WML CONSULTING

Civil, Structural and Geotechnical Engineers

Geo-Environmental Investigation & Assessment

For a site at

Woodhouse Lane, Wythenshawe

Undertaken for

Wythenshawe Community Housing Trust

Report No. 11047G-WML-XX-ZZ RP-G-0002

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WML CONSULTING
Civil, Structural and Geotechnical Engineers

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Executive Summary

Site Location	The site comprises land off Woodhouse Lane, Wythenshawe, Manchester. It is centred on approximate Ordnance Survey National Grid Reference 382799E, 387374N with an indicative postcode of M22 9TF.
Development Proposals	The project involves the construction of a three-storey residential apartment structure. External areas are to include hardstanding for access and parking to the south-east and very localised soft landscaped amenity space.
Ground Conditions	Ground conditions encountered during the intrusive investigation generally comprised a surface horizon of topsoil underlain by made ground to depths of between 0.50 and 2.50mbgl, locally underlain by glacial till and in turn by the Bollin Mudstone Member to maximum proven depth of 3.70mbgl.
Site Preparation and Earthworks	Significant buried concrete/brick obstructions associated with former structures are not envisaged. However, if such are encountered, these will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings. Such materials removed as part of the clearance work, subject to appropriate screening and crushing, will be suitable for re-use as bulk fill beneath hard cover areas. Construction near any retained trees and importantly within any RPA's should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'. Site enabling works will need to take account of the integrity of any existing/adjacent services at the site. No significant earthworks are anticipated, unless basement areas are to be excavated. In consideration of the size of the site area, it is anticipated that any site won excavated soils would need to be removed to an appropriate facility.
Foundations	Based on the thickness of the made ground and in consideration of potential loadings for the new three storey structure the use of more traditional foundations would be rendered impracticable. Therefore, it is anticipated that a piled foundation solution will be the most suitable option for the three storey-structure at the site. Piles will need to be taken down through the made ground and any soft cohesive soils and into the underlying competent Bollin Mudstone Member. Pile design should assume no side support (skin friction) for the pile sections surrounded by made ground or soft/incompetent soils. For preliminary considerations, a pre-cast driven concrete pile would minimise waste soil arisings but potential noise and vibration effects may render this option unsuitable. Therefore, a bored pile solution is likely to be the most appropriate solution for the site. Alternatively, the potential to increase the bearing pressure of the cohesive soils could be achieved through the use of rigid inclusions. This technique utilises the installation of high deformation modulus columns to increase the bearing pressure whilst also reducing settlements, minimising waste arisings and limiting vibration effects on surrounding structures. It has been indicated that foundations can then be designed utilising a bearing pressure of up to 200kN/m^2 supported on the engineered ground. In consideration of the thickness of the made ground it is anticipated that new floor slabs would be suspended.
New Pavements	New road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3.0% in untreated made ground and natural cohesive strata.
Soakaways	In consideration of the cohesive nature of the natural soils together with the limited external site area, soakaways are not considered a feasible drainage option for the site.
Concrete Classification	The typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.
Ground Contamination	The test results indicate that the shallow soils do not pose a significant or widespread risk to human health. However, a direct contact pollution linkage will still exist in new landscaped areas and it is recommended that made ground exposed at the surface in such areas is removed or is covered by clean sub-soil and topsoil thus removing the pollution linkage. This

	will normally comprise a 600mm clean cover, with a minimum 150mm thickness of topsoil and 450mm thickness of sub-soil, over the existing made ground. The risk to controlled waters from the site are considered low with no environmental remediation considered necessary.
Ground Gas	No specific ground gas protection measures required.
Waste Soils	For preliminary guidance based on the current information, it is likely that made ground, would be classified as 'Non-hazardous' with natural soils classified as 'Inert' for landfill disposal. It will be the responsibility of the waste producer to undertake further testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines and Duty of Care requirements.

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1.0 INTRODUCTION

Appointment

1.1 WML Consulting has been commissioned by Wythenshawe Community Housing Trust (WCHT) to undertake a Geo-environmental Investigation and Assessment of a site located at the old British Legion off Woodhouse Lane in Wythenshawe.

Proposed Development

1.2 The project involves the construction of a three-storey residential apartment structure. External areas are to include hardstanding for access and parking to the south-east and very localised soft landscaped amenity space.

1.3 A copy of the current proposals are included within Appendix 01.

Objective

1.4 The objective of the ground investigation and assessment was to provide geotechnical recommendations for construction design purposes together with a geo-environmental risk assessment in terms of possible ground contamination.

1.5 To achieve the objective, the following tasks were undertaken:

- Review the existing desk study report for the site and design a Phase 2 Ground Investigation.
- Characterise the ground conditions in terms of geology, soil geotechnical parameters and ground contamination from information provided by the ground investigation.
- Provide recommendations regarding suitable foundations together with any other geotechnical considerations that could affect possible future development.
- Determine a ground conceptual model for the site so as to undertake a ground contamination Generic Quantitative Risk Assessment (GQRA).

Scope

1.6 A Phase 1 Desk Study for the site has been undertaken by WML and is presented in the following report:

- Phase 1 Desk Study and Preliminary Geoenvironmental Assessment, Reference 11047G-WML-00-XX RP-G-0001, dated April 2023.

1.7 This report includes the findings of a Phase 2 Ground Investigation designed on conclusions and recommendations within the Phase 1 Desk Study. For ease of reference, the findings of the Desk Study are summarised in the following sections. However, the two reports are not exclusive and should be read in conjunction.

1.8 The ground investigation comprised the formation of window sample probeholes undertaken with reference to BS5930:2015 + A1:2020 Code of Practice for Ground Investigation and BS10175:2011 together with A2:2020, "Investigation of Potentially Contaminated Sites - Code of Practice" except where superseded by EN ISO 22475-1 "Geotechnical Investigation and Assessment – Sampling by Drilling and Excavation and Groundwater Measurements".

1.9 Geotechnical soil testing was undertaken in general accordance with guidelines provided in BS1377:1990 – Parts 1-9, "Method of Test for Soils for Civil Engineering Purposes". Samples for chemical analysis were obtained and handled generally in accordance with the current guidelines (BS10175: 2011 and A2:2017).

2.0 SITE LOCATION AND DESCRIPTION

Site Location

2.1 The site comprises land off Woodhouse Lane, Wythenshawe, Manchester. It is centred on approximate Ordnance Survey National Grid Reference 382799E, 387374N with an indicative postcode of M22 9TF.

Site Description

2.2 At the time of the inspection in September 2022 the north-eastern section of the site comprised a generally level landscaped area with a picnic bench, which appears to be used by the adjacent office staff.

