

Ground Investigation Report

Former Happy Man Public House, Portway



Report Status

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Appendices Drawings > Exploratory Hole Logs > Laboratory Testing Results

Annexes Guidance Notes on: Risk Management Framework; and, Material Suitability

Appointment

Soil and Structures Ltd were instructed by Holdgate Consulting Ltd on behalf of Bafa Services Ltd (the Client) in February 2023 to prepare a Ground Investigation Report (*the Report*) to support the development of the site of the former Happy Man public house (*the Site*).

Development proposals include for construction of nine semi-detached three storey town houses and a block of eight apartments with associated hard-standing and soft landscaping areas.

Reliance on the advice presented herein rests solely with the Client.

Scope and Context

The Ground Investigation Report offers land quality and ground engineering advice with respect to the proposed development of the Site.

This intrusive ground investigation offers a snapshot of ground conditions at discrete locations across the Site and seeks to reconcile these findings with the Site setting to offer as complete a picture of the ground as possible. An assessment of the likely consistency of ground conditions is offered however, variations between exploratory hole positions cannot be ruled out.

The intrusive investigation fieldworks were supervised by the author of the Report.

The legal context of this advice relates to an assessment of:

- i) **Potential ground-related hazards that may affect the development** that is governed by health and safety law (various acts and regulations); and,
- ii) **The suitability of the Site for its proposed end use** that is rooted within national planning policy guidance (the National Planning Policy Framework) that is governed by planning law (various acts). The assessment of suitability is an assessment of specific, ground-related hazards; contamination and pollution.

Background to this Report

This Report is preceded by one ground-related report; a Phase 1 Desk Study & Geo-Environmental Appraisal prepared by Mugen Geo Ltd ref. MGEO 20 11 M22 1UB dated November 2020.

References

The Ground Investigation Report has been written with reference to various sources of information. These are either appended or included as footnotes at the base of each respective page.

Guidance notes on: i) the risk management framework adopted in the report; and, ii) material suitability are included as annexes. These are intended to offer further context and advice on these different aspects of site investigation and groundworks. Additional guidance and sources of information are referenced within them.

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SOIL AND
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1.0 The Site and Proposed Development

1.1 The Site

Location and size: The Site comprises a parcel of land approximately 0.30 ha in area located immediately north-west of Portway, Wythenshawe, Manchester. The grid reference for the Site is approximately 381767 E 387085 N.

Access: At the point of investigation, the Site was accessed on foot or by vehicle via a gated entrance off Portway to the south-east.

Topography: The surface topography of the Site is level with a small raised plinth (patio area) within the north-eastern corner of the Site.

Utilities: Below ground utilities are understood to be present beneath the Site with overhead lines crossing the rear portion of the Site.

Existing structures: At the point of the ground investigation fieldworks, the former Happy Man public house had been completely demolished with the former cellar removed with the resultant excavation left open and unfilled.

1.2 The Proposed Development

Development proposals: Development proposals include for construction of nine semi-detached three storey town houses and a block of eight apartments with associated hard-standing and soft landscaping areas (Figure 1).

Development works and risk: An appreciation of the construction processes is essential for development-related risk assessments given the groundworks stand to meaningfully alter the level of risk, e.g. potentially harmful soils being removed or moved by earthworks, or new slopes being formed.

In this scenario, the requirement for a Site strip of the existing hardstanding construction will see the Site returned to a natural soil formation outside of the former public house's footprint.

To enable this development, the following groundworks are likely to be required, N.B. listing is outline only.

- > **Demolition:** Demolition of the former public house and removal from Site together with excavation and removal of the former cellar;
- > **Preparation:** Site strip of hard-standing areas and removal from Site;
- > **Earthworks:** filling operations (up to c. 2.5 m) are expected to be required to bring formation levels up across the former cellar footprint.
- > **Utility Excavations:** Excavation of drainage and other utility alignments.
- > **Foundation Excavations:** Excavation of foundation alignments for the new dwellings.
- > **Surfacing:** Formation of new hard-standing and soft landscaping areas.

Risk profile of the proposed development for human health: The proposed development is considered to be a more sensitive end use with the Site being developed from a former commercial end use. Access to private gardens means residents stand to come into contact with any residual soils remaining below garden areas.

It is noted that some proposed garden areas are located over the former cellar footprint resulting in the soils underlying these gardens being whatever material is placed as part of the development works; for which the contractor will have control over the quality of these soils.



Figure 1: Development plan

- > Extract from appended Proposed Platform Site Plan.
- > INSERT >>> Location plan pre-demolition

2.0 Site Setting

The Site setting is summarised within the existing Phase 1 Desk Study & Geo-Environmental Appraisal prepared by Mugen Geo Ltd ref. MGEO 20 11 M22 1UB dated November 2020. In conclusion, this report states (key statements highlighted in green-blue text):

“Based on the past history of the site the probability of contamination being present sufficient to affect the identified existing receptors is considered to be a low risk. The site was undeveloped until the construction of the existing building and car park. The current uses of the site were considered to have been a low risk of causing pollution or transferring contaminants beyond the confines of the site. The future site usage as identified in the prepared development is likely to be low risk in the absence of a significant contamination source. The site comprises the existing building and surrounding hardstanding which it is assumed will have been laid upon a thin horizon of placed aggregate. Natural soils are therefore assumed to underlie the site at shallow depth and that, in order to develop the site, most/ all of the demolition materials and hardstanding will be removed from site prior to development. Further investigation can be undertaken to reduce uncertainty and risk but ultimately these risks cannot be entirely eliminated. However, in commissioning further investigation the cost to benefit of doing so must be considered. It is not “suspected” that the site is contaminated to an extent that it could adversely affect the proposed development and / or create new pollutant linkages. On this basis, an intrusive investigation in respect of contamination is considered not to be necessary. ...”

It is also noted that Conditions 11 and 13 of Manchester City Council’s planning Decision Notice relate to ground conditions. At the point of issue, no consultation response to the Phase 1 Desk Study was available for review.

Condition 11 sets out the requirement to investigate and where necessary, test the viability of drainage to ground as part of the proposed drainage strategy.

Condition 13 sets out the requirement to investigate the risks to human health and the wider environment posed by potentially harmful or polluting material that may reside on the Site. The condition ultimately seeks to confirm that the development can be deemed ‘suitable for use’.

The condition also sets out the requirement for the scope of any investigation works to be agreed in advance with the Local Planning Authority. In this instance, given both the conclusions of the Phase 1 Desk Study and planned development works (reductions in level to natural soils or else, filling using selected materials) the scope of the ground investigation was not issued for prior approval.

3.0 Intrusive Investigation and Laboratory Testing

The intrusive investigation (Table 1) was designed in general accordance with guidance for site investigation^{1,2,3}, with reference to the Site setting and responding to the revealed ground conditions.

The locations of the exploratory holes are illustrated on the Ground Model drawings in Section 5.0.

Table 1: Scope and Rationale of the Intrusive Investigation

Activity	Ref.	Rationale
Inspection of existing excavations opened up by the developer	-	To confirm the ground conditions across the Site.
3 window sample boreholes	WS101 to WS103	To confirm the ground conditions across the Site and permit sample recovery.
9 dynamic cone penetration tests	DCP101 to DCP109	To investigate of the density of the shallow soils across the Site
Logging of soil arisings from exploratory holes.	-	To characterise ground conditions and support classification of materials present in the ground. Material descriptions are detailed in the notes on the Ground Model in Section 5.0, the accompanying exploratory hole logs and strata depths on the plan itself.

Two geotechnical samples were obtained for to confirm the plasticity, soluble sulphate and pH of the Till deposits.

No environmental samples were obtained given the lack of evidence of potentially harmful or polluting material and development proposals.

Ground gas monitoring was not undertaken for reasons set out within Section 6.0.

4.0 Ground Conditions

Anticipated ground conditions: Based on the Site setting the presence of four main materials were anticipated across the Site: (1) Made Ground deposits consisting of construction materials associated with the hard-standing areas and demolition of the former public house; (2) Till deposits underlain by; (3) a weathered Bollin Mudstone Member likely encountered from shallow depths (within 3.0 m of the surface) based on local borehole records in the same geological units (50 m to the north). In addition to these main materials, (4) Alluvium deposits were anticipated within the former pond.

Revealed ground conditions: The intrusive investigation undertaken on Site confirmed the anticipated conditions with no variations and four notable observations:

- > Observation 1: Weathered mudstone and siltstone was encountered within 2.0 m of the Site surface;
- > Observation 2: Alluvium was confirmed within the former pond alignment to depths of 1.8 m below ground level (where investigated);
- > Observation 3: The Till and weathered bedrock were found to be ‘practically impermeable’ (very low permeability) holding surface water at varied depths. and,
- > Observation 4: The weathered bedrock (Bollin Mudstone Member) is prone to rapid loss of strength when exposed to water.

The Ground Model for the Site is presented in Section 5.0 and includes further commentary on the ground conditions.

