

LCRM: Stage 1 Risk Assessment

LAND OFF CHURCH LANE, MOSTON, GREATER MANCHESTER

Project Ref: GUK-0524-02

For: Built Developments Limited



GROUNDSMITHS
GEOTECHNICAL ENGINEERS



CLIENT:

Built Developments Limited

PROJECT:

Residential Development

SITE REFERENCE:

**Land off Church Lane
Moston
Greater Manchester**

REPORT REFERENCE:

GUK-0524-02/Rp-001



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CONTENTS

SUMMARY & RECOMMENDATIONS

1	INTRODUCTION	7
1.1	Appointment.....	7
1.2	Report Context and Status	7
1.3	Objectives	8
1.4	Scope of Works.....	8
1.5	Previous Ground Investigation Reports.....	8
1.6	Limitations of Study	8
2	SITE SETTING	10
2.1	Details & Description	10
2.2	Anticipated Geology & Hydrogeology	10
2.3	Designations	13
2.4	Environmental Records	14
2.5	Site History.....	15
3	PRELIMINARY ENGINEERING APPRAISAL	18
3.1	Soils.....	18
3.2	Landslip (Mass Movement Deposits)	19
3.3	Foundations	19
3.4	Floor Construction	20
3.5	Heave Precautions	20
3.6	Slope Stability	21
3.7	Superstructure Precautions.....	21
3.8	Excavation.....	21
3.9	Natural Ground Subsidence.....	21
3.10	Obstructions	21
3.11	Concrete	22
3.12	Stress Relief	22
3.13	Pavement.....	22
3.14	Site Drainage.....	22
4	PRELIMINARY ENVIRONMENTAL APPRAISAL	23
4.1	Introduction	23
4.2	Potential Sources of Contamination.....	23
4.3	Potential Migration Pathways	24
4.4	Potential Receptors	25
4.5	Environmental Risk Assessment	25
5	FURTHER WORKS.....	33
5.1	Introduction	33
5.2	Objectives of Investigation	33
5.3	Proposed Methods of Investigation	34
5.4	Testing	34
5.5	Outline Remediation Requirements.....	35
6	REGULATORY APPROVAL	37



7	INFORMATION SOURCES.....	38
8	REPORTING LIMITS	40

TABLES

Table 2.1 - General Site Details	10
Table 2.2 - Published Geological Conditions	10
Table 2.3 - Summary of Designations & Other Potential Actions	13
Table 2.4 - Environmental Data.....	14
Table 2.5 - Summary of General Historical Ordnance Survey Features	15
Table 4.1 - Summary of Potential Sources and Contaminants	24
Table 4.2 - Summary of Plausible Pathways.....	24
Table 4.3 - Summary of Potential Receptors.....	25
Table 4.4 - Risk Categorisation	26
Table 4.5 - Summary of Environmental Risk (Current Site Condition without Mitigation).....	28
Table 5.1 - Phase 2 Investigation Recommendations	34

FIGURES & DRAWINGS

4450/S0/105/G PROPOSED SITE PLAN

PLATES

1 – 8 GENERAL SITE PHOTOGRAPHIC LAYOUT

APPENDICES

APPENDIX A: ENVIRO+GEOINSIGHT REPORT
APPENDIX B: HISTORICAL ORDNANCE SURVEY PLANS
APPENDIX C: COAL AUTHORITY CONSULTANTS COAL MINING REPORT
APPENDIX D: ZETICA UXO



SUMMARY & RECOMMENDATIONS

This summary presents the salient points of the report but should not be referred to in isolation of the body text. There will be other information contained within the report which puts into context the findings of the Executive Summary. No reliance should therefore be placed on the Executive Summary until the report has been read in full. The recommendations given are considered reasonable based on available information and the assessment of the Site as carried out by Groundsmiths (UK) Ltd at this time.

1 ENVIRONMENTAL CONSTRAINTS

Ground Investigation: A general environmental ground investigation is considered necessary given the current status and proposed end use of the development in relation to the identified levels of risk.

Biogenic Ground Gases: Risk from carbon dioxide and/or methane is currently anticipated based on the Site's environmental setting and condition, although this should be confirmed through Site-specific monitoring. A BS8485 Characteristic Situation 2 determination for the Site is therefore postulated at this time.

Radon: No radon precautions are indicated to be required in construction, although this should be confirmed with Building Control in relation to any specific requirements they may have.

General Soil Contamination: A general check on contaminant levels should be undertaken within the remit of an intrusive ground investigation.

Asbestos in Soil: The presence of any asbestos fibres within the general on-Site made ground soils and underlying natural strata should be confirmed as part of an intrusive ground investigation. This should also broadly assess the areas where former garaging was once present.

PCB in Soil: Contamination associated with an off-Site transformer is not anticipated. This equipment lies 8-9m from Site, is housed within a brick structure, and lies adjacent to development occupied by sensitive receptors. Redevelopment of the land between it and Site is noted to have occurred. Contaminant migration is unlikely to have occurred to the extent that it could impact upon the Site. A low risk is postulated and further testing is not considered necessary unless currently unforeseen gross contamination is encountered during development.

Remediation Requirements: An LCRM Stage 3 Remedial Strategy incorporating current MCC guidelines would need to be issued to the Local Planning Authority to address any soils and/or ground gas remediation requirements. Validation reporting would also be needed on a separate basis, once any remedial works had been completed.

Risk to Construction Workers: All works to be undertaken should be specifically assessed as part of a health and safety evaluation to mitigate the exposure of workers to any dusts and fibres as may be generated during development.