2.3 The landscaped areas is secured with a mix of low level knee board fencing within the site and a more secure brick and metal railing fence along Woodhouse Lane.

2.4 Topographical survey information for the site has been provided as part of the site location plan.

2.5 This indicates that the site is generally level at elevations of 57.33m Above Ordnance Datum (AOD) in the north-west to 57.65m AOD in the south-west although it is anticipated that this reflects the undulating nature of the site.

3.0 SUMMARY OF ENVIRONMENTAL AND HISTORICAL SETTING

3.1 The following paragraphs summarise the most relevant findings of the Phase 1 desk study report.

Geology

3.2 The BGS plans indicate that the site is underlain by the Devensian Glacial Till, indicated to mainly comprise clay locally interbedded with sands and gravels. The drift deposits are indicated to be underlain by the Triassic Bollin Mudstone Member.

Radon

3.3 The site is not in a Radon Affected Area as defined by the UK Health Security Agency were less than 1% of properties are above the Action Level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.

Mining and Subsidence

3.4 Risks to the development from subsidence relating to shallow, unrecorded abandoned mine workings are considered low and can be discounted. The risk from non-coal mining activity at the site is also considered low.

Environmental Setting

3.5 The bedrock underlying the site is classified as a 'Secondary B' Aquifer. The superficial strata is classified as a 'Secondary Undifferentiated' Aquifer.

3.6 The site is not within an Environment Agency Source Protection Zone, and no groundwater abstraction licenses are located within 500m. A northerly flowing surface watercourse is located 249m east, which is indicated to be culverted at its closest point, no further surface water features are indicated within 250m.

3.7 There are no active landfills located within 500m of the site or historic landfills within 250m of the site.

3.8 There are no petrol filling stations located within 250m of the subject site.

Site History

3.9 The earliest map dated 1876 indicates the site to comprise undeveloped agricultural land to the immediate north of Cedars House and gardens.

3.10 By 1954 the site had been developed as the Wythenshawe British Legion Club, with the main structure in the norther and central section. It is anticipated that the area of parking to the south became increasingly more developed as the ownerships of vehicles became more prevalent after the 1960's. The site then remained generally unmodified until around 2013 when the structure was demolished and the area landscaped in its current configuration.

3.11 The area surrounding the site has historically comprised undeveloped land in rural / agricultural use, with localised residential structures. By the 1960's Brownwood Hall (Brownwood Hall Church) had been constructed immediately north-east of the site and Brownley Green Secondary School, to the east of Woodhouse Lane. In later years the remaining areas were developed primarily with residential housing. Between the early 1970's and around 2010, the former Cedars House and gardens, to the south, was in use as a council depot/yard. However, around 2013 the depot had been redeveloped as a multi-storey office structure and car park, currently occupied by WCHT.

Preliminary Contamination Risk Assessment

3.12 The approach at the Phase 1 Desk Study stage was precautionary until such time as uncertainties in the conceptual model could be verified by appropriate site investigation.

3.13 However, based on the site history and the proposed development scenario, potential pollution linkages were considered low or unlikely with associated preliminary risks being assessed as very low to low.

3.14 Such uncertainties relate in the main to the potential for ACM and asbestos fibres to be present within shallow associated with demolition of the former structure.

4.0 SITE INVESTIGATION

Rationale

4.1 Intrusive investigations were undertaken primarily to provide geotechnical parameters for structural design purposes but also to verify the preliminary site conceptual model and clarify the low environmental risk.

4.2 Window sample probeholes were undertaken to provide information on near surface deposits and to obtain samples for chemical analysis and geotechnical testing. Due to the small diameter of the probing equipment, the depth of penetration achieved is dependent on favourable ground conditions. As such, ground penetration may be restricted in circumstances where the ground is particularly strong or contains relatively large obstructions such as cobbles and/or boulders.

4.3 Monitoring standpipes have been installed in probeholes for the measurement of groundwater levels.

4.4 Chemical analysis of a general suite of contaminants was undertaken on selected samples of soil. This was to clarify the expected contamination risk.

Intrusive Works

4.5 The ground investigations were undertaken by LOT Geotechnics Ltd on 20th April 2023. This comprised the formation of 5no window sample probeholes to a maximum depth of 3.70 metres below ground level (mbgl).

4.6 The exploratory hole records are presented in Appendix 02 of this report whilst the exploratory hole locations are shown on drawing 11047G-SK01 in Appendix 01.

Monitoring Standpipes

4.7 Monitoring wells for groundwater measurements were installed in 3 No. probeholes, as indicated on the logs presented in Appendix 02.

Geotechnical and Chemical Testing

4.8 In-situ geotechnical testing was undertaken at regular intervals during the formation of the window samples and boreholes in the form of Standard Penetration Tests (SPT's). The results for this testing are presented on the descriptive logs in Appendix 02.

4.9 Geotechnical soils testing was undertaken on selected samples for the following:

- Natural moisture content
- Liquid and Plastic limits.

4.10 The results of the geotechnical testing are presented in Appendix 03.

4.11 Chemical analysis was undertaken on selected soil samples for the following contaminants of concern:

- Total arsenic, boron, cadmium, chromium VI, copper, lead, mercury, nickel, selenium, vanadium, zinc.
- Total cyanide, phenols, sulphur, sulphate.
- Speciated USEPA polyaromatic hydrocarbons (PAH).
- Asbestos screen and identification.
- 2:1 water/soil sulphate extract, pH.

4.12 The results of the chemical analysis are presented in Appendix 04.

5.0 GROUND CONDITIONS

General

5.1 Ground conditions encountered during the intrusive investigation generally comprised a surface horizon of topsoil underlain by made ground to depths of between 0.50 and 2.50mbgl, locally underlain by glacial till and in turn by the Bollin Mudstone Member to maximum proven depth of 3.70mbgl.

Topsoil (Imported)

5.2 Topsoil Imported to form the landscaped area after demolition of the previous structure was encountered within all exploratory holes from ground level to depths of between 0.25 and 0.40mbgl.

5.3 The topsoil comprised dark brown, sandy, organic clay.

Made Ground

5.4 Made ground was encountered within the majority of exploratory holes from ground level to depths of between 0.50 and 2.50mbgl. The greater thickness are likely to represent infilled basements to historic structures.

5.5 Within WS01, WS02 and WS03 the made ground comprised brown, variably sandy and gravelly clay to depths of between 0.50 and 0.60mbgl.

5.6 Within WS04 and WS05 the made ground comprised brownish grey, sandy gravel to depths of between 1.60 and 2.10mbgl. Within WS05 this was underlain by greyish brown, slightly gravelly, sandy clay to a depth of 2.50mbgl. Gravel sized fragments generally comprised brick, sandstone and concrete.