¹ Code of practice for site investigations. BS 5930 (2015)
² Investigation of potentially contaminated sites - code of practice. BS 10175 (2011)+2017
³ Guidance on investigation for ground gas - Permanent gases and Volatile Organic Compounds. BS 8576 (2013)

Photograph 1 – Texture of Bollin Mudstone (siltstone)



Photograph 3 – Texture of the Alluvium within former pond



Photograph 4 – Existing trial hole position illustrating hardstanding construction (brick sets below sub-base and running coarse) and surface water ponding in Till



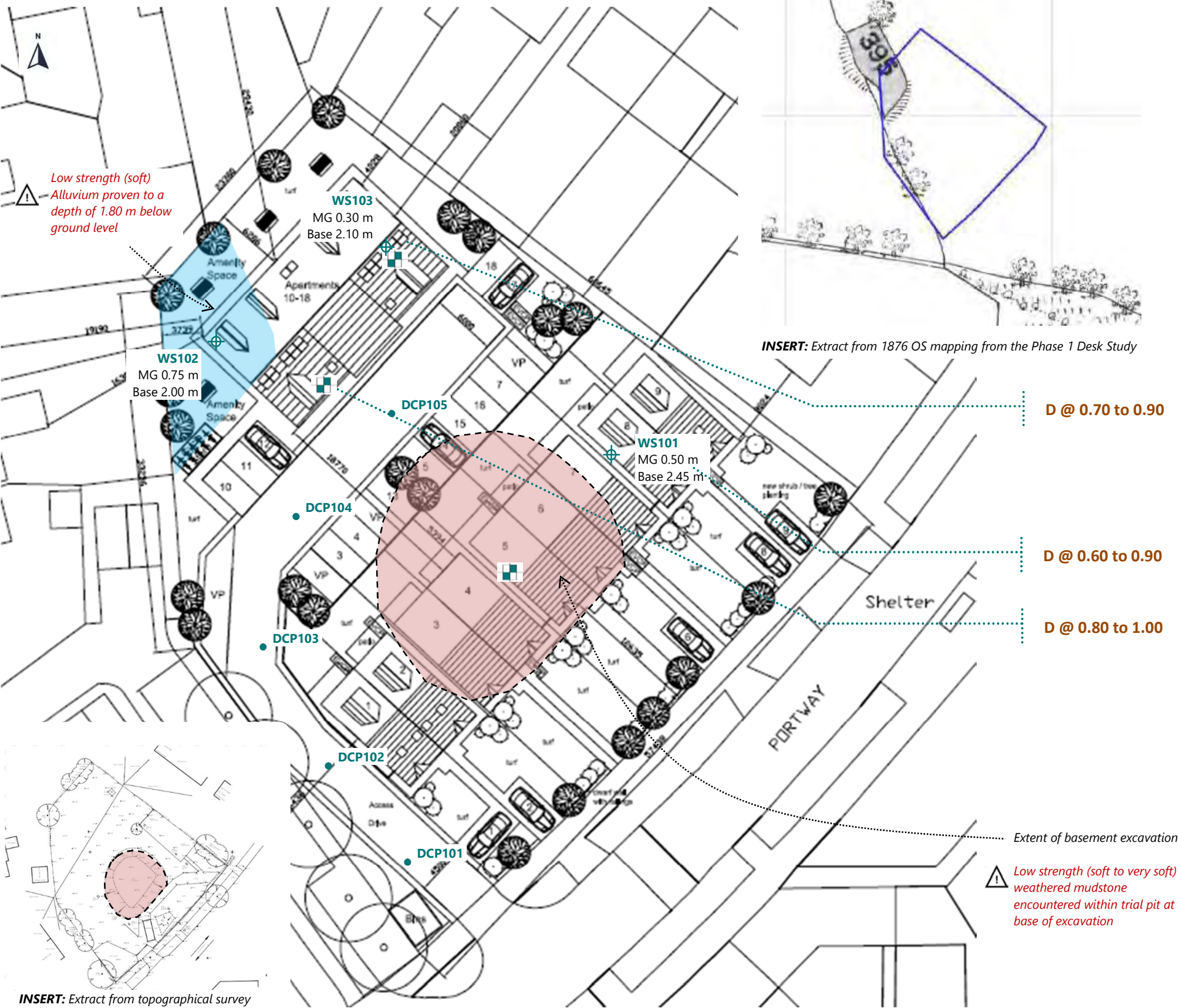
Photograph 2 – Texture of the Till



Photograph 5 – Stitched panorama looking east towards the former public house and former cellar alignment



5.0 Ground Model – Plan



Key	
	Machine excavated trial pit (by others)
	Window sample borehole
	MG – depth of Made Ground
	Base – depth to base of hole (refusal)
	Dynamic cone penetration (TRL probe)
	Small disturbed sample (geotechnical)

Geotechnical Commentary

> **Made Ground** deposits were present across the Site and comprised either; i) hardstanding construction including an unbound brick sub-base; ii) re-worked natural soils (WS101 and WS102); or, iii) residual demolition arisings across the footprint of the former public house;

> **Till** deposits were present across the Site and only really distinguishable from the underlying weathered bedrock by the presence of rounded gravel and a generally orangeish colouration.

The Till tested as a low to medium plasticity clay soil (low volume change potential) with low levels of sulphate (22.7 to 104 mg/l) and slightly alkaline pH (8 to 8.8).

> **Bollin Mudstone Member** deposits were encountered at shallow depths across the Site (1.70 to 1.80 m below ground level) and characterised by extremely weak to very weak light reddish brown and light grey interbedded siltstone and mudstone.

Where exposed and wetted within the trial hole at the base of the excavation for the former cellar, the mudstone was found to be soft to very soft.

> **Groundwater** was not encountered in any of the exploratory holes however standing water was noted within open excavations.

Environmental Commentary

> No visual or olfactory evidence potentially harmful or polluting material was encountered on the Site or within any of the exploratory holes.

> No evidence of degradable material was encountered within the exploratory holes.

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6.0 Risk Management – Hazard Screening and Preliminary Risk Assessment

Hazard Screening	Indicators?	Action	Commentary
Geological Hazards			
Collapsible soils	No	Responsive	No evidence of Blown Sand revealed on Site or deep Made Ground (>2.5 m) (ref. Section 2.0, 4.0 and 5.0).
Compressible soils	Yes	Assess risk	Evidence of compressible soils revealed on Site within the former pond (ref. Section 2.0, 4.0 and 5.0).
Ground dissolution	No	Responsive	No evidence of rocks liable to dissolution revealed on Site (ref. Section 2.0, 4.0 and 5.0).
Running sand	No	Responsive	No evidence of fine sand dominated soils revealed on Site (ref. Section 2.0, 4.0 and 5.0).
Sensitive clays	Yes	Assess risk	Evidence of ‘plastic’ soils revealed on Site (ref. Section 4.0 and 5.0).
Slope instability	Yes	Assess risk	Existing slopes on Site within former cellar excavation (ref. Section 1.0, 4.0 and 5.0).
Natural ground gas	Yes	Assess risk	Evidence of alluvial soils on Site within the former pond (ref. Section 2.0, 4.0 and 5.0).
Radon	Yes	Responsive *	< 1 % of ‘dwellings’ above the action level (ref. Section 2.0). * See Preliminary Risk Assessment on following page for further information.
Aggressive geology	No	Responsive	Based on the author’s experience, Till deposits and the Bollin Mudstone Member test with low sulphate levels with near neutral pH (typically in the range 6 to 8).
Hydrogeological & Hydrological Hazards			
River and sea flooding	No	Seek advice	Flood zone 1 with no defences (ref. Section 2.0).
Surface water flooding	No	Seek advice	Localised low risk surface water flooding risk identified on the Site (ref. Section 2.0).
Groundwater flooding	No	Seek advice	No groundwater encountered within 1.0 m of the ground surface in winter – groundwater flooding potential predicted to be low / below ground.
Watercourses	No	Seek advice	No evidence of a watercourse (open or culverted) on Site (ref. Section 2.0).
Historical Hazards			
Contamination (on-site)	No	Responsive	No evidence harmful material encountered as part of fieldworks (ref. Section 4.0 and 5.0).
Contamination (off-site)	No	Responsive	Residential land uses surround the Site with very low potential for ‘cross-contamination’ (ref. Section 2.0).
Pollution (waters)	No	Responsive	No evidence of historic activities that may have resulted in polluting material being introduced into the soils or potentially polluting material (ref. Section 2.0, 4.0 and 5.0).
Landfill gas	No	Responsive	No landfills or infilled land within 250 m of the Site and no degradable material encountered in ground as part of fieldworks (ref. Section 2.0, 4.0 and 5.0).
Mining (incl. mine gas)	No	Responsive	No evidence of coal or non-coal mining activities below the Site (ref. Section 2.0).
Sub-surface structures	No	Responsive	No below ground structures, e.g. basements, are understood to remain on Site (ref. Section 4.0 and 5.0).
Unexploded ordnance	No	Responsive	No evidence of military land use on Site or evidence of bomb damage on Site or immediately surrounding the Site on post-war ordnance survey mapping (ref. Section 2.0).
Archaeological interests	No	Seek advice	No evidence of mapped archaeological features on Site.
Utilities (above or below)	Yes	Seek advice	Evidence of buried and overhead utilities on Site (ref. Site observations).
Ecological Hazards			
Sensitive land uses	No	Seek advice	The Site is not designated as statutory sensitive land use, e.g. SSSI (ref. Section 2.0).
Invasive species	Possibly	Seek advice	No obvious signs of non-native invasive species, e.g. Japanese Knotweed, revealed on Site – winter working (ref. Site observations). This does not represent an ecological survey.
Protected species	Possibly	Seek advice	Evidence of potential habitats present on Site, e.g. hedgerows and trees (ref. Site observations). This does not represent an ecological survey.

