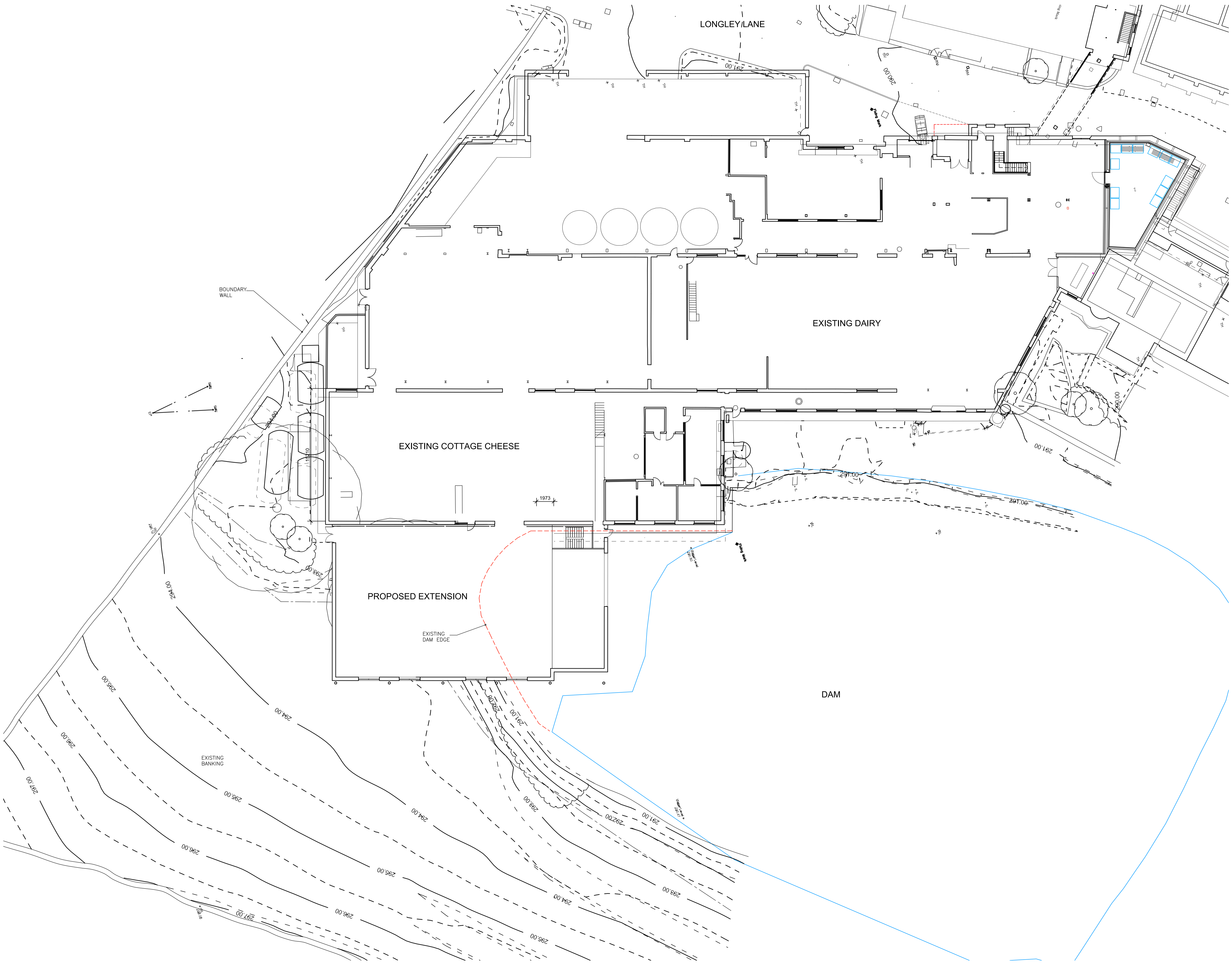
holmearchitecture
 17a Chapelgate · Scholes · Holmfirth · HD9 1SX
 matt@holmearchitecture.com | www.holmearchitecture.com | 07975977532