5.7 SPT 'N' values undertaken within areas of deeper made ground recorded values ranging between 0 and 53 and indicates a harder upper horizon and a less compact deposits below depths of around 1.60m to 2.50mbgl within WS04 and WS05.

Glacial Till

5.8 Glacial till was encountered underlying the made ground within WS01, WS02 and WS03 from depths of between 0.50 and 0.60mbgl, extending to depths of between 1.10 and 1.60mbgl.

5.9 The glacial till generally comprised brown mottled, slightly gravelly, sandy clay with occasional thin sand bands. However, within WS03 the material comprised brown, slightly silty, sand with thin bands of clay.

5.10 A single SPT 'N' value within the cohesive glacial till of 9 indicated a generally firm consistency.

5.11 A single SPT 'N' value within the granular glacial till of 15 indicated a generally medium dense state of compaction.

Bollin Mudstone Member

5.12 Strata considered to represent the weathered Bollin Mudstone Member were encountered underlying the made ground or glacial till within all exploratory soils from depths of between 1.10 and 2.50mbgl, extending a maximum proven depth of 3.70mbgl.

5.13 The Bollin Mudstone Member strata initially comprised reddish brown, slightly silty, slightly sandy clay with mudstone lithorelicts, grading to extremely weak, highly weathered mudstone with depth.

5.14 SPT 'N' values within the Bollin Mudstone Member ranged between 7 and in excess of 50 indicating a generally locally soft to firm consistency, becoming the equivalent of a stiff to very stiff consistency.

Geotechnical Testing

5.15 Geotechnical testing undertaken on selected samples are summarised in the following table :

Test	Cohesive Made Ground	Cohesive Glacial Deposits
Natural Moisture Content	24%	16 – 21%
Liquid Limit	41%	26 – 41%
Plasticity Index	20% (Modified to 12.6%)	10 – 21% (Modified to 9.4 – 19.7%)
Atterberg Classification	Intermediate Plasticity	Low – Intermediate Plasticity

Visual/Olfactory Evidence of Contamination

5.16 No visual and/or olfactory evidence of significant ground contamination was identified within the exploratory holes during the investigation.

Groundwater

5.17 Perched groundwater was encountered during the formation of WS04 and WS05, within made ground at depths of 2.50mbgl.

5.18 It should be appreciated that the groundwater observations described above have been undertaken during a very short period of time. Significant variations in the long-term groundwater regime may occur at other times, particularly with prolonged, extreme weather conditions, and that no account can be taken of such in this report.

General

5.19 It should also be appreciated that ground conditions may vary between and away from the exploratory hole positions, and that no account can be taken in this report of such variations.

6.0 GEOTECHNICAL APPRAISAL

Site Preparation

6.1 Extensive historical foundations, ground floor slabs and other buried concrete/brick obstructions associated with former structures are not envisaged. However, if such are encountered, these will need to be broken out to suitable depths below formation levels where they are to impinge on the proposed buildings. Such materials removed as part of the clearance work, subject to appropriate screening and crushing, will be suitable for re-use as bulk fill beneath hard cover areas.

6.2 It is assumed that the current development configuration has been outlined in consideration of retained trees to the east of the site boundary and specifically Root Protection Areas (RPA) as would need to be determined by the landscape architect.

6.3 Notwithstanding this, construction near any retained trees and importantly within any RPA's should be undertaken with due regard to guidance provided in BS5837:2012 'Trees in relation to design, demolition and construction – recommendations'.

6.4 Site enabling works will need to take account of the integrity of any existing/adjacent services at the site.

6.5 No significant earthworks are anticipated, unless basement areas are to be excavated. In consideration of the size of the site area, it is anticipated that any site won excavated soils would need to be removed to an appropriate facility.

Foundations

6.6 Made ground and any soft / loose natural deposits should be considered unsuitable for the direct support of structural loads as they will be weak and compressible, leading to possibly unacceptable total and differential settlements.

6.7 In consideration of the depth of competent strata locally at depths of up to 2.50mbgl, it is anticipated that trench fill foundations would not provide a viable or economic foundation solution for the proposed new structure.

6.8 Therefore, based on the thickness of the made ground and in consideration of potential loadings for the new three storey structure the use of more traditional foundations would be rendered impracticable. Therefore, it is anticipated that a piled foundation solution will be the most suitable option for the three storey-structure at the site.

6.9 Piles will need to be taken down through the made ground and any soft cohesive soils and into the underlying competent Bollin Mudstone Member. Pile design should assume no side support (skin friction) for the pile sections surrounded by made ground or soft/incompetent soils.

6.10 Pile type, selection and design should to be undertaken in conjunction with a reputable, specialist piling contractor, ideally with experience of the local ground conditions.

6.11 However, for preliminary considerations, a pre-cast driven concrete pile would minimise waste soil arisings but potential noise and vibration effects may render this option unsuitable. Therefore, a bored pile solution is likely to be the most appropriate solution for the site.

6.12 Alternatively, the potential to increase the bearing pressure of the cohesive soils could be achieved through the use of rigid inclusions. This technique utilises the installation of high deformation modulus columns to increase the bearing pressure whilst also reducing settlements, minimising waste arisings and limiting vibration effects on surrounding structures. It has been indicated that foundations can then be designed utilising a bearing pressure of up to 200kN/m^2 supported on the engineered ground.

6.13 Where foundations are to be locally constructed on clay soils in close proximity to existing and/or removed trees, identification of the tree species will determine its water demand as provided in Appendix 4.2-A of NHBC Standards 2010, Foundations, Chapter 4.2, Building Near Trees. Assessment as to the cohesive strata heave or shrinkage potential should then be undertaken in consideration of a low volume change potential for the clay with foundations designed to appropriate depths where such effects are envisaged.

Floor Slabs

6.14 In consideration of the thickness of the made ground it is anticipated that new floor slabs would be suspended.

Excavations and Groundwater

6.15 Excavations at the site will be feasible using conventional hydraulic plant. All excavations at the site and specifically requiring man-entry, will need adequate lateral support, or will need to be battering back to a safe angle to ensure their stability.

6.16 Conventional 'sump and pump' dewatering measures are anticipated to be adequate to keep excavations dry.

External Pavements

6.17 In consideration of the near surface ground conditions, it is recommended that new road pavement design should be based on a California Bearing Ratio (CBR) value of no more than 3.0% in untreated made ground and natural cohesive strata.

6.18 The CBR will need to be reviewed and confirmed by site inspection and possibly suitable in-situ testing at formation levels following any earthwork operations and prior to pavement construction.

6.19 In any event, all formations should be proof-rolled with any soft, loose or otherwise unsuitable material being removed and replaced with compacted granular fill.