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Preliminary Risk Assessment	Risk	Outline detail of action <i>N.B. responsibility rests with the Contractor for the implementation of any responsive action</i>
Geological Hazards		
Collapsible soils	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of fine sand is encountered in the ground.
Compressible soils	Low	Localised risk: Risk mitigation: Deepening of foundations locally to the former pond.
Ground dissolution	Low	No further action: No evidence of rocks liable to dissolution revealed on Site.
Running sand	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of fine sand or silt is encountered in the ground.
Sensitive clays	Low	Site wide risk: Risk mitigation: Design of foundations based on a low volume change potential within the Till deposits.
Slope instability	Moderate / Low	Localised risk: Risk mitigation: Engineer design of filling operations across the former cellar alignment to include: benching of fill into the surrounding natural soils with step heights of no more than 300 mm and step depths of no less than 600 mm to reduce the likelihood of below ground slip surfaces remaining in the ground (that could result in localised ground movement)
Natural ground gas	Moderate / Low	Localised risk: Precautionary risk mitigation: The inclusion of sub-floor ventilation achieving 'very good' ventilation and a continuous damp proof membrane will serve as inherent ground gas protection meeting the requirements of an Amber 1 classification ⁴ of the Site. <i>The footprint of the former pond is located across the western portion of the proposed apartment block (Section 5.0). The pond was confirmed to be around 2.0 m (1.80 m) deep locally to the apartment block and included 'grey with light grey and light brown mottled very silty fine SAND with small pockets of silt' over 'a thin (0.40 m) layer of 'soft dark grey silt with a slight organic (natural) odour' overlying weathered bedrock. Based on these descriptions, this material is expected to have a very low ground gas generation potential⁵. Furthermore, the planned development of this portion of the Site and formation of trench fill foundations through the former pond will serve to effectively create a physical barrier against the migration and ingress of gas from the wider pond area resulting in an event smaller volume of material with the potential to generate ground gases residing beneath the proposed structure. Taken together the risk presented to the proposed development from natural ground gases is considered to be low however, in lieu of gas monitoring data, it is recommended that the ground gas regime is increased to Amber 1 as a precautionary measure.</i>
Radon	Low	No further action: No requirement for radon protection within proposed dwellings. <i>The proposed use of suspended beam and block flooring that will incorporate sub-floor ventilation and a continuous damp proof membrane will serve as inherent ground gas protection.</i>
Aggressive geology	Low	Site wide risk: Risk mitigation: DS-1 and AC-1 classification recommended in all soils encountered as part of this investigation.
Historical Hazards		
Contamination (on-site)	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of potentially harmful material is encountered in the ground. Advisory note: <i>All soft landscaping areas should be taken down through any residual Made Ground deposits and formed on the underlying natural clay soils. For soft landscaping areas planned over the excavation for the former cellar it is recommended that the formation soils beneath the soft landscaping areas comprise Site-won natural clay over any deeper fill deposits (possibly also Site-won clay) before Topsoil is laid down.</i> Advisory note: <i>Imported soils (all sources) will need to be confirmed as being 'suitable for use' as set out within the Local Planning Authority's guidance⁶</i>
Contamination (off-site)	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of potentially harmful or polluting material is observed around boundary of the Site, e.g. stained, discoloured or odorous soils.
Pollution (waters)	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of potentially harmful material is encountered in the ground
Landfill gas	Low	See note above relating to natural ground gas.
Mining (incl. mine gas)	Low	Site wide risk: Responsive action: Responsive: Notify Engineer of any evidence of marked changes of ground conditions (colour, composition, 'softness')
Sub-surface structures	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of below ground sub-structures, e.g. wells or cellars, is encountered in the ground.
Unexploded ordnance	Low	Site wide risk: Responsive action: Notify Engineer if any evidence of rounded metal or glass objections are revealed in the ground.

⁴ <https://www.nhbc.co.uk/binaries/content/assets/nhbc/products-and-services/tech-advice-and-guidance/guidance-on-evaluation-of-development-proposals-on-sites-where-methane-and-carbon-dioxide-are-present.pdf>

⁵ *Guidance on investigation for ground gas - Permanent gases and Volatile Organic Compounds. BS 8576 (2013)*

⁶ [Contaminated Land | Manchester City Council](#)

7.0 Conclusions and Recommendations

Based on available information and the scope of this Report the Site ground conditions are considered to be: i) well-correlated against the anticipated ground conditions; and, ii) consistent in nature (shallow Made Ground consistent with former use of the Site and shallow bedrock profile).

7.1 Conclusions

In conclusion, the Ground Investigation Report finds that;

- > **The overall risk rating** for the ground is generally 'low' with the greatest risk ('moderate / low') highlighted against slope instability and natural ground gas both of which are considered to be readily mitigated with basic risk mitigation measures.

Further investigation is not recommended.

Risk mitigation is recommended as detailed in Section 7.2.

- > **Excavations** are expected to be progressed at typical rates through the surfacing, Made Ground, Till and weathered bedrock deposits employing a medium sized excavator, e.g. 3CX with any bucket.

Excavations themselves are generally unlikely to warrant short-term temporary support however, if left open, are expected to be subject to water retention and rapid softening. Localised instability within the Alluvium deposits within the former pond may occur. Deeper excavations (> 1.20 m) are also unlikely to require support (unless taken through any placed fill) however any personnel access into excavations should only be undertaken with adequate support. Further guidance is available⁷.

In general, pumps are likely to be required to remove groundwater from excavations due to the very low permeability of the Till and weathered bedrock. Further guidance is available⁸.

- > **Earthworks (cut and fill)** are required as part of the proposed development including; a Site-wide reduction in levels, and filling of the excavation for the former cellar.

The specification for the filling operations will be subject to the foundation solution (see advice hereafter).

- > **Material suitability for re-use (geotechnical and environmental).**

The Made Ground deposits are expected to be variably graded and therefore generally not recommended for re-use in load bearing situations unless inspected and confirmed to be suitable by the Engineer (as noted above)

The Till and weathered bedrock deposits present on Site are expected to fall under Class 2 material (stony cohesive, general fill). Again, inspection of their suitability by the Engineer is recommended in advance of their use as a fill.

For material re-use as an engineering or load-bearing fill the Engineer's approval will be required. Additional testing may be required to confirm grading and where necessary, a compaction regime if placed in load bearing situations, e.g. beneath ground bearing floor slabs or behind retaining walls.

For all scenarios, developing a strategy for management of materials/soils in advance of the works is advised to minimise handling and maintain soil conditioning.

- > **Waste classification of excavation arisings** for any material surplus to requirements (requiring disposal) will need to be agreed with the groundworks contractor in line with current guidance⁹.

Natural soils excavated are expected to be classed as Soil and Stones (EWC 20 02 02) if requiring disposal off Site. The shallow Made Ground, if requiring disposal, appears to comprise a mix of construction products and re-worked natural soils that, overall, are likely to fall into the EWC 20 02 02 classification however, this would need to be confirmed by the groundworks contractor.

- > **Foundations:** The presence of weathered, intact shallow bedrock deposits (within 2.0 m of the surface) will offer 'good' support to shallow foundations.

Foundation options are open but are likely to be guided towards the adoption of spread footings formed within the shallow Bollin Mudstone Member bedrock deposits that, across the proposed development footprint are expected to be encountered at depths of around 1.50 m below ground level.

It is understood that initial discussions with the preferred contractor were guided towards the adoption of rafted foundations. Whilst a technically viable solution, the use of rafts will place a greater onus on the need for high levels of quality control on the filling operations required across the excavation for the former cellar as well as deepening of downstands locally to the former pond that, similar in the same way as strip footings, would necessitate deeper excavation locally to this feature.

For centrally loaded linear strips, formed at a depth of 1.50 m below ground level within the stiff Tiff / extremely weak mudstone/siltstone a presumed bearing capacity of 125 kN/m² could be adopted as part of the design. If and where deepened to a depth of 2.00 m below ground level, a presumed bearing capacity within the extremely weak to very weak mudstone of 160 kN/m² could be adopted.

Attention should be given to:

- > The need for deeper formations across the former cellar with specific attention given to the trial pit position that will require localised deepening of footings to this feature given the presence of water-softened mudstone;
- > Limiting the duration excavations are left open to mitigate against the formation soils softening and loosing strength that is expected to occur over a period of days;
- > Ensuring filling operations across the excavation for the former cellar are completed in such a manner as to ensure that re-excavation through the fill can be completed safely and practically (minimising the potential for collapse). Partial filling of the excavation to limit the depth of excavations for proposed foundations could be considered with blockwork making up the residual depth of the footing; and,
- > Selecting formation depths that take into account the proximity to existing and planned trees and vegetation noting the Till deposits have a low volume change potential.