All dimensions to be verified on site, and the Architect informed of any discrepancy. All drawings and specifications should be read in conjunction with the H&S Plan
 This drawing is the Property of Holme Architecture Limited ©
 DO NOT SCALE FROM THIS DRAWING

drawn by	checked by	date	scale @ A3
MC	MC	13.08.24	1:200

Longley Farm: Dairy Extension and Refurbishment

Existing Site Plan		
project number	drawing number	revision
100	101	



Construction staff and operatives must ensure the principal contractor has provided thorough and accurate information on all health and safety aspects relating to the designs identified on this drawing including the review of:

- Designers/contractors risk assessments
- Method statements
- Permit to work
- Pre construction information

The designers note that the following health and safety risks relating to this drawing have not been eliminated during the design process:

ref	residual risk

revision	date	by	chk

All dimensions to be verified on site and the Architect informed of any discrepancy. All drawings and specifications should be read in conjunction with the Health and Safety Plan; all conflicts should be reported to the CDM Co-ordinator.
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 DO NOT SCALE FROM THIS DRAWING

- | | | |
|--------------------------------------|----------------------------------|---------------------------------------|
| <input type="checkbox"/> preliminary | <input type="checkbox"/> comment | <input type="checkbox"/> construction |
| <input type="checkbox"/> planning | <input type="checkbox"/> tender | <input type="checkbox"/> record |

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 Tel: 07975977532
 matt@holmearchitecture.com
 www.holmearchitecture.com

LONGLEY FARM			
drawn by	checked by	date	scale @ A1
MAC	MAC	09/10/24	scale
Proposed Cottage Cheese Extension			
Proposed Site Plan DRAFT			
project number	drawing number	revision	
104	110		

cadd reference: D:\02 Projects\Longley\02_Dairy_Reroofing\02_Design\1001_External\Works\104_110_Proposed Cottage Cheese Site Plan.dwg

Appendix 2

Borehole Records



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: Longley Farm

Project No.
C3779/23/E/5733

Co-ords:

Hole Type
WLS

Location: Longley Lane, Holmfirth, West Yorkshire, HD9 2JD

Level:

Scale
1:25

Client: J & E Dickinson

Dates: 05/09/2024

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.00 - 0.30					0.30		TOPSOIL (Soft, organic, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine. Gravel is sub-angular and fine to coarse of sandstone. Common rootlets present).		
		1.00 - 1.45 1.00 - 1.45 1.00	D D SPT	87	100	N=6 (1,0/1,1,2,2)	1.00		Soft becoming firm, brown mottled grey, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to coarse of sandstone. [WEATHERED MARSDEN FORMATION]		1
		2.00 - 2.45 2.00 - 2.45 2.00	D D SPT	77	100	N=14 (3,3/3,3,5,3)	1.70		Soft becoming firm, thinly laminated, grey mottled orangish brown, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to medium of mudstone. [WEATHERED MARSDEN FORMATION]		2
		2.60 2.60	D SPT	67	100	0 (50 for 10mm/0 for 0mm)	2.60 2.65		Firm, thinly laminated, dark grey, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to medium of mudstone. Localised iron staining throughout. [WEATHERED MARSDEN FORMATION]		3
									Brown, extremely weak SANDSTONE recovered as gravel. [MARSDEN FORMATION] End of Borehole at 2.65m		3
											4
											5

Remarks





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: Longley Farm	Project No. C3779/23/E/5733	Co-ords:	Hole Type WLS
Location: Longley Lane, Holmfirth, West Yorkshire, HD9 2JD	Level:		Scale 1:25
Client: J & E Dickinson	Dates: 05/09/2024		Logged By SH