Concrete Design

6.20 Design/mix of buried concrete should be undertaken in accordance with the "Aggressive Chemical Environment for Concrete" (ACEC) classification, of BRE Special Digest 1:2005 (Concrete in Aggressive Ground). With reference to the site history, it is deemed appropriate to classify the site as "Brownfield", with respect to BRE Special Digest, assuming mobile groundwater conditions.

6.21 Assuming foundations and or pile caps are at a minimum depth of of 1.00mbgl values of 2:1 water/soil extract for sulphate range between 40mg/l and 48mg/l. Values of pH range from 7.4 to 8.2 indicating near neutral to slightly alkaline conditions.

6.22 On the basis of these results, the typical design sulphate (DS) class and "Aggressive Chemical Environment for Concrete" (ACEC) class for the site are DS-1 and AC-1 respectively.

Drainage and Soakaways

6.23 In consideration of the cohesive nature of the natural soils together with the limited external site area, soakaways are not considered a feasible drainage option for the site.

7.0 GENERIC QUANTITATIVE RISK ASSESSMENT (GQRA)

General

7.1 A review of the readily available information had concluded that the potential for exposure to ground contamination is unlikely to low leading to a low preliminary risk.

7.2 However, it has been considered prudent to undertake chemical analysis of the sub-surface soils to confirm the low human health risk status of the site.

Human Health

7.3 Selected samples have been analysed for a general suite of contaminants of concern and compared against Screening Levels (SL's) for human health to determine the significance of the measured concentrations in relation to the site conceptual model. Thus, a Generic Quantitative Risk Assessment has been undertaken in line with guidelines provided in Land Contamination Risk Management, April 2021.

7.4 The criteria for a limited number of contaminants have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

7.5 Within the document, Category 4 Screening Levels (C4SL's) are described as being more pragmatic than previous screening criteria and represent concentrations in soil that present an 'acceptable' level of risk within the context of Part 2A.

7.6 The National Planning Policy Framework states that 'after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990'. Therefore, by inference, the C4SL's are appropriate for use in the planning context.

7.7 Although the SP1010 document states that C4SL only apply for a 'sandy loam soil with 6% soil organic matter', it is generally accepted that assessment criteria for metals are not sensitive to changes in soil organic content (SOM). The C4SL's have therefore been adopted as assessment criteria in this report for the listed metals within the SP1010.

7.8 Subsequent to SP1010, LQM/CIEH have published a document entitled 'The LQM/CIEH S4ULs for Human Health Risk Assessment' 2015. In brief, the document provides updated assessment criteria which have been derived in accordance with UK legislation, national as well as EA policy and using a modified version of the CLEA software and available guidance. The new screening criteria, or Suitable 4 Use Levels (S4ULs), are intended to provide a complete and updated replacement to the previous LQM/CIEH GAC of 2009. As such they are considered appropriate for use in this assessment for other contaminants not covered by C4SL's and/or for organic contaminants assuming a worst-case Soil Organic Matter (SOM) of 1% as an initial conservative assessment.

7.9 For each contaminant, S4UL's and C4SL's have been calculated for six land use scenarios, namely:

- Residential with homegrown produce.
- Residential without homegrown produce.
- Allotments.
- Commercial.
- Public Open Space, near residential housing.
- Public Parks, remote from residential housing.

7.10 In light of the proposed development, the SL's for a "Residential without homegrown produce" end-use are considered appropriate for the assessment at this stage. A table of relevant SL's are provided in Appendix 05.

Soil Test Results

7.11 6no soil samples were analysed for a suite of Contaminants of Concern (CoC). The majority of the concentrations were measured below the SL's for a "Residential without homegrown produce" end-use with the following exception.

Contaminant	Number of Exceedances	SL (mg/kg)	Recorded Concentrations (mg/kg)	Samples
Lead	1	310	770	WS02 – 0.30m

7.12 In consideration of its single exceedance and the site history it is possible that the elevated concentration of lead is associated with the former use of lead water pipes, a fragment of which has become entrained within the made ground.

7.13 No asbestos was detected within any of the samples analysed.

Discussion and Conclusions

Human Health

7.14 The test results indicate that the made ground beneath the site is not considered to include significant and/ or widespread contamination sources. However, a single sample of made ground recorded a concentration of lead above the SL.

7.15 Notwithstanding this, where surfaced with hardstanding, there will be no mechanism for a long-term direct contact contamination linkage. Therefore, the risk to end-users and to the general public will be negligible in the long-term.

7.16 However, a direct contact pollution linkage will still exist in new gardens and landscaped areas and it is recommended that made ground exposed at the surface in such areas is removed or is covered by clean sub-soil and topsoil thus removing the pollution linkage. This will normally comprise a 600mm clean cover, with a minimum 150mm thickness of topsoil and 450mm thickness of sub-soil, over the existing made ground.

7.17 Where the made ground is currently less than 600mm thick, it may be more appropriate to excavate and remove it to expose the underlying natural soils prior to placement of a suitable thickness of sub-soil/topsoil.

Controlled Waters

7.18 No significant or widespread ground contamination has been encountered beneath the site.

7.19 The site is not within an Environment Agency Source Protection Zone, and no groundwater abstraction licenses are located within 500m. A northerly flowing surface watercourse is located 249m east, which is indicated to be culverted at its closest point, no further surface water features are indicated within 250m.

7.20 The bedrock underlying the site is classified as a 'Secondary B' Aquifer. The superficial strata is classified as a 'Secondary Undifferentiated' Aquifer. In terms of sensitivity, the groundwater within the aquifers beneath the site is considered to be of limited resource value and utilisation.

7.21 The relatively low permeability of the underlying strata will also limit lateral and vertical migration of any undetected mobile contamination towards the underlying (bedrock) aquifer.

7.22 Therefore, the risk to controlled waters from the site is considered low with no environmental remediation considered necessary.

8.0 GROUND GAS RISK ASSESSMENT

Ground Gas Conceptual Model

8.1 The site is not in Radon Affected Area, defined by the UK Health Security Agency as less than 1% of properties are above the Action Level of exposure. Therefore, no radon protection measures are necessary for new structures as described in publication BR211 by the Building Research Establishment.

8.2 There are no active landfills located within 500m of the site or historic landfills within 250m of the site.

8.3 The presence of ground gas resulting from shallow unrecorded mine workings can be discounted.

8.4 No appreciable thickness of made ground or other soil with significant organic contents have been encountered beneath the site.

Conclusions

8.5 In consideration of the above, the risk to the development from ground gas is considered very low with no specific remedial measures required.

8.6 However, notwithstanding the above, due to the thickness of made ground exceeding 600mm, all new floor slabs will need to be suspended. As such this would include as standard a sub floor void which is serviced by perimeter ventilation to at least two opposing elevations.