If and where rafts are selected, then an engineering specification for the filling operations across the excavation for the former cellar and former pond will be required that is expected to be guided towards an end product specification achieving a similar level of stiffness to the surrounding soils. Based on the findings of this investigation, the Till deposits were found to have an undrained shear strength of around 75 kN/m² (firm to stiff clay) at a depth of 1.0 m below ground level that loosely correlates with a CBR value of 5 %.

⁷ CIRIA Report 97 - Trenching Practice - Second Edition (1992)

⁸ CIRIA Report No C515 Groundwater Control (2001)

⁹ [Waste classification technical guidance - GOV.UK](#)

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- > **Floor slabs** will need to be suspended given either; the presence of variably thick Made Ground deposits beneath the infilled excavation for the former cellar or, the low strength Alluvium beneath the apartment block.

Alternatively, if and where rafted foundations are adopted, the consideration could be given to bringing Site levels up with suitable fill to a set specification to ensure an even and suitable stiffness beneath the rafts.

- > **Buried concrete** placed in all soils encountered as part of this investigation is recommended to be designed to suit DS-1 AC-1 classifications¹⁰. Groundwater should be regarded as 'static'.
- > **Hard-standing** sub-grades or formations will comprise orangeish brown or light reddish brown sandy gravelly CLAY (Till).

Based on the revealed ground conditions and Dynamic Cone Penetration testing (Figure 2) it is considered likely that CBR value of at least 4.0 % will be achieved across the Site in this material.

In general, treatment of the sub-grade is unlikely to be required however proof rolling is generally advised to locate soft and hard spots allowing for targeted treatment through excavation and replacement with a suitable granular fill.

Attention should be given to not keeping the Till sub-grade exposed to inclement weather given this material is expected to rapidly soften and loose strength under these conditions.

- > **Drainage** of the former Site is expected to be controlled by drainage into the former piped network. For the proposed development, given the presence of very low permeability soils and rocks beneath the Site, it is recommended that the drainage is piped off the Site at rates to be agreed with the Local Planning Authority.

For completeness, the shallow Till and weathered bedrock deposits (light reddish brown and light grey mudstone and siltstone) are expected to have permeabilities in the range of 10^{-6} to 10^{-10} m/s.

- > **Water supply pipes** will likely be laid within shallow subsoil or re-worked natural soil deposits that, being natural are considered to present a low risk to water supply pipes.

No testing of the soils was undertaken given: i) the low likelihood for the ground to include potentially polluting material (Section 2.0); ii) the lack of potentially polluting material identified as part of the intrusive investigation; and, iii) new water supply pipes being formed within natural clay soils (Till).

Whilst considered unlikely, if and where unexpected material is encountered in the ground (not described herein) additional testing or the precautionary use of barrier pipe should be considered.

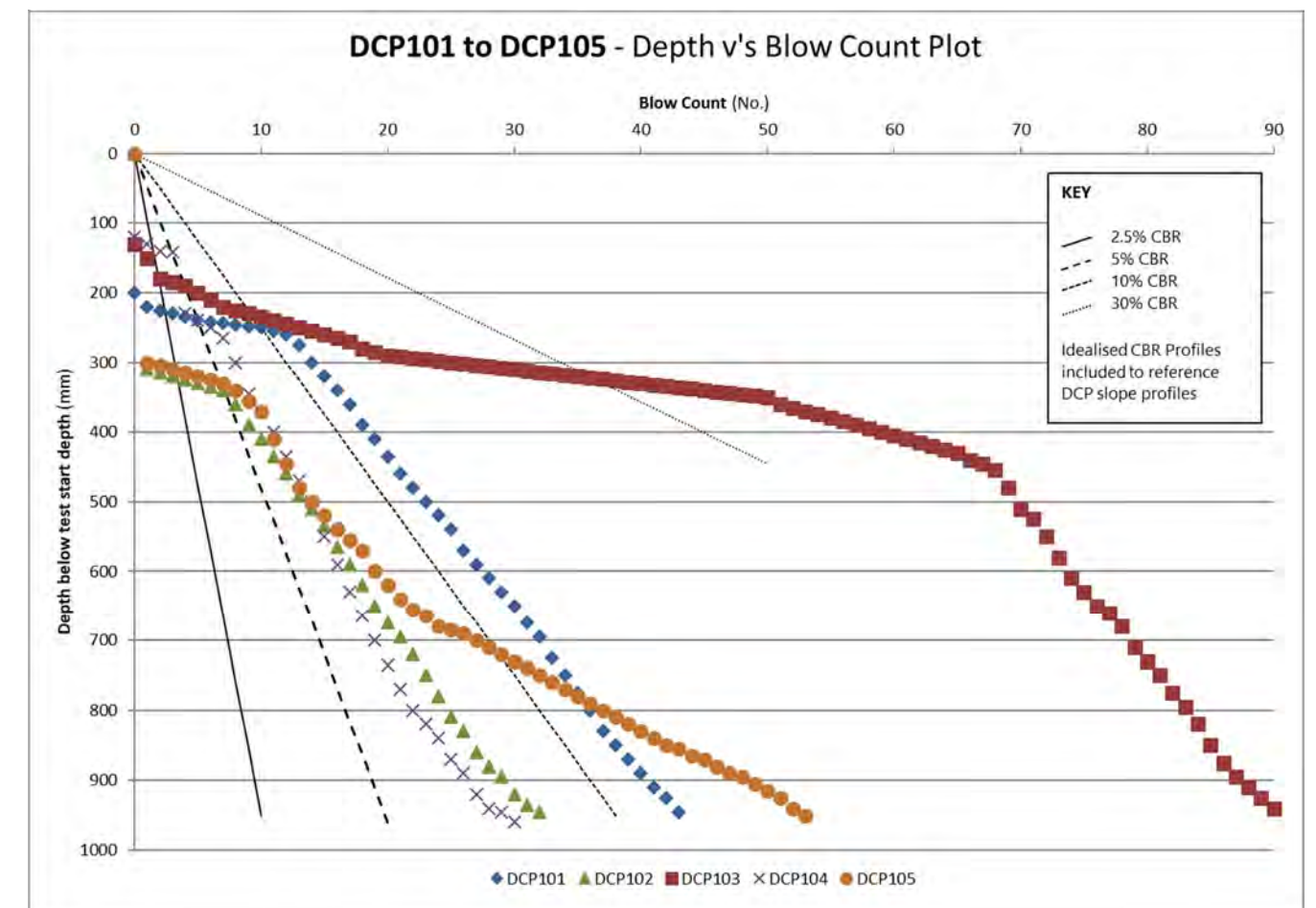


Figure 2: Dynamic Cone Penetration traces (locations illustrated on the plan in Section 5.0)

- > **Soft landscaping** can be designed in accordance with the architect or landscape architect's specification subject to the following:
 - > Formation soils for the soft landscaping are proven to be natural clay soils; either in-situ or placed as part of filling operations (that are expected to be limited across the planned soft landscaping areas);
 - > It is recommended that imported Topsoil required for the soft landscaping is sourced from a reputable supplier and tested 'at source' to confirm its suitability for use. The suitability of the imported Topsoil should be confirmed in line with the local planning authority's guidance¹¹ and the chemical quality of the soils tested at a frequency as set out with the local planning authority's guidance and compared against Generic Assessment Criteria for a residential with homegrown produce.

⁵ [4.2 Building near trees - NHBC Standards 2021](#)

¹⁰ [BRE Special Digest 1 \(2005\) Concrete in aggressive ground. 3rd Edition. \(2017\)](#)

¹¹ [Contaminated Land | Manchester City Council](#)

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7.2 Recommendations

Recommended follow-on work includes:

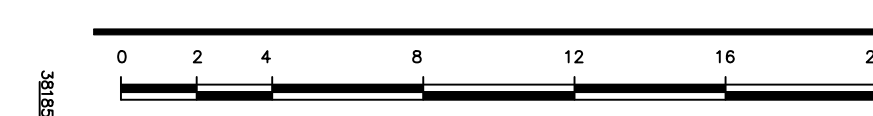
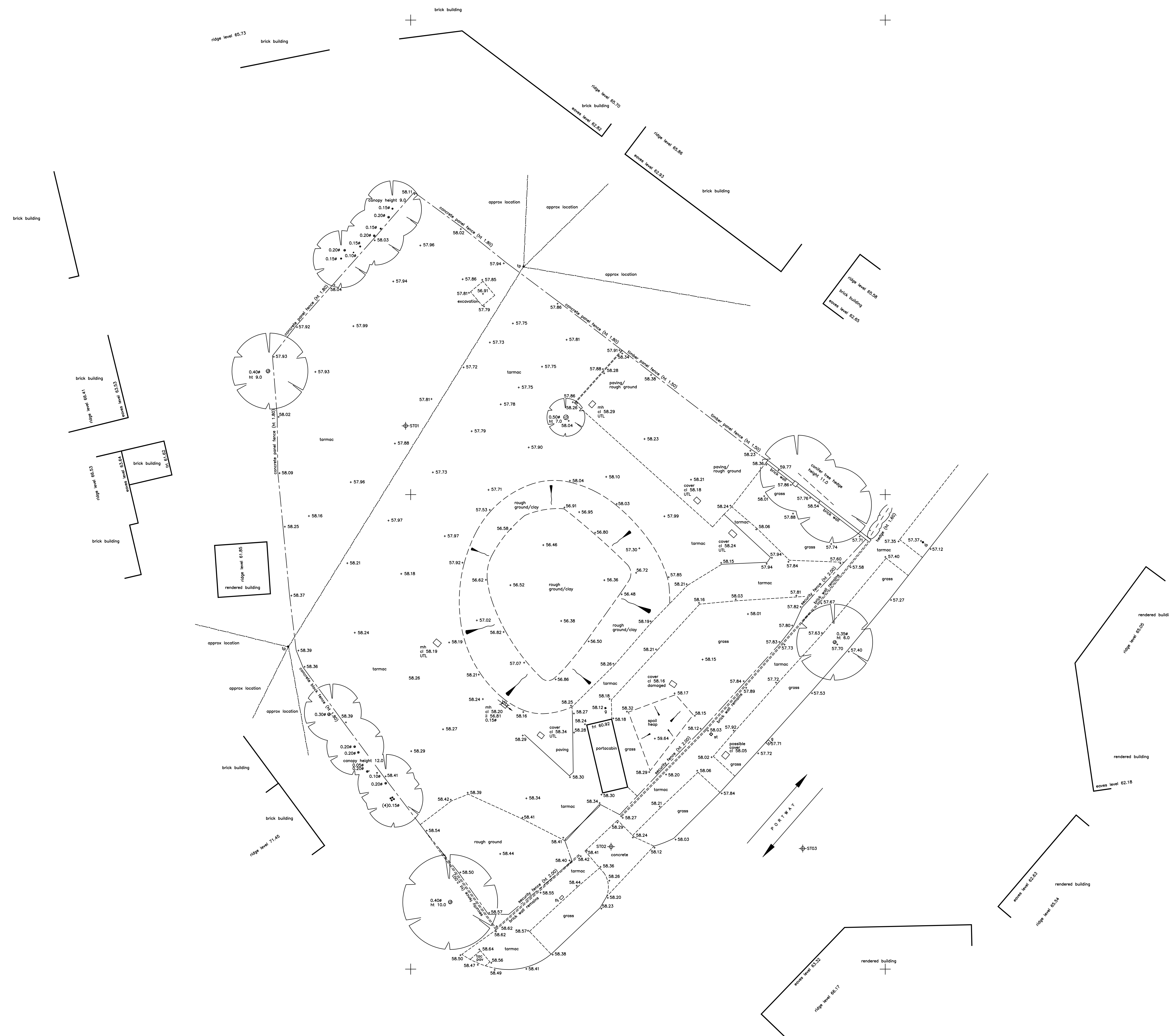
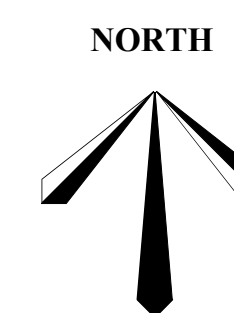
1. [Review of the risk register](#) and engineering advice in the conclusions herein;
2. [Submission of the Ground Investigation Report](#) to the project design team and, where necessary, the local planning authority and other stakeholders;
3. [Risk mitigation](#):
 - > **Localised risk**: Engineer design of filling operations across the former cellar alignment to include: benching of fill into the surrounding natural soils with step heights of no more than 300 mm and step depths of no less than 600 mm to reduce the likelihood of below ground slip surfaces remaining in the ground (that could result in localised ground movement); and,
4. [Precautionary risk mitigation](#):
 - > **Localised risk**: natural ground gas: provision of ground gas protection measures in line with Amber 1 classification. Based on this classification, independent inspection is not considered to be necessary however, it is recommended that plot-by-plot photographs of both the sub-floor ventilation and the continuously sealed damp proof membrane are obtained for inclusion within the Validation Report (discussed below).

Further ground-related reporting is expected to be required in the form of a **Validation Report** confirming that the above risk mitigation measures has been completed successfully.

It is also noted that, if and where [unexpected material](#) is encountered in the ground (not described herein) that is suspected to include potentially harmful or polluting material, e.g. stained soils or suspected asbestos containing material, then the advice of the Engineer should be sought with any responsive remedial works agreed with the Local Planning Authority in advance of works re-commencing in the area the material was encountered.

Photographic diary of the groundworks: *It is recommended that a photographic record of the groundworks is maintained to document the physical condition and nature of the ground conditions across the Site. This will serve as a valuable record for the project as well as any future planned works on the Site.*

10) = hept	α = seven	α = off
11) = oct	α = eight	α = off
12) = nov	α = eleven	α = off
13) = dec	α = ten	α = off
14) = undec	α = eleven	α = off
15) = duode	α = twelve	α = off
16) = tri	α = three	α = off
17) = tetra	α = four	α = off
18) = penta	α = five	α = off
19) = hexa	α = six	α = off
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24) = undeca	α = eleven	α = off
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105) = duode	α = twelve	α = off
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114) = undeca	α = eleven	α = off
115) = duode	α = twelve	α = off
116) = tri	α = three	α = off
117) = tetra	α = four	α = off
118) = penta	α = five	α = off
119) = hexa	α = six	α = off
120) = hepta	α = seven	α = off
121) = octa	α = eight	α = off
122) = nona	α = nine	α = off
123) = deca	α = ten	α = off
124) = undeca	α = eleven	α = off
125) = duode	α = twelve	α = off
126) = tri	α = three	α = off
127) = tetra	α = four	α = off
128) = penta	α = five	α = off
129) = hexa	α = six	α = off
130) = hepta	α = seven	α = off
131) = octa	α = eight	α = off
132) = nona	α = nine	α = off
133) = deca</		

[illegible]

General Notes

Do not scale from this drawing. It is used as a guide only.
Copyright exists on all drawings and drawing should not be copied without the consent of P.N. Bakes Architectural Consultancy.

Drawing to be read in conjunction with all relevant Specifications and other Consultants drawings.

All dimensions and levels to be checked on site prior to commencement. Any discrepancies to be notified to PN Bakes Architectural Consultancy Immediately.

of Practice and meet current Building Regulations.

Ref.	Revision	Date
------	----------	------

F - EV/CP shown on layout.

G - Apartments reduced / redrawn. Aug. 21

~~space standards.~~ Nov. 21

~~K - Apartments and car parking amended. Dec. 22~~

Legend

EVCP Charging Point fixed to

dwelling
Free Standing Commercial

EVCP	Electric Vehicle Charging Unit
EVCP	Electric Vehicle Charging Unit

with two charging sockets.



Exploratory Hole Log
WS101

SOIL AND
STRUCTURES

Project Details

Name Happyman PH, Portway
Reference 20282

Dates & Weather

Start 20.02.2023
End 20.02.2023
Weather Overcast; 5 to 10 deg

Operations

Contractor Soil and Structures Ltd
Plant Hand held window sampler
Logger RB

Engineer's Log

Depth		Water	Material	Description	Samples	In-Situ Testing
mbgl	mAOD					
0.0	0.00			MADE GROUND: Soft light reddish brown and light grey mottled slightly sandy CLAY with low cobble content. Sand is fine. Cobbles are half and whole bricks. [RE-WORKED NATURAL SOILS]		
0.1						
0.2						
0.3						
0.4						
0.5	0.50			Soft light reddish brown and light grey mottled slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium angular to sub-rounded mixed natural lithologies. [SUSPECTED TILL]		
0.6						
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4						
1.5						
1.6						
1.7	1.70					
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5	2.45					
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
4.1						
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4.5						
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4.7						
4.8						
4.9						
5.0						
5.1						
5.2						
5.3						
5.4						
5.5						
5.6						
5.7						
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						

Exploratory Hole Dimesions

Diameter 0.08 m
Backfill Arisings

Notes

Stability Stable
Groundwater None encountered
Termination Refusal of hand held window sampler
In-Situ Testing None undertaken.

Material Key

Topsoil
Granular
Bedrock
Made Ground
Cohesive
Void

Exploratory Hole Log
WS102

SOIL AND
STRUCTURES

Project Details

Name Happyman PH, Portway
Reference 20282

Dates & Weather

Start 20.02.2023
End 20.02.2023
Weather Overcast; 5 to 10 deg

Operations

Contractor Soil and Structures Ltd
Plant Hand held window sampler
Logger RB

Engineer's Log

Depth		Water	Material	Description	Samples	In-Situ Testing
mbgl	mAOD					
0.0	0.00			MADE GROUND: Black asphalt over unbound, aligned bricks		
0.1						
0.2						
0.3	0.30			Soft orangeish brown sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium angular to sub-rounded mixed natural lithologies. [SUSPECTED RE-WORKED NATURAL SOILS]		
0.4						
0.5						
0.6						
0.7	0.75			Soft grey with light grey and light brown mottling silty fine SAND with silt pockets (up to 50 mm) [SUSPECTED ALLUVIUM]		
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4	1.40			Soft dark grey slightly sandy SILT with slight natural organic odour [SUSPECTED ALLUVIUM]		
1.5						
1.6						
1.7						
1.8	1.80			Light grey completely to very weathered SILSTONE recovered as sandy very gravelly very stiff clay. Gravel is fine to medium angular corestones. Scraping/slow to progress drill. [BOLLIN MUDSTONE MEMBER]		
1.9						
2.0	2.00					
2.1				Purpose: Targetting former pond.		
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
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5.7						
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5.9						
6.0						
6.1						
6.2						
6.3						

Exploratory Hole Dimesions

Diameter 0.08 m
Backfill Arisings

Notes

Stability Stable
Groundwater None encountered
Termination Refusal of hand held window sampler
In-Situ Testing None undertaken.