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
				87	100	0.30		<p>TOPSOIL (Soft, organic, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine. Gravel is sub-angular and fine to coarse of sandstone. Common rootlets present).</p>		
		1.00 - 1.45 1.00 - 1.45 1.00	D D SPT			1.00		<p>MADE GROUND (Soft to firm, brown, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to coarse of sandstone). [REWORKED]</p>	1	
				77	100	1.60		<p>Soft, light brown mottled grey, silty CLAY. [WEATHERED MARSDEN FORMATION]</p>		
		2.00 - 2.45 2.00	D SPT			2.00		<p>Firm becoming stiff, thinly laminated, dark grey, slightly gravelly, silty CLAY. Gravel is tabular, sub-angular and fine to medium of mudstone. Localised iron staining throughout. [WEATHERED MARSDEN FORMATION]</p>	2	
		3.00 3.00	D SPT			3.00			3	
				67	95					
		4.00	SPT			4.00				
				57	100	4.10		<p>Brown, extremely weak SANDSTONE recovered as gravel. [MARSDEN FORMATION] End of Borehole at 4.00m</p>	4	
									5	

Remarks





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Longley Farm

Project No.
C3779/23/E/5733

Co-ords:

Hole Type
WLS

Location: Longley Lane, Holmfirth, West Yorkshire, HD9 2JD

Level:

Scale
1:25

Client: J & E Dickinson

Dates: 05/09/2024

Logged By
SH

Well	Water Strikes	Samples and In Situ Testing				Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)					
		1.00 - 1.45	D D SPT	87	100	0.25		TOPSOIL (Soft, organic, brown, slightly sandy, slightly gravelly, clayey SILT. Sand is fine. Gravel is sub-angular and fine to coarse of sandstone. Common rootlets present).		
		1.00 - 1.45					0.85	MADE GROUND (Firm, brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is angular to sub-angular and fine to coarse of brick, concrete and sandstone). [RE Firm, brown mottled grey and orangish brown, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to coarse of sandstone. [WEATHERED MARSDEN FORMATION]	1	
		1.00				1.40		Medium dense, dark grey, clayey, silty, tabular, sub-angular and fine to medium GRAVEL of mudstone. [WEATHERED MARSDEN FORMATION]		
		1.90	D SPT	77	100	1.65		Firm, brown mottled grey and orangish brown, slightly gravelly, silty CLAY. Gravel is sub-angular and fine to coarse of sandstone. [WEATHERED MARSDEN FORMATION]		
		2.00					2.00		Brown, weak SANDSTONE recovered as gravel. [MARSDEN FORMATION]	2
						2.10		End of Borehole at 2.00m		
										3
										4
										5