9.0 OTHER POTENTIAL DEVELOPMENT CONSIDERATIONS

Excavated Soils

9.1 Excavation works undertaken during the development are likely to produce waste soils for which appropriate waste management will be required. In line with current sustainability principals, any waste soils should firstly be considered for re-use where possible by incorporation into the development.

9.2 However, due to the extent of the proposed redevelopment, it is envisaged that such excavated soil will, in the main, need to be removed from site under appropriate duty of care.

9.3 It should be noted that the chemical analysis results for disposal classification are assessed against different assessment criteria to those relating to contamination risk assessment. Soils that are deemed suitable for use in terms of risk to human health and the environment may not necessary be un-contaminated and could be classified as Non-Hazardous or even Hazardous for disposal purposes.

9.4 For preliminary guidance based on the current information, it is likely that made ground, would be classified as 'Non-hazardous' with natural soils classified as 'Inert' for landfill disposal.

9.5 However, excavated soils which are contaminated with TPH compounds may classify as 'Hazardous' if disposed to landfill. Any soils containing ACM or significant asbestos fibres may also classify as 'Hazardous' following further quantification analysis.

9.6 In addition, for Inert and Hazardous waste disposal, allowance will need to be made for adequate Waste Acceptance Criteria (WAC) testing with appropriate consideration of the additional time and cost associated with this.

9.7 It will be the responsibility of the waste producer to undertake further testing and classification of any waste soils for disposal to an appropriately licenced landfill in accordance with current guidelines and Duty of Care requirements.

Imported Fill

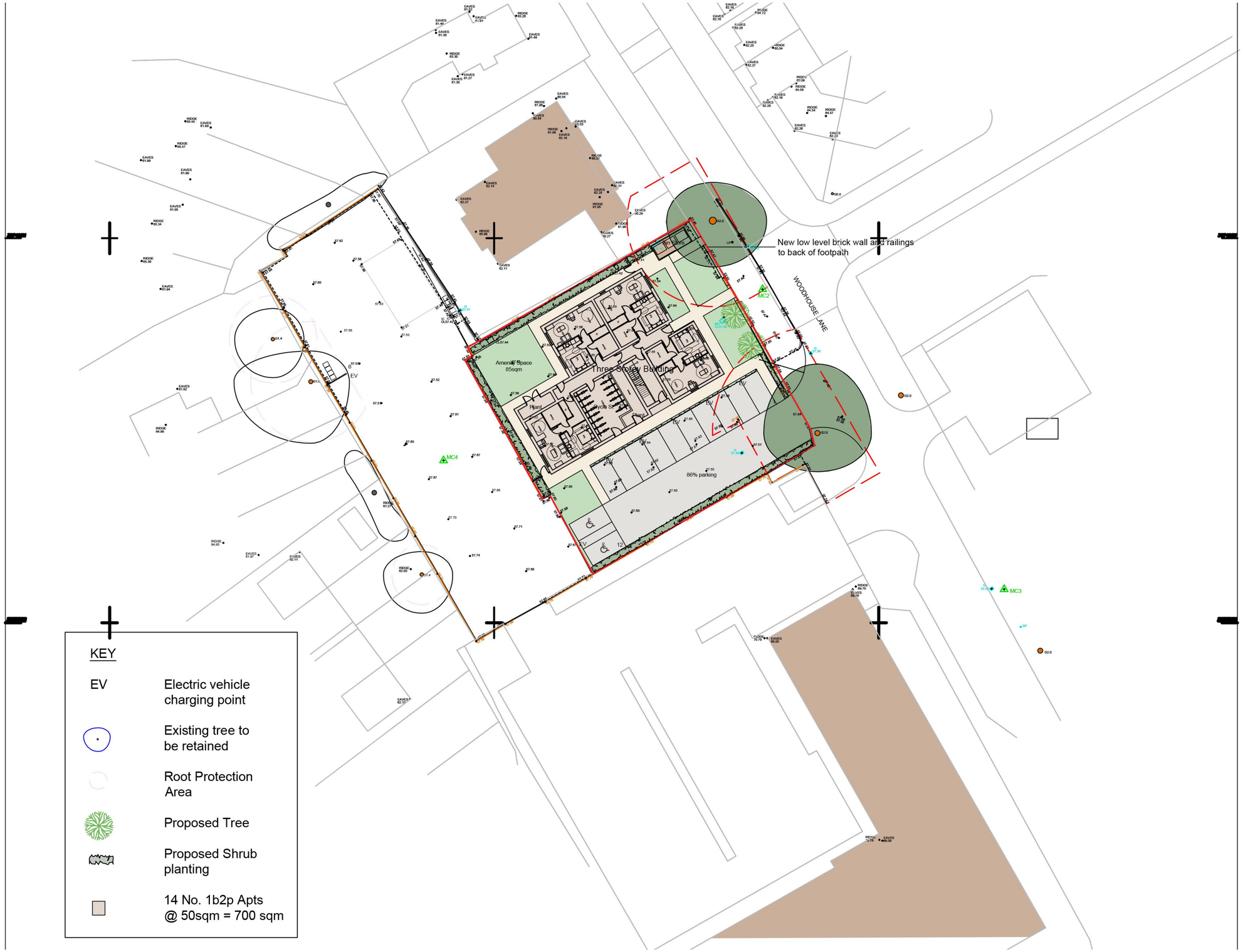
9.8 Imported fill will be subject to specific quality requirements and should be accompanied by appropriate certification to confirm its suitability. Allowance should also be made for testing imported fill materials prior to placement to ensure suitability.

Water Supply Pipes

9.9 The relevant water supply provider will need to be consulted with regards the selection of suitable water supply pipe materials for the development, should these be required. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination are not anticipated.

APPENDIX 01

Drawings



KEY

EV	Electric vehicle charging point
	Existing tree to be retained
	Root Protection Area
	Proposed Tree
	Proposed Shrub planting
	14 No. 1b2p Apts @ 50sqm = 700 sqm

Notes

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0 5 10 15 20
Scale in m. @ A3 1:500

Residual Risks
In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above. It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

Safety Health and Environmental Information Box

RevID	Note	Date	Drwn	Chkd
P1	First Issue	01.02.23	SB	SB
P2	General amendments to site plan	17.02.23	SB	SB

Project Name & Number
Former British Legion Site

Client
WCHG

N

Layout Title
Option One - Proposed Site plan
14 Unit Scheme - Three Storey

number	rev	status	drawn by	checked
6811-ARC-00-00-DR-A-0100011	P1	S	SB	SB

Arcus Consulting LLP
www.arcus.uk.com
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QA35

Notes

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0 5 10 15 20

Scale in m. @ A4 1:500

Residual Risks

In addition to the hazard/risks normally associated with the types of work detailed on this drawing take note of the above. It is assumed that all works on this drawing will be carried out by a competent contractor working, where appropriate, to an appropriate method statement.