Material Key

Topsoil
Granular
Bedrock
Made Ground
Cohesive
Void

Exploratory Hole Log
WS103

SOIL AND
STRUCTURES

Project Details

Name Happyman PH, Portway
Reference 20282

Dates & Weather

Start 20.02.2023
End 20.02.2023
Weather Overcast; 5 to 10 deg

Operations

Contractor Soil and Structures Ltd
Plant Hand held window sampler
Logger RB

Engineer's Log

Depth		Water	Material	Description	Samples	In-Situ Testing
mbgl	mAOD					
0.0	0.00			MADE GROUND: Black asphalt over unbound, aligned bricks		
0.1						
0.2						
0.3	0.30			Stiff light reddish brown and light grey mottled very sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium angular to sub-rounded mixed natural lithologies. [SUSPECTED TILL]		
0.4						
0.5						
0.6						
0.7	0.70			Light grey completely to very weathered SILSTONE recovered as sandy very gravelly stiff clay with gravel being corestones. Scraping/slow to progress drill. [BOLLIN MUDSTONE MEMBER]	D @ 0.70 to 0.90	
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4						
1.5				1.50 m ... becoming very stiff		
1.6						
1.7						
1.8						
1.9						
2.0						
2.1	2.10					
2.2				Purpose: General coverage of Site.		
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5						
3.6						
3.7						
3.8						
3.9						
4.0						
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5.8						
5.9						
6.0						
6.1						
6.2						
6.3						

Exploratory Hole Dimesions

Diameter 0.08 m
Backfill Arisings

Notes

Stability Stable
Groundwater None encountered
Termination Refusal of hand held window sampler
In-Situ Testing None undertaken.

Material Key

Topsoil
Granular
Bedrock
Made Ground
Cohesive
Void

Calculation Sheet

Dynamic Cone Penetration (TRL)

SOIL AND STRUCTURES

Project Details

Name	Happy Man Public House, Portway, Wythenshawe
Reference	20282

Test Dates

Start	20.02.2023
End	20.02.2023

Weather

Preceding 24 hrs	Light rain showers, 5 to 10 degrees celcius
During testing	Overcast, 5 to 10 degrees celcius

Test Method

Method	Dynamic Cone Penetration (TRL)
Guidance	Design Manual for Roads and Bridges Volume 7 Section 3 Part 2 HD 29/08

Analysis

CBR Conversion	TRL correlation given in guidance above.
-----------------------	--

$$CBR = 10^{(2.48 - 1.057 \cdot \log_{10} P)}$$

Where P= penetration in mm

General Notes

1. Where 'deflection' is reported this relates to the rods being moved >10° off vertical
2. All results after the 'deflection' is noted are highlighted orange - use with caution
3. Where 'deflection' is reported as the test end, this relates to the rods being moved >20° off vertical
4. Where 'ceased' is reported this relates to needing to abandon the test due to external factors, e.g. vehicle movement
5. Data up to 50 blows is tabled with full dataset graphed - full dataset available on request

Author	Russell Bowman BSc (Hons) MSc CEng CWEM MCIWEM
---------------	---

Signed	
---------------	---

Calculation Sheet

Dynamic Cone Penetration [TRL]

SOIL AND STRUCTURES

Test Details

Test Ref.	DCP101	DCP102	DCP103	DCP104	DCP105					
Test depth	GL	GL	GL	GL	GL					
Chainage	10	20	30	40	50					
Offset	N/A	N/A	N/A	N/A	N/A					
Deflection	No	No	No	No	No					
Test End	End	End	End	End	End					
End Depth	945	945	940	960	950					

Test Results

Blow No.	DCP101	DCP102	DCP103	DCP104	DCP105					
0	200	> 25 blows	130	120	> 25 blows					
1	220	310	150	130	300					
2	225	315	180	140	305					
3	230	320	185	142	310					
4	235	325	190	230	315					
5	240	330	200	240	320					
6	242	335	210	250	325					
7	244	340	220	265	330					
8	246	360	225	300	340					
9	248	390	230	345	355					
10	250	410	235	370	370					
11	255	435	240	400	410					
12	260	460	245	435	445					
13	275	490	250	470	480					
14	300	510	255	500	500					
15	320	535	260	550	520					
16	340	565	265	590	540					
17	360	590	270	630	555					
18	390	620	280	665	570					
19	410	650	285	700	600					
20	435	675	290	735	620					
21	460	695	292	770	640					
22	480	720	294	800	655					
23	500	750	296	820	665					
24	520	780	298	840	680					
25	540	810	300	870	685					
26	570	830	302	890	690					
27	590	860	304	920	700					
28	610	880	306	940	710					
29	630	895	308	945	720					
30	650	920	310	960	730					
31	675	935	312		740					
32	695	945	314		750					
33	725		316		760					
34	750		318		770					
35	775		320		780					
36	800		322		790					
37	830		324		800					
38	850		326		810					
39	870		328		820					
40	890		330		830					
41	910		332		840					
42	925		334		850					
43	945		336		855					
44			338		865					
45			340		870					
46			342		880					
47			344		890					
48			346		895					
49			348		905					
50			350		915					

Calculation Sheet

Dynamic Cone Penetration [TRL]

SOIL AND STRUCTURES

Test Details

Test Ref.	DCP101	DCP102	DCP103	DCP104	DCP105					
Test depth	GL	GL	GL	GL	GL					
Chainage	10	20	30	40	50					
Offset	N/A	N/A	N/A	N/A	N/A					
Deflection	No	No	No	No	No					
Test End	End	End	End	End	End					
End Depth	945	945	940	960	950					

CBR Conversions

Blow No.	DCP101	DCP102	DCP103	DCP104	DCP105					
0										
1	12.7	55.1	12.7	26.5	#VALUE!					
2	55.1	55.1	8.3	26.5	55.1					
3	55.1	55.1	55.1	145.1	55.1					
4	55.1	55.1	55.1	2.7	55.1					
5	55.1	55.1	26.5	26.5	55.1					
6	145.1	55.1	26.5	26.5	55.1					
7	145.1	12.7	26.5	17.3	55.1					
8	145.1	8.3	55.1	7.0	26.5					
9	145.1	12.7	55.1	5.4	17.3					
10	145.1	10.1	55.1	10.1	17.3					
11	55.1	10.1	55.1	8.3	6.1					
12	55.1	8.3	55.1	7.0	7.0					
13	17.3	12.7	55.1	7.0	7.0					
14	10.1	10.1	55.1	8.3	12.7					
15	12.7	8.3	55.1	4.8	12.7					
16	12.7	10.1	55.1	6.1	12.7					
17	12.7	8.3	55.1	6.1	17.3					
18	8.3	8.3	26.5	7.0	17.3					
19	12.7	10.1	55.1	7.0	8.3					
20	10.1	12.7	55.1	7.0	12.7					
21	10.1	10.1	145.1	7.0	12.7					
22	12.7	8.3	145.1	8.3	17.3					
23	12.7	8.3	145.1	12.7	26.5					
24	12.7	8.3	145.1	12.7	17.3					
25	12.7	12.7	145.1	8.3	55.1					
26	8.3	8.3	145.1	12.7	55.1					
27	12.7	12.7	145.1	8.3	26.5					
28	12.7	17.3	145.1	12.7	26.5					
29	12.7	10.1	145.1	55.1	26.5					
30	12.7	17.3	145.1	17.3	26.5					
31	10.1	26.5	145.1		26.5					
32	12.7		145.1		26.5					
33	8.3		145.1		26.5					
34	10.1		145.1		26.5					
35	10.1		145.1		26.5					
36	10.1		145.1		26.5					
37	8.3		145.1		26.5					
38	12.7		145.1		26.5					
39	12.7		145.1		26.5					
40	12.7		145.1		26.5					
41	12.7		145.1		26.5					
42	17.3		145.1		26.5					
43	12.7		145.1		55.1					
44			145.1		26.5					
45			145.1		55.1					
46			145.1		26.5					
47			145.1		26.5					
48			145.1		55.1					
49			145.1		26.5					
50			145.1		26.5					



Russell Bowman
Soil and Structures Limited
89 Moorhead Lane
Shipley
BD18 4JW

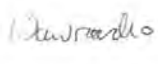
i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: russell@soilandstructures.co.uk

Analytical Report Number : 23-21842

Project / Site name:	Happyman PH, Porway, Wythenshawe	Samples received on:	23/02/2023
Your job number:	20282	Samples instructed on/ Analysis started on:	09/03/2023
Your order number:		Analysis completed by:	14/03/2023
Report Issue Number:	1	Report issued on:	03/04/2023
Samples Analysed:	3 soil samples		


Signed:

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

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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: 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

Lab Sample Number				2610314	2610315	2610316
Sample Reference				WS101	WS103	TP 102
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60-0.90	0.70-0.90	0.80-1.00
Date Sampled				20/02/2023	20/02/2023	20/02/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	16	14
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5	8.8	8
Total Sulphate as SO ₄	%	0.005	MCERTS	0.059	0.016	0.017
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.1	0.023	0.026
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	104	22.7	26.2
Total Sulphur	%	0.005	MCERTS	0.035	0.009	0.009

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

Analytical Report Number : 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

* 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 *
2610314	WS101	None Supplied	0.60-0.90	Brown clay.
2610315	WS103	None Supplied	0.70-0.90	Brown clay.
2610316	TP 102	None Supplied	0.80-1.00	Brown clay.