Remarks



Appendix 3

Dynamic Probing Records



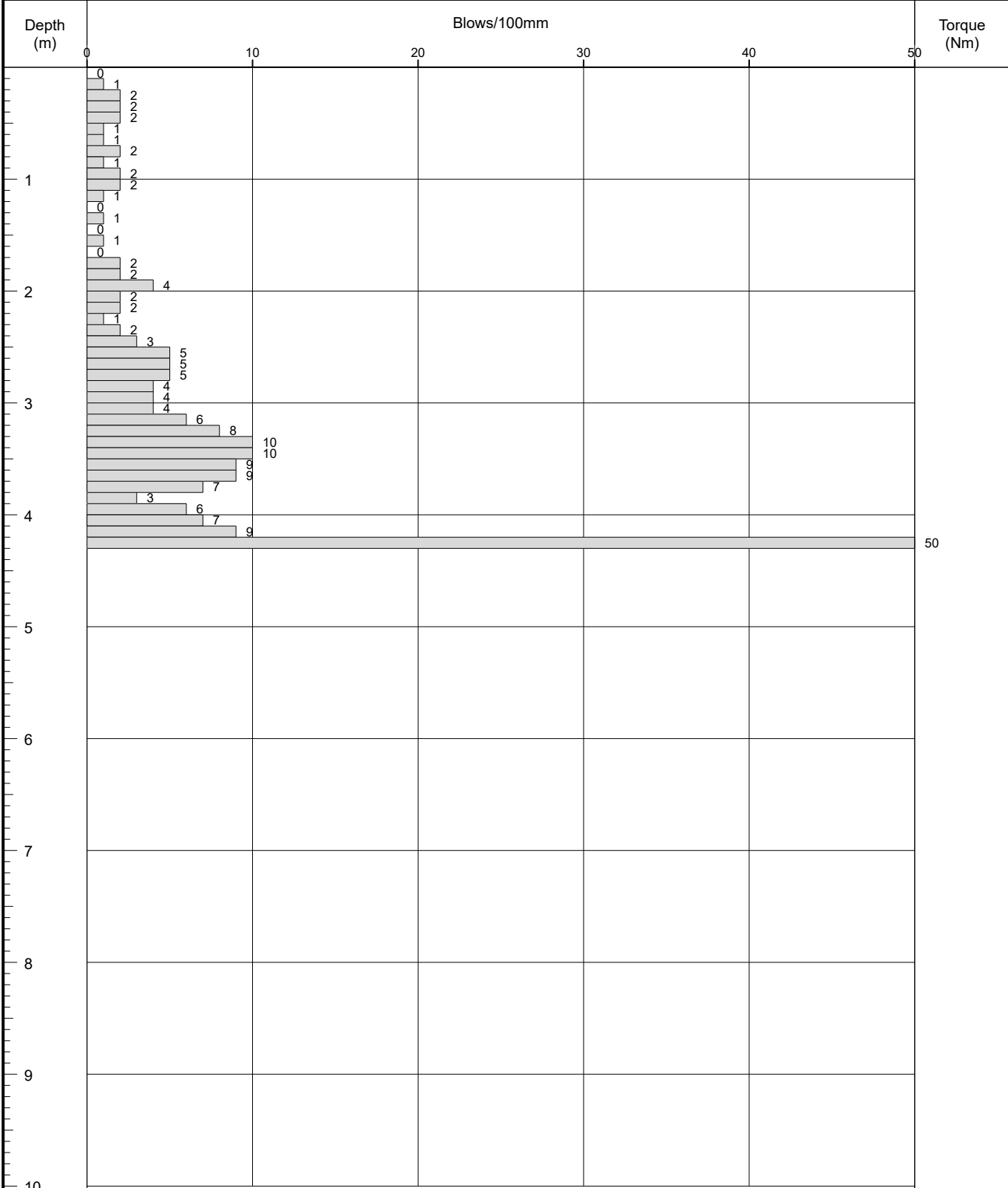
Probe Log

Probe No.

DP02

Sheet 1 of 1

Project Name: Longley Farm	Project No. C3779/23/E/5733	Co-ords:	Hole Type DCP
Location: Longley Lane, Holmfirth, West Yorkshire, HD9 2JD	Level:		Scale 1:50
Client: J & E Dickinson	Dates: 05/09/2024		Logged By SH



Remarks:	Fall Height	750mm	Cone Base Diameter	50.5mm
	Hammer Wt	63.5kg	Final Depth	4.2m
	Probe Type	DPSH-B		



Appendix 4

Laboratory Testing

Environmental
Geotechnical
Specialists

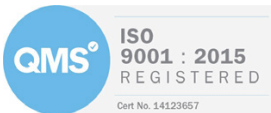


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LABORATORY REPORT

job number	date
site address	
date scheduled	date issued
issued by	

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8948

Schedule of UKAS Accredited Laboratory Tests



1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN ISO 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	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		A	
ii. Large pycnometer	Pt 2 : 8.3			U
iii. Small pycnometer	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	A	
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	A	
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2	A	
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4	A	
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS				
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS				
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3		A	
- CBR mould	Pt 4 : 3		A	
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3		A	
- CBR mould	Pt 4 : 3		A	
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		A	
ii. Recompacted sample	Pt 5 : 7		A	
iii. Soaked, inc measurement of swell	Pt 5 : 7		A	
4. COMPRESSIBILITY OF SOIL				
i. One dimensional consolidation	Pt 5 : 3		A	
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL				
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		A	
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

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Disclaimer

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

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GEOTECHNICAL TESTING RESULTS