Safety Health and Environmental Information Box

RevID	Note	Date	Drwn	Chkd
P1	First Issue	15.02.23	-	-

WML CONSULTING

Project: Former British Legion
Drg Title: Exploratory Hole Plan
Job No: 11047G By: TPB
Drg No: SK-01 Rev: -
Date: 24/04/2023 Scale: NTS

Project Name & No.
Former British Legion Site, Woodhouse Lane, Wythenshawe

Client
WCHG

number
6811-ARC-00-00-DR-A-010016

rev	drawn by	checked by	status
P1	SB	SB	S

N

Layout Title
Location Plan

Arcus Consulting LLP
www.arcus.uk.com
info@arcus.uk.com

ARCUS CONSULTING

QA35

APPENDIX 02

Exploratory Hole Records

WML CONSULTING	Project Title: Former British Legion		WS01
	Project Number: 11047G	Client: Wythenshawe C.H.G.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 20/04/2023	Method: Window Sample	Driller: LOT Geotechnics Ltd	Logged By: TPB

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.10	E				0.30	Turf over dark brown, sandy, organic CLAY. (TOPSOIL)		
0.40	E				0.60	Brown, variably sandy, gravelly CLAY. Gravel is angular to subangular, fine to coarse, including brick and sandstone. (MADE GROUND)		
1.00	D				1.00	Firm, brown mottled, slightly gravelly, sandy CLAY with occasional thin sand bands. Gravel is subangular to subrounded, fine to coarse of mixed lithologies. (GLACIAL TILL)		
1.20	J	N=9			1.50			
		N=25			2.00	Firm to stiff, reddish brown, slightly silty, slightly sandy CLAY. (WEATHERED BOLLIN MUDSTONE MEMBER)		
					2.60			
		pp 50/220mm			3.00	Reddish brown, silty CLAY with mudstone lithorelicts grading to extremely weak, highly weathered MUDSTONE. (BOLLIN MUDSTONE MEMBER)		
		pp 50/145mm			3.70			
					4.00	End Of Borehole At 3.70 m		

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Hole refused at 3.70mbgl.

Scale: 1:30

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

WML CONSULTING	Project Title: Former British Legion		WS02
	Project Number: 11047G	Client: Wythenshawe C.H.G.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 20/04/2023	Method: Window Sample	Driller: LOT Geotechnics Ltd	Logged By: TPB

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.30	E				0.25	Turf over dark brown, sandy, organic CLAY. (TOPSOIL)		
					0.55	Brown, slightly gravelly, sandy CLAY. Gravel is angular to subangular, fine to coarse, including brick and sandstone. (MADE GROUND)		
					1.00			
1.20	J	N=10			1.10	Firm, brown mottled, slightly gravelly, sandy CLAY with occasional thin sand bands. Gravel is subangular to subrounded, fine to coarse of mixed lithologies. (GLACIAL TILL)		
		N=23			2.00	Firm to stiff, reddish brown, slightly silty, slightly sandy CLAY. (WEATHERED BOLLIN MUDSTONE MEMBER)		
		pp 50/115mm			2.80	Reddish brown, silty CLAY with mudstone lithorelicts grading to extremely weak, highly weathered MUDSTONE. (BOLLIN MUDSTONE MEMBER)		
					3.00	End Of Borehole At 2.80 m		
					4.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

REMARKS

No Groundwater Encountered
Hole refused at 2.80mbgl.

Scale: 1:30

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

WML CONSULTING	Project Title: Former British Legion		WS03
	Project Number: 11047G	Client: Wythenshawe C.H.G.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 20/04/2023	Method: Window Sample	Driller: LOT Geotechnics Ltd	Logged By: TPB

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.10	E				0.30	Turf over dark brown, sandy, organic CLAY. (TOPSOIL)		
0.40	E				0.50	Brown, slightly gravelly, sandy CLAY. Gravel is angular to subangular, fine to coarse, including brick and sandstone. (MADE GROUND)		
					0.70			
					0.80	Yellow brown, slightly silty SAND. (GLACIAL TILL)		
		N=15			1.00	Firm, brown mottled, slightly gravelly, sandy CLAY. Gravel is subangular to subrounded, fine to coarse of mixed lithologies. (GLACIAL TILL)		
1.60	D				1.60	Medium dense, brown, slightly silty SAND with thin bands of CLAY. (GLACIAL TILL)		
		N=35			2.00	Firm to stiff, reddish brown, slightly silty, slightly sandy CLAY. (WEATHERED BOLLIN MUDSTONE MEMBER)		
					2.20	Reddish brown, silty CLAY with mudstone lithorelicts grading to extremely weak, highly weathered MUDSTONE. (BOLLIN MUDSTONE MEMBER)		
		pp 50/190mm			2.80	End Of Borehole At 2.80 m		
					3.00			
					4.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Hole refused at 2.80mbgl.

Scale: 1:30

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

WML CONSULTING

	Project Title: Former British Legion		WS04
	Project Number: 11047G	Client: Wythenshawe C.H.G.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 20/04/2023	Method: Window Sample	Driller: LOT Geotechnics Ltd	Logged By: TPB

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	E				0.35	Turf over dark brown, sandy, organic CLAY. (TOPSOIL)		
0.50	E					Brownish grey, sandy, angular to subangular, fine to coarse GRAVEL including brick and concrete. Low cobble content. Cobbles are subangular, of brick. (MADE GROUND)		
		N=11			1.00			
		N=0			2.00			
					2.10	Very soft to soft, brown, slightly silty, sandy CLAY. (WEATHERED BOLLIN MUDSTONE MEMBER)		
		N=7			2.80			
		pp 50/225mm			3.00	Extremely weak, light grey and occasionally reddish brown, highly weathered MUDSTONE. (BOLLIN MUDSTONE MEMBER)		
						End Of Borehole At 3.00 m		
					4.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Hole refused at 2.70mbgl.

Scale: 1:30

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/04/2023	2.5				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

WML CONSULTING	Project Title: Former British Legion		WS05
	Project Number: 11047G	Client: Wythenshawe C.H.G.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 0	E Coord: 0
Date: 20/04/2023	Method: Window Sample	Driller: LOT Geotechnics Ltd	Logged By: TPB

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	E				0.40	Turf over dark brown, sandy, organic CLAY. (TOPSOIL)		
0.50	E					Brownish grey, sandy, angular to subangular, fine to coarse GRAVEL including brick and concrete. Low cobble content. Cobbles are subangular, of brick. (MADE GROUND)		
		N=52			1.00			
					1.60	Greyish brown, slightly gravelly, sandy CLAY. Gravel is subangular, fine to coarse, including brick. (MADE GROUND)		
		N=4			2.00			
					2.50		▼	
2.60	J					Extremely weak, light grey and occasionally reddish brown, highly weathered MUDSTONE. (BOLLIN MUDSTONE MEMBER)		
		pp 50/235mm			2.90			
					3.00	End Of Borehole At 2.90 m		
					4.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Hole refused at 2.90mbgl.