Analytical Report Number : 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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
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.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-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.



Russell Bowman
Soil and Structures Limited
89 Moorhead Lane
Shipley
BD18 4JW

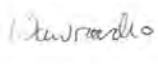
i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: russell@soilandstructures.co.uk

Analytical Report Number : 23-21842

Project / Site name:	Happyman PH, Porway, Wythenshawe	Samples received on:	23/02/2023
Your job number:	20282	Samples instructed on/ Analysis started on:	09/03/2023
Your order number:		Analysis completed by:	14/03/2023
Report Issue Number:	1	Report issued on:	03/04/2023
Samples Analysed:	3 soil samples		


Signed:

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

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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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: 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

Lab Sample Number				2610314	2610315	2610316
Sample Reference				WS101	WS103	TP 102
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60-0.90	0.70-0.90	0.80-1.00
Date Sampled				20/02/2023	20/02/2023	20/02/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	16	14
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5	8.8	8
Total Sulphate as SO ₄	%	0.005	MCERTS	0.059	0.016	0.017
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.1	0.023	0.026
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Analytical Report Number : 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

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2610315	WS103	None Supplied	0.70-0.90	Brown clay.
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Analytical Report Number : 23-21842

Project / Site name: Happyman PH, Porway, Wythenshawe

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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
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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.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-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.

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Soil and Structures Limited
Client Address: 89 Moorhead Lane, Shipley, BD18 4JW
Contact: Russell Bowman
Site Address: Happyman PH, Portway, Wythenshawe

Client Reference: 20282
Job Number: 23-21844-1
Date Sampled: 20/02/2023
Date Received: 23/02/2023
Date Tested: 27/03/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

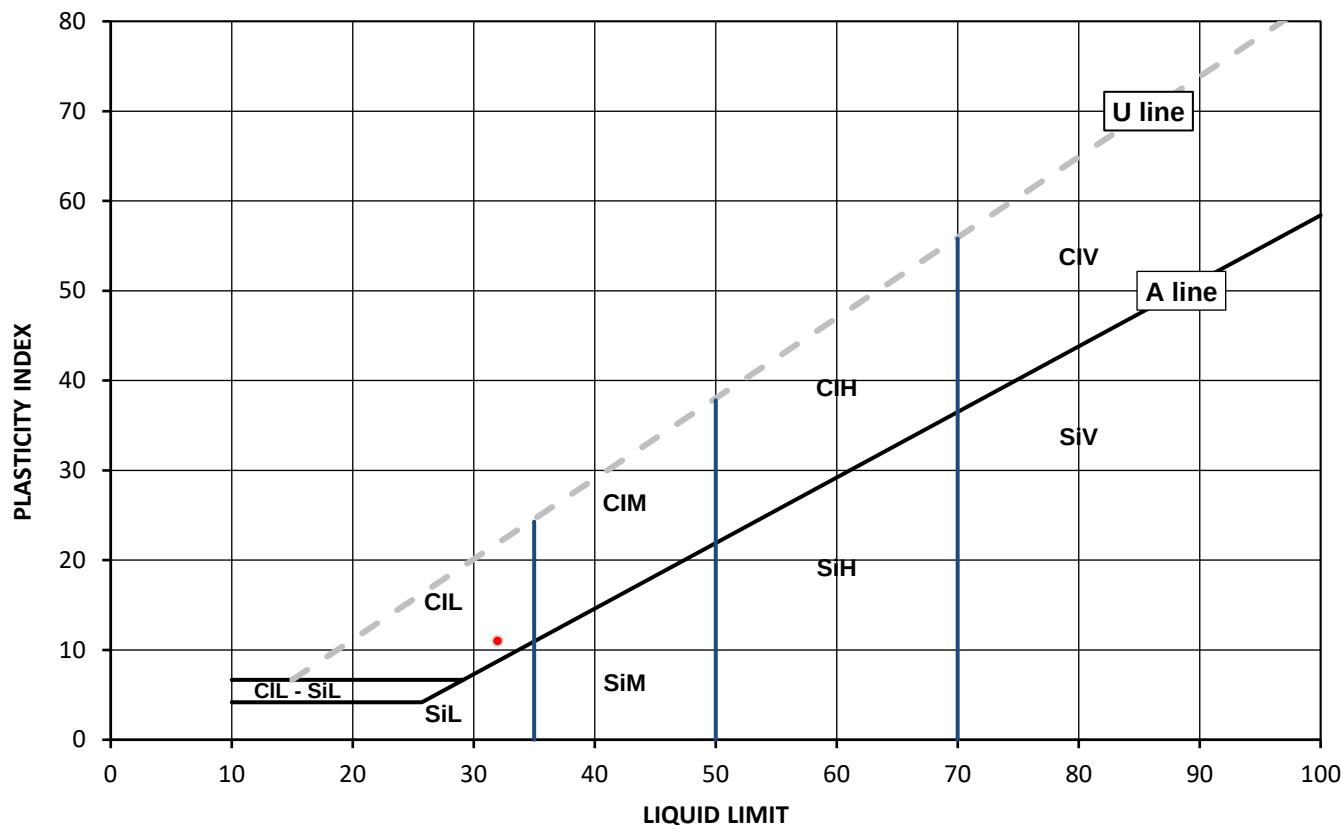
Test Results:

Laboratory Reference: 2610352
Hole No.: WS101
Sample Reference: Not Given
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 0.60
Depth Base [m]: 0.90
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
21	32	21	11	82



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

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i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Soil and Structures Limited
Client Address: 89 Moorhead Lane, Shipley, BD18 4JW
Contact: Russell Bowman
Site Address: Happyman PH, Portway, Wythenshawe

Client Reference: 20282
Job Number: 23-21844-1
Date Sampled: 20/02/2023
Date Received: 23/02/2023
Date Tested: 27/03/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

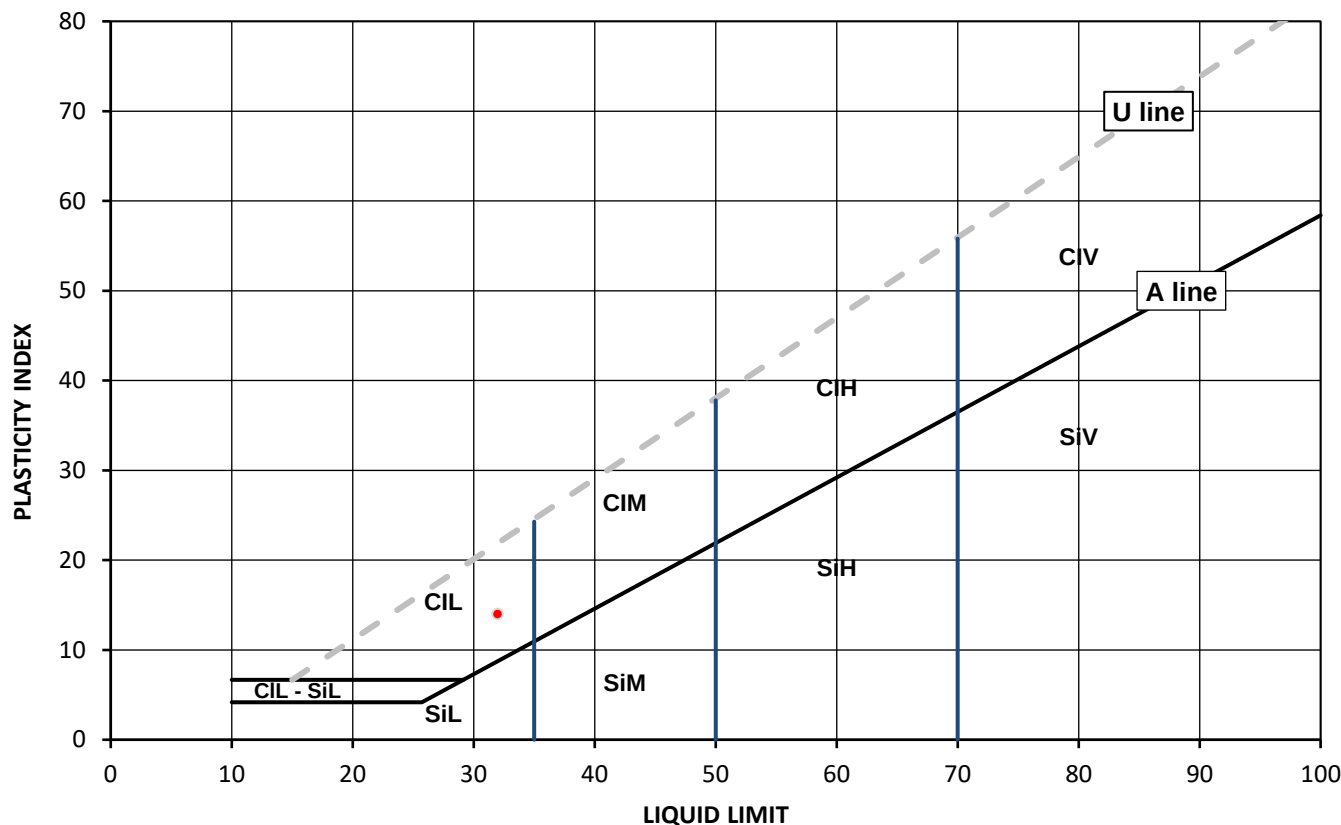
Test Results:

Laboratory Reference: 2610353
Hole No.: WS103
Sample Reference: Not Given
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 0.70
Depth Base [m]: 0.90
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20	32	18	14	98



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Soil and Structures Limited
Client Address: 89 Moorhead Lane, Shipley, BD18 4JW
Contact: Russell Bowman
Site Address: Happyman PH, Portway, Wythenshawe

Client Reference: 20282
Job Number: 23-21844-1
Date Sampled: 20/02/2023
Date Received: 23/02/2023
Date Tested: 27/03/2023
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

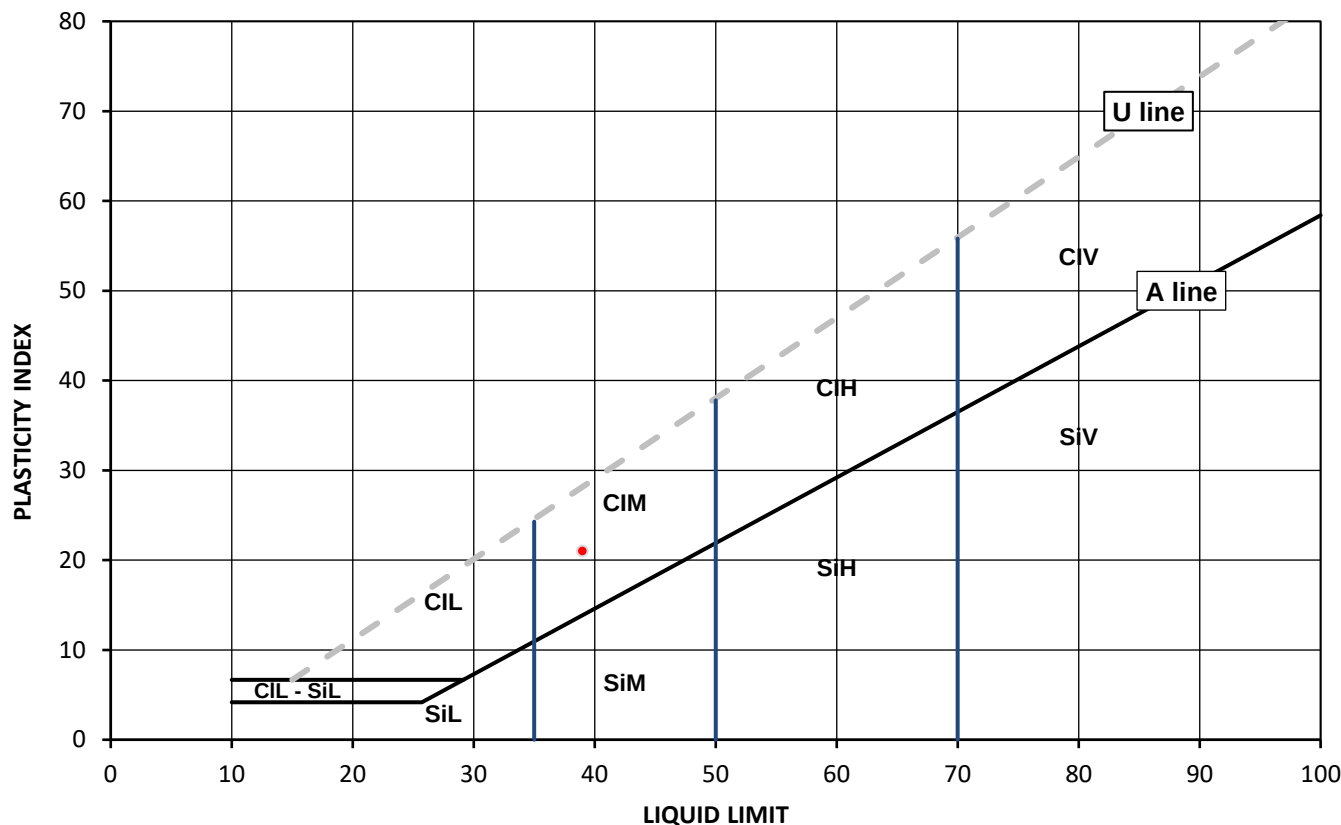
Test Results:

Laboratory Reference: 2610354
Hole No.: TP 102
Sample Reference: Not Given
Sample Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 0.80
Depth Base [m]: 1.00
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20	39	18	21	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Client: Soil and Structures Limited

Water Content by BS 1377-2:1990: Clause 3.2
Atterberg by BS 1377-2: 1990:
Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

Client Reference: 20282

Client Address: 89 Moorhead Lane, Shipley,
BD18 4JW

Job Number: 23-21844-1

Date Sampled: 20/02/2023

Date Received: 23/02/2023

Contact: Russell Bowman

Date Tested: 27/03/2023

Site Address: Happyman PH, Portway, Wythenshawe

Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-2 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m															
2610352	WS101	Not Given	0.60	0.90	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	21		82	32	21	11						
2610353	WS103	Not Given	0.70	0.90	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	20		98	32	18	14						
2610354	TP 102	Not Given	0.80	1.00	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	20		99	39	18	21						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel

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Reporting Specialist
for and on behalf of i2 Analytical Ltd

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4041

Client: Soil and Structures Limited

Client Address: 89 Moorhead Lane, Shipley,
BD18 4JW

Contact: Russell Bowman

Site Address: Happyman PH, Portway, Wythenshawe

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

Client Reference: 20282

Job Number: 23-21844-1

Date Sampled: 20/02/2023

Date Received: 23/02/2023

Date Tested: 27/03/2023

Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2610352	WS101	Not Given	0.60	0.90	D	Brown slightly gravelly very sandy CLAY		21	Sample was quartered, oven dried at 106 °C			
2610353	WS103	Not Given	0.70	0.90	D	Brown slightly gravelly very sandy CLAY		20	Sample was quartered, oven dried at 106 °C			
2610354	TP 102	Not Given	0.80	1.00	D	Brown slightly gravelly sandy CLAY		20	Sample was quartered, oven dried at 106 °C			

Comments:

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Signed:

Katarzyna Koziel

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

General Guidance on Material Suitability

Suitability (in general): A *soil* becomes a *material* once excavated. This Guidance Note advice with respect to the suitability of soils to remain on Site and the suitability of materials recovered from Site.

The materials are given preliminary classifications based on those set out within the Manual of Contract Documents for Highways Works¹.

Geotechnical suitability: If and where earthworks (cut and fill) are planned as part of the works then strength and compaction testing is typically recommended to inform the earthworks specification. Subject to the earthwork design details being finalised, it is common for additional geotechnical testing, e.g. compaction testing, to be recommended to confirm suitability.

Chemical suitability: Chemical suitability is assessed in the context of the historical and geological setting of the Site as well as against the proposed end use of the Site. This assessment forms a core part of the current planning framework as laid out within the Environment Agency's Land Contamination Risk Assessment guidance².

General Guidance on Materials Management

Materials management: In general, once material is excavated from the ground it could be deemed a 'waste' unless it has a specified use. This also applies to materials intended for re-use on Site.

For natural materials, re-use on Site is generally not regulated apart from in specific scenarios.

For non-natural deposits (Made Ground) additional protocols need to be followed (CL:AIRE Code of Practice³) to demonstrate that the material is suitable for re-use and therefore, not a waste.

¹ Manual of Contract Documents for Highways Works, Volume 1 Specification for Highway Works – Series 600 Earthworks (2016)

² [Land contamination risk management \(LCRM\) - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/444444/LCRM.pdf)

³ CL:AIRE The Definition of Waste: Development Industry Code of Practice Version 2 (2011)

Risk Management Framework

The **Hazard Screen** is first stage of risk management; establishing whether a hazard exists (that could present a risk). The hazards considered in this Report cover four broad, ground-related categories; geological, hydrogeological and hydrological, historical and ecological, further detail on which is presented in the annex on 'Background threat'.

Preliminary Risk Assessment is the second stage of risk management; establishing if the risk presented by the identified hazard is acceptable or not and, if not, what action is required to either further assess or reduce this risk. The assessment adopted within this Report includes three levels of risk rating (Low, Medium or High) rating to support focus on the content of the assessment. This approach is based on a simplified version of that outlined within CIRIA document C552 with the same underlying philosophy carried through; assessing both the consequence and likelihood of an incident manifesting.

Unexpected encounters can arise even where lines of evidence indicate a hazard is not present. The appointed Contractor is advised to have in place response plans for dealing with such occurrences.

The figure below illustrates the sequential stages of risk management adopted within this Report.