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 Huddersfield,
 HD8 8LU

Classification of Index Properties

C3779/23/E/5733

Project Name: Longley Farm

BS EN ISO: 17892: Parts 1, 12

Fig. Sheet.
2 1

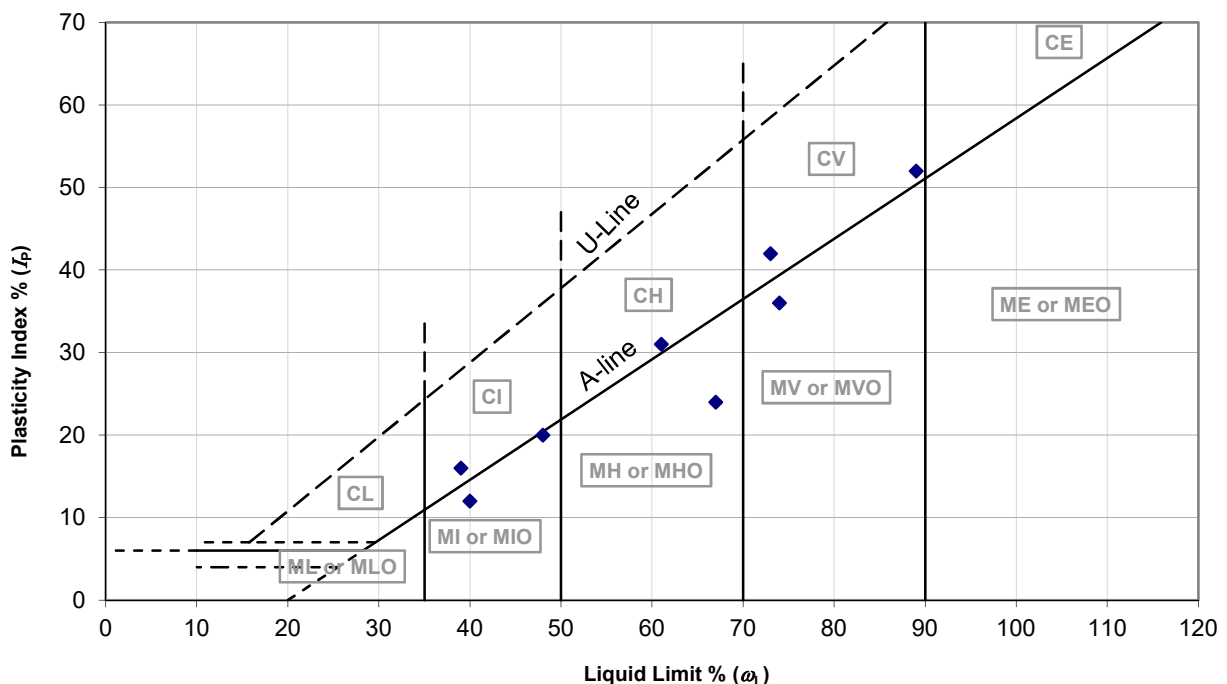
Location:

Input By: Harry

Client: J & E Dickinson

Check By: Harry

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		Casagrande Class	N.H.B.C Class (%)
									(I_L) (%)	(I_C) (%)		
WS01	1.00	43	89	37	52	0	43	52	0.1	0.9	C V	HIGH
WS01	2.00	15	48	28	20	0	15	20	-0.7	1.7	M I	MEDIUM
WS01	2.60	21	61	30	31	27	29	23	-0.3	1.3	C H	MEDIUM
WS02	1.00	48	73	31	42	0	48	42	0.4	0.6	C V	HIGH
WS02	2.00	46	67	43	24	0	46	24	0.1	0.9	M H	MEDIUM
WS02	3.00	19	40	28	12	0	19	12	-0.8	1.8	M I	LOW
WS03	1.00	19	39	23	16	2	19	16	-0.3	1.3	C I	LOW
WS03	1.00	37	74	38	36	6	39	34	0.0	1.0	M V	MEDIUM





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ENVIRONMENTAL TESTING RESULTS



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4041



Environmental Science

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i2 Analytical Ltd.
 7 Woodshots Meadow,
 Croxley Green
 Business Park,
 Watford,
 Herts,
 WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 24-041513

Project / Site name:	Longley Farm	Samples received on:	11/09/2024
Your job number:	C3779	Samples instructed on/ Analysis started on:	11/09/2024
Your order number:		Analysis completed by:	18/09/2024
Report Issue Number:	1	Report issued on:	18/09/2024
Samples Analysed:	3 soil samples		