Scale: 1:30

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/04/2023	2.5				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

APPENDIX 03

Geotechnical Testing Results

LABORATORY REPORT

Contract Number: PSL23/2930

Report Date: 10 May 2023

Client's Reference: 11047G

Client Name: WML Consulting
No 8 Oak Green Earl Road
Stanley Green Business Park
Cheadle Hulme
Cheshire
SK8 6QL

For the attention of: Tom Booth

Contract Title: Wythenshawe

Date Received: 26/4/2023
Date Commenced: 26/4/2023
Date Completed: 10/05/2023

Notes: **Opinions and Interpretations are outside the UKAS Accreditation**

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Director)
R Berriman (Quality Manager)
S Royle (Laboratory Manager)

L Knight (Assistant Laboratory Manager)
S Eyre (Senior Technician)
M Fennell (Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS01		D	1.00		Brown mottled grey slightly gravelly very sandy CLAY.
WS03		D	1.60		Brown slightly gravelly sandy CLAY.
BH01		D	1.70		MADE GROUND dark brown very gravelly sandy Cclay.

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Wythenshawe

Contract No:
PSL23/2930
Client Ref:
11047G

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS01		D	1.00		16			26	16	10	94	Low Plasticity CL
WS03		D	1.60		21			41	20	21	97	Intermediate Plasticity CI
BH01		D	1.70		24			41	21	20	63	Intermediate Plasticity CI

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Wythenshawe

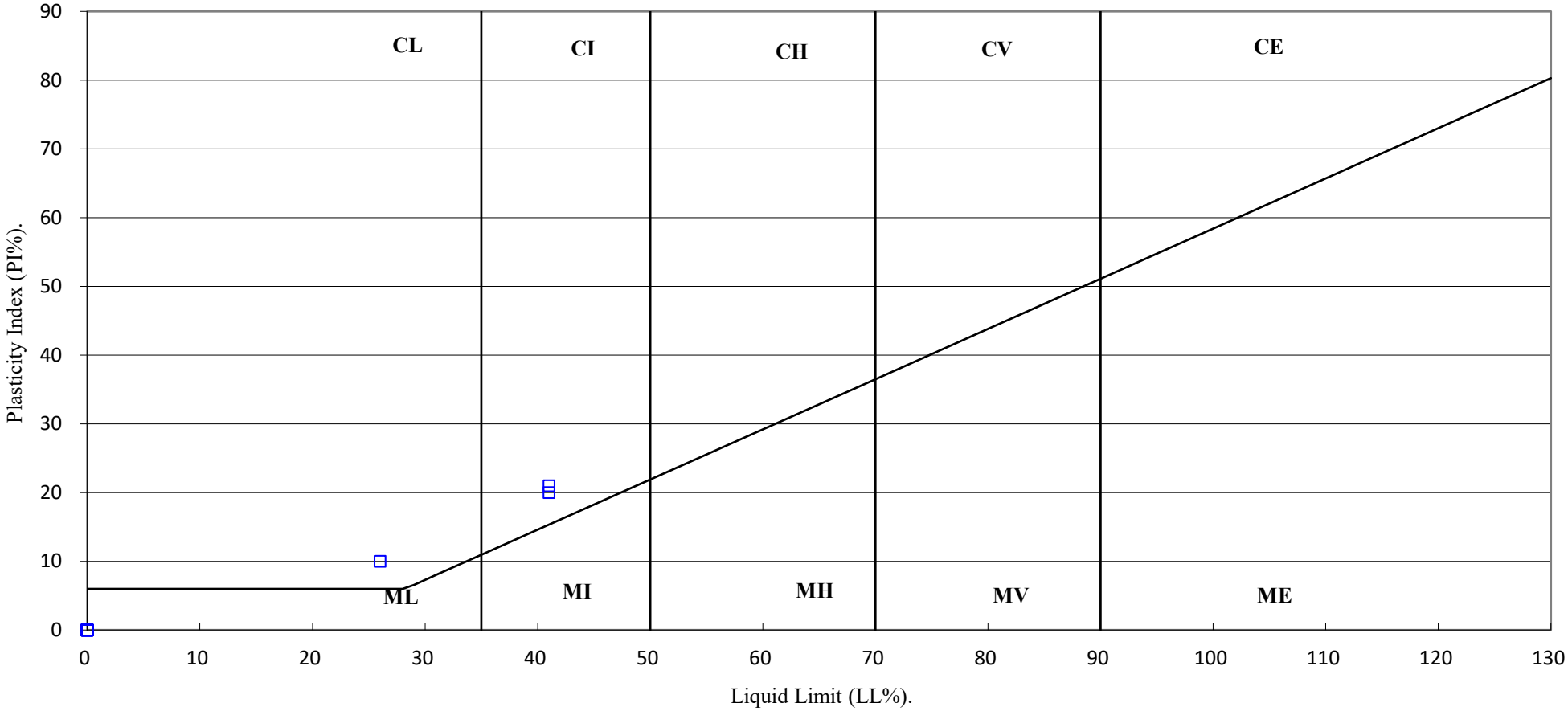
Contract No:

PSL23/2930

Client Ref:

11047G

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



UKAS TESTING 4043 / PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	**Wythenshawe**	**Contract No:** PSL23/2930 **Client Ref:** 11047G

APPENDIX 04

Chemical Analytical Results

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	23-13468-1
Initial Date of Issue:	28-Apr-2023
Client	WML Consulting Ltd
Client Address:	No. 8 Oak Green Stanley Green Business Park Earl Rd Cheadle SK8 6QL
Contact(s):	Tom Booth
Project	11047G Wythenshawe
Quotation No.:	
Date Received:	24-Apr-2023
Order No.:	11047G
Date Instructed:	24-Apr-2023
No. of Samples:	9
Turnaround (Wkdays):	5
Results Due:	28-Apr-2023
Date Approved:	28-Apr-2023
Approved By:	

Details:	Stuart Henderson, Technical Manager

Results - Soil

Project: 11047G Wythenshawe

Client: WML Consulting Ltd			**Chemtest Job No.:**		23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468
Quotation No.:			**Chemtest Sample ID.:**		1628569	1628571	1628572	1628573	1628574	1628575	1628576	1628577	1628578
Order No.: 11047G			Client Sample Ref.:		E	J	E	J	E	E	E	E	J
			Sample Location:		WS01	WS01	WS02	WS02	WS03	WS04	WS04	WS05	WS05
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.10	1.20	0.30	1.20	0.40	0.20	0.50	0.50	2.60
			Date Sampled:		20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023
			Time Sampled:		AM	AM	AM	AM	AM	PM	PM	PM	PM
			Asbestos Lab:		DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-		-		-	-	-	-	
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020	21	13	19	15	16	24	15	15	11
pH	U	2010		4.0	7.9	7.6	7.5	7.4	7.5	7.5	8.0	8.0	8.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.43		< 0.40		< 0.40	0.77	0.51	0.85	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.013	0.040	0.053	0.048	0.033	0.014	0.15	0.43	0.047
Total Sulphur	U	2175	%	0.010	0.025	< 0.010	< 0.010	< 0.010	< 0.010	0.024	0.033	0.19	< 0.010
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	
Sulphate (Total)	U	2430	mg/kg	100	740		300		580	820	2400	4900	
Arsenic	U	2455	mg/kg	0.5	17		4.8		5.7	19	7.9	8.1	
Cadmium	U	2455	mg/kg	0.10	0.33		< 0.10		0.10	0.34	0.17	0.17	
Copper	U	2455	mg/kg	0.50	45		12		15	60	17	20	
Mercury	U	2455	mg/kg	0.05	0.45		0.05		0.07	0.47	0.13	0.10	
Nickel	U	2455	mg/kg	0.50	22		12		13	24	12	15	
Lead	U	2455	mg/kg	0.50	100		770		150	110	95	57	
Selenium	U	2455	mg/kg	0.25	0.84		0.46		0.53	0.92	0.40	0.39	
Vanadium	U	2455	mg/kg	0.5	26		13		14	29	20	24	
Zinc	U	2455	mg/kg	0.50	68		37		41	76	68	71	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	
Organic Matter	U	2625	%	0.40	2.2		< 0.40		< 0.40	5.3	3.2	0.51	
Naphthalene	U	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	0.12	< 0.10	< 0.10	
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	U	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	U	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	U	2800	mg/kg	0.10	0.34		< 0.10		< 0.10	0.35	1.3	0.49	
Anthracene	U	2800	mg/kg	0.10	0.14		< 0.10		< 0.10	0.13	0.30	0.17	
Fluoranthene	U	2800	mg/kg	0.10	0.76		< 0.10		< 0.10	0.85	2.5	1.9	
Pyrene	U	2800	mg/kg	0.10	0.73		< 0.10		< 0.10	0.80	2.0	1.6	
Benzo[a]anthracene	U	2800	mg/kg	0.10	0.51		< 0.10		< 0.10	0.44	1.0	1.0	
Chrysene	U	2800	mg/kg	0.10	0.42		< 0.10		< 0.10	0.36	0.75	0.98	
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	0.72		< 0.10		< 0.10	0.59	1.7	1.6	
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	0.57	0.46	
Benzo[a]pyrene	U	2800	mg/kg	0.10	0.70		< 0.10		< 0.10	0.60	1.3	1.5	
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	0.33		< 0.10		< 0.10	0.39	1.1	1.1	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	0.25	0.22	
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	0.29		< 0.10		< 0.10	0.37	0.73	0.69	

Results - Soil

Project: 11047G Wythenshawe

Client: WML Consulting Ltd				**Chemtest Job No.:**	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468	23-13468
Quotation No.:				**Chemtest Sample ID.:**	1628569	1628571	1628572	1628573	1628574	1628575	1628576	1628577	1628578
Order No.: 11047G				Client Sample Ref.:	E	J	E	J	E	E	E	E	J
				Sample Location:	WS01	WS01	WS02	WS02	WS03	WS04	WS04	WS05	WS05
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.10	1.20	0.30	1.20	0.40	0.20	0.50	0.50	2.60
				Date Sampled:	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023	20-Apr-2023
				Time Sampled:	AM	AM	AM	AM	AM	PM	PM	PM	PM
				Asbestos Lab:	DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Total Of 16 PAH's	N	2800	mg/kg	2.0	4.9		< 2.0		< 2.0	5.0	14	12	
Total Phenols	U	2920	mg/kg	0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10	

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

APPENDIX 05

Site Specific Acceptance Criteria

Site Specific Assessment Criteria for Residential (with homegrown produce) assuming a 1% SOM for Hydrocarbons

Contaminant	Assessment Criteria for Residential (mg/kg)
Metals	
Arsenic	37
Boron	290
Cadmium	26
Chromium III	910
Chromium VI	6
Copper	2,400
Lead*	200
Mercury	1.2
Nickel	130
Selenium	250
Vanadium	410
Zinc	3,700
Non – Metals	
Phenol	120
Polyaromatic Hydrocarbons (PAH)	
Benz[a]anthracene	7.2
Benzo[a]pyrene	2.2
Benzo[b]fluoranthene	2.6
Benzo[ghi]perylene	320
Benzo[k]fluoranthene	77
Chrysene	15
Dibenz[ah]anthracene	0.24
Fluoranthene	280
Indeno[123-cd]pyrene	27
Naphthalene	2.3
Pyrene	620

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Criteria for Residential End Use (mg/kg)
Volatile Organic Compounds (VOCs)	
Benzene	0.087
Ethylbenzene	47
Toluene	130
Xylene	56
1,2-Dichloroethane	0.0071
1,1,1-Trichloroethane	8.8
Tetrachloroethane	1.6
Tetrachloroethene (PCE)	0.18
Tetrachloromethane	0.026
Trichloroethene (TCE)	0.016
Trichloromethane	0.91
Vinyl Chloride	0.00064
Semi-Volatile Organic Compounds (SVOCs)	
1,2-Dichlorobenzene	23
1,4-Dichlorobenzene	61[f]
1,2,4-Trichlorobenzene	2.6
Hexachlorobenzene	1.8 (0.2)[vap]
Total Petroleum Hydrocarbons (TPH)	
Aliphatic C5-6	42
Aliphatic C6-8	100
Aliphatic C8-10	27
Aliphatic C10-12	130(48)[vap]
Aliphatic C12-16	1,100(24)[sol]
Aliphatic C16-35	65,000(8.48)[f,sol]
Aliphatic C35 - 44	65,000(8.84)[f,sol]
Aromatic C5 – 7 (benzene)	70
Aromatic C7 – 8 (toluene)	130
Aromatic C8-10	34
Aromatic C10-12	74
Aromatic C12-16	140
Aromatic C16-21	260[f]
Aromatic C21-35	1,100[f]
Aromatic C35 - 44	1,100[f]

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