REDACTED

Signed: _____

Anna Goc
 PL Head of Reporting Team
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

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

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: 24-041513

Project / Site name: Longley Farm

Lab Sample Number				313596	313597	313598
Sample Reference				WS01	WS02	WS03
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.50	0.50
Date Sampled				10/09/2024	10/09/2024	10/09/2024
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	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	15	18	20
Total mass of sample received	kg	0.1	NONE	0.3	0.6	0.3

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	SCA	SCA	SCA

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.3	7.3	7
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	%	0.005	MCERTS	0.093	0.045	0.045
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	30	170	65
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	15.1	87.2	32.4
Organic Matter (automated)	%	0.1	MCERTS	4.5	3.8	3.2

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.16	0.34	0.07
Anthracene	mg/kg	0.05	MCERTS	< 0.05	0.15	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.39	1.3	0.09
Pyrene	mg/kg	0.05	MCERTS	0.45	1.4	0.09
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.23	0.83	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.33	1	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.46	1.7	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.31	0.92	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.46	1.9	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.31	0.93	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.07	0.19	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.33	1.2	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	3.5	11.9	< 0.80
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Analytical Report Number: 24-041513

Project / Site name: Longley Farm

Lab Sample Number	313596			313597			313598		
Sample Reference	WS01			WS02			WS03		
Sample Number	None Supplied			None Supplied			None Supplied		
Depth (m)	0.20			0.50			0.50		
Date Sampled	10/09/2024			10/09/2024			10/09/2024		
Time Taken	None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status						

Heavy Metals / Metalloids

Element	Units	Test Limit of detection	Test Accreditation Status	313596	313597	313598
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	9.1	11
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.4	0.3	0.3
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	23	24	23
Copper (aqua regia extractable)	mg/kg	1	MCERTS	31	31	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	77	36	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	12	11	9.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	35	32	35
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	76	55	45

Petroleum Hydrocarbons

Compound	Units	Test Limit of detection	Test Accreditation Status	313596	313597	313598
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	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
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	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 EH_CU+HS_1D_AL	mg/kg	10	NONE	< 10	< 10	< 10

Compound	Units	Test Limit of detection	Test Accreditation Status	313596	313597	313598
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	< 1.0
TPHCWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	< 10	23	< 10
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_1D_AR	mg/kg	10	NONE	< 10	23	< 10

VOCs

Compound	Units	Test Limit of detection	Test Accreditation Status	313596	313597	313598
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 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	5	MCERTS	< 5.0	< 5.0	< 5.0
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 : 24-041513

Project / Site name: Longley Farm

* 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 *
313596	WS01	None Supplied	0.2	Brown loam and clay with gravel and vegetation
313597	WS02	None Supplied	0.5	Brown loam and clay with gravel and vegetation
313598	WS03	None Supplied	0.5	Brown clay and loam with gravel

Analytical Report Number : 24-041513

Project / Site name: Longley Farm

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (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 SO ₄ 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/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088-PL	D/W	MCERTS
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

Analytical Report Number : 24-041513

Project / Site name: Longley Farm

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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

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 >

End of Report



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Appendix 5

Soil Screening Value Comparison Sheet



Rogers Geotechnical Services: Soil Screening Values Comparison Sheet



Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet														
Job Number	C3779/23/E/5733			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	
Job Name	Longley Farm, Holmfirth												Exceeds SSV	Exceeds 2017, Below 2015
Date	14/10/2024			Sample Location	WS01	WS02	WS03							
Client	J&E Dickinson			Depth Top	0.20	0.50	0.50							
				Depth Base										
Determinand	Units	Ref	LOD	Commercial 1%										
				Atrisk 2015 (No Free Product)	Atrisk 2017									
Cadmium	mg/kg	C	0.2		410	0.40	0.30	0.30						
Chromium (Hexavalent)	mg/kg	B/C	1.8	49.1	19.7	< 1.8	< 1.8	< 1.8						
Copper	mg/kg	A+	1.0		106000	31.00	31.00	21.00						
Mercury	mg/kg	A/D	0.3		350	< 0.3	< 0.3	< 0.3						
Nickel	mg/kg	A+	1.0		1770	12.00	11.00	9.60						
Lead	mg/kg	C	1.0		2310	77.00	36.00	34.00						
Zinc	mg/kg	A+	1.0		1100000	76.00	55.00	45.00						
Vanadium	mg/kg	A+	1.0		7490	35.00	32.00	35.00						
Arsenic	mg/kg	C	1.0		635	13.00	9.10	11.00						
Selenium	mg/kg	A	1.0		13000	< 1.0	< 1.0	< 1.0						
Cyanide (Free)	mg/kg	A	1.0		373	< 1.0	< 1.0	< 1.0						
Total Phenols	mg/kg	A	1.0		685	< 1.0	< 1.0	< 1.0						
Naphthalene	mg/kg	A+	0.05	90.1	75	< 0.05	< 0.05	< 0.05						
Acenaphthylene	mg/kg		0.05			< 0.05	< 0.05	< 0.05						
Acenaphthene	mg/kg	A+	0.05	83600	156.8	< 0.05	< 0.05	< 0.05						
Fluorene	mg/kg	A+	0.05		66500	< 0.05	< 0.05	< 0.05						
Phenanthrene	mg/kg		0.05			0.16	0.34	0.07						
Anthracene	mg/kg	A+	0.05		535000	< 0.05	0.15	< 0.05						
Fluoranthene	mg/kg	A+	0.05		72200	0.39	1.30	0.09						
Pyrene	mg/kg	A+	0.05		54100	0.45	1.40	0.09						
Benzo[a]anthracene	mg/kg	A	0.05	131	1.71	0.23	0.83	< 0.05						
Chrysene	mg/kg	A	0.05	14000	0.44	0.33	1.00	< 0.05						
Benzo[b]fluoranthene	mg/kg	A	0.05	142	1.22	0.46	1.70	< 0.05						
Benzo[k]fluoranthene	mg/kg	A	0.05	1430	0.686	0.31	0.92	< 0.05						
Benzo[a]pyrene	mg/kg	B/C	0.05	76.3	26.1	0.46	1.90	< 0.05						
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.05	142	0.0614	0.31	0.93	< 0.05						
Dibenz(a,h)Anthracene	mg/kg	A	0.05	14.3	0.00393	0.07	0.19	< 0.05						
Benzo[g,h,i]perylene	mg/kg	A	0.05	1440	0.0187	0.33	1.20	< 0.05						
Total Of 16 PAH's	mg/kg		0.8			3.50	11.90	< 0.80						
Aliphatic TPH >C5-C6	mg/kg	A+	0.02	4490	327	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C6-C8	mg/kg	A+	0.02	10400	157	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C8-C10	mg/kg	A+	0.05	1370	82.4	< 0.010	< 0.010	< 0.010						
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	7900	49.9	< 1.0	< 1.0	< 1.0						
Aliphatic TPH >C12-C16	mg/kg	A+	2.0	34000	20.9	< 2.0	< 2.0	< 2.0						
Aliphatic TPH >C16-C21	mg/kg	A+	8.0		3620000	< 8.0	< 8.0	< 8.0						
Aliphatic TPH >C21-C35	mg/kg	A+	8.0		3620000	< 8.0	< 8.0	< 8.0						
Aliphatic TPH >C35-C44	mg/kg		10.0											
Total Aliphatic Hydrocarbons	mg/kg		10.0											
Aromatic TPH >C5-C7	mg/kg	A+	0.01		12.5	< 0.010	< 0.010	< 0.010						
Aromatic TPH >C7-C8	mg/kg	A+	0.01	27900	834	< 0.010	< 0.010	< 0.010						
Aromatic TPH >C8-C10	mg/kg	A+	0.05	2210	613	< 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	C3779/23/E/5733			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			
Job Name	Longley Farm, Holmfirth								Exceeds SSV	Exceeds 2017, Below 2015	Below limit of detection (LOD)	
Date	14/10/2024			Sample Location	WS01	WS02	WS03					
Client	J&E Dickinson			Depth Top	0.20	0.50	0.50					
				Depth Base								
Determinand	Units	Ref	LOD	Commercial 1%								
Aromatic TPH >C10-C12	mg/kg	A+	1.0	12300	369	< 1.0	< 1.0	< 1.0				
Aromatic TPH >C12-C16	mg/kg	A+	2.0	41300	155	< 2.0	< 2.0	< 2.0				
Aromatic TPH >C16-C21	mg/kg	A+	10.0		28400	< 10	< 10	< 10				
Aromatic TPH >C21-C35	mg/kg	A+	10.0		28400	< 10	23.00	< 10				
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			7.30	7.30	7.00				
Sulphate (2:1 Water Soluble) as SO4	g/l		0.00125			0.02	0.09	0.03				
ACM Type			N/A									
Asbestos Identification	%					None detected	None detected	None detected				
ACM Detection Stage			N/A									
Moisture	%		0.01			15.00	18.00	20.00				
Soil Colour			N/A									
Other Material			N/A									
Soil Texture			N/A									
Sulphate (Total)	%		0.005									
Organic Matter	%		0.1			4.50	3.80	3.20				

Appendix 6

Fill Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Commercial Landuse

Tox Data Report No.	Compound	Commercial (mg/kg)				Reference
	<i>Metals</i>	1% SOM		6% SOM		
3	Cadmium	410		410		C
4	Chromium VI	19.7	49.1	19.7	49.1	B/C
	Copper	106000		106000		A+
7	Mercury	350.00		405.00		A/D
8	Nickel	1770		1770		A+
	Lead	2310		2310		C
	Zinc	1100000		1100000		A+
	Vanadium	7490		7490		A+
	<i>Semi and Non Metals</i>					
1	Arsenic	635		635		C
10	Selenium	13000		13000		A
	Free Cyanide	373		373		A
9	Phenols (total)	685		3170		A
	<i>Poly Aromatic Hydrocarbons</i>	Free product	No free product	Free product	No free product	
20	Naphthalene	75	90.1	432	1050	A+
	Acenaphthene	156.8	83600	106000		A+
	Fluorene	66500		72000		A+
	Anthracene	535000		544000		A+
	Fluoranthene	72200		72600		A+
	Pyrene	54100		54400		A+
	Benzo(a)anthracene	1.71	131	10.3	142	A
2	Chrysene	0.44	14000	2.64	14300	A
2	Benzo(b)fluoranthene	1.22	142	7.29	144	A
2	Benzo(k)fluoranthene	0.686	1430	4.12	1440	A
2	Benzo(a)pyrene	26.1	76.3	26.2	76.3	B/C
2	Dibenz(a,h)anthracene	0.00393	14.3	0.0236	14.4	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	142	0.368	144	A*
2	Benzo(g,h,i)perylene	0.0187	1440	0.112	1450	A*
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	327	4490	1100	29400	A+
	Aliphatic C6-C8	157	10400	769	98200	A+
	Aliphatic C8-C10	82.4	1370	476	14800	A+
	Aliphatic C10-C12	49.9	7900	297	69500	A+
	Aliphatic C12-C16	20.9	34000	126	139000	A+
	Aliphatic C16-C21	3620000		3620000		A+
	Aliphatic C21-C35	3620000		3620000		A+
	Aromatic C5-C7 (Benzene)	12.5		98		A+
	Aromatic C7-C8 (Toluene)	834	27900	4360	183000	A+
	Aromatic C8-C10	613	2210	3600	20800	A+
	Aromatic C10-C12	369	12300	2190	53800	A+
	Aromatic C12-C16	155	41300	65400		A+
	Aromatic C16-C21	28400		28400		A+
	Aromatic C21-C35	28400		28400		A+
	<i>Others</i>					
	pH	-		-		-
	Organic Content (%)	-		-		-
	Soluble Sulphate (mg/l)	-		-		-
	Total Sulphate (%)	-		-		-
	Asbestos	-		-		-
A = WS ATKINS PLC, ATRISK SOIL SCREENING VALUES BASED ON 1% SOIL ORGANIC MATTER						
A+ = Values updated June 2017.						
A* Atrisk's SSV is lower than Chemest'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 1% 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 7.95 should be used.						