Controlled Waters Receptors: Risk from the off-site discharge of any leachable contaminants is considered to be low. Further assessment should be made if currently unforeseen gross contamination is encountered.

Invasive Plants Species: Risk from invasive plant species should be independently confirmed prior to investigation given the presence of dense vegetation.

2 GEOTECHNICAL & GENERAL DEVELOPMENT CONSTRAINTS

Ground Investigation: A formal geotechnical assessment will need to be carried out to confirm the nature and thickness of the made ground, in addition to assessing the nature of the underlying natural strata given the potential for variation with spatial extent and depth to bedrock.

Buried Concrete: Protection to buried concrete products will be required where they come into contact with soils that exhibit levels of sulphate above DS1, although final design parameters should be discussed with the Designing Engineer following completion of laboratory testing.

Anticipated Foundation Type: A piled foundation solution is currently anticipated for most, if not all, of the proposed development. Consultation should be made with the Designing Engineer with respect to foundation



design once ground investigation works have been completed. Due consideration should be made as required to the placement of dwellings in relation to the indicated geological fault.

General Ground Stability: Global slope stability problems are not expected, although due consideration should always be given to how other off-Site land could impact on the Site.

The instability of loose and/or weathered strata should be anticipated, particularly during prolonged periods of wet weather, where excavations are deep, or are left open for protracted periods of time.

Where there is the possibility of weak/unstable ground being present or passing across any boundary, a geotechnical risk assessment of the integrity/stability should be undertaken. Designed and engineered temporary or permanent works should be deployed as necessary.

Heave Precautions: To mitigate against heave, foundations would need to be constructed in accordance with current guidelines where they are found to lie within influencing distance of removed, existing, or proposed planting when in cohesive soils.

Excavation Obstructions: Existing foundations and other substructure would need to be grubbed-out accordingly, where they impact upon new development.

Potable Water Supplies: Protection consistent with brownfield development (e.g. Protecta-Line) could potentially be required. This is to be confirmed.

Surface Water Drainage: For surface water, should soakaways be proposed, infiltration testing in accordance with BRE365 would need to be completed as required. It should be noted, however, that it would be inappropriate for unstable, potentially unstable, and/or contaminated strata to receive point-source flows of water from dedicated soakaways. Based on the anticipated nature, thickness, and composition of the made ground to be encountered, it is likely that all three of these conditions could be met and that a sealed piped connection will be needed.

Pavement: At this stage, it is anticipated that a design CBR <2.0% should be assumed. All necessary in situ testing in compliance with Manchester City Council (Highways) requirements will need to be undertaken to facilitate detailed design work. Notwithstanding usual road construction requirements, a geogrid to increase load carrying capacity may be required. Frost susceptibility should be assumed.

Archaeology: The need for archaeological monitoring has not been identified within the remit of this assessment.

UXO: Further assessment with respect to potential unexploded ordnance is unlikely to be required on the basis of current third party information.

3 MINING LEGACY CONSTRAINTS

Coal Authority data indicates that there are no records of past underground mining within the zone of likely physical influence, no probable unrecorded shallow workings at <30m below ground level, no mine entries within 100m, no on-Site coal outcrops, or any records of coal mining subsidence. Risk from shallow coal mining would not therefore be expected on this basis.



1 INTRODUCTION

1.1 Appointment

Groundsmiths (UK) Ltd ('Groundsmiths') were appointed by Built Developments Limited (the 'Client') to provide professional services in relation to the preliminary geotechnical and geo-environmental assessment of land located off Church Lane, Moston, Greater Manchester (herein referred to as the 'Site').

Groundsmiths have prepared this report for the sole use of the Client that commissioned it in accordance with the agreement under which our services are performed. No other warranty, expressed or implied, is made as to the professional advice included in this report. Any unauthorised third parties using the information presented in this report do so entirely at their own risk and are duly excluded from any warranty, duty of care or skill.

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1.2 Report Context and Status

It is understood that it is the Client's intention to redevelop the Site for residential end use, with this comprising numerous residential dwellings with associated private garden curtilage and parking, and some small areas of public open space (the proposed layout is provided as Drawing Ref. 4450/SO/105/G, dated 14th February 2024). The aim of this report, therefore, is to present a preliminary assessment of the geotechnical and land contamination status of the Site in relation to its proposed redevelopment.

The assessment given herein follows a technical review of currently available published geological, hydrogeological, mining legacy, and geo-environmental records, with works being completed in accordance with the general requirements of BS10175 ^[1], BS5930 ^[2] and Land Contamination Risk Management ('LCRM') guidance ^[3] (which replaced CLR11 in October 2020).

Notwithstanding the provision of discourse on any general construction matters that may apply, the assessment includes potential sources of historic ground contamination, anticipated impacts on sensitive receptors, and identifies where any further risk assessment and/or other works are required to facilitate development within the framework of a generic residential with home-grown produce exposure scenario as defined by the Environment Agency ^[4].

Interpretation and recommendations given in this report should not be assumed valid for adjacent areas of land, or for alternate land use. Should the proposed Site usage change, the recommendations and conclusions presented in this report will need to be re-assessed in accordance with all current guidance.



1.3 Objectives

The primary objectives of this assessment were to:

- Obtain current information from published sources with respect to any environmental designations, SSSI, visual and cultural designations, and agricultural and/or habitat designations as may exist on Site or within the immediate area of development.
- Obtain current information from published sources about the likely soil and groundwater conditions within the area of development.
- Identify and assess the potential for any ground related environmental hazards, including the potential for where any ground gas regime may represent constraints to the proposed development.
- Identify and assess the potential for any ground related geotechnical hazards to exist, including any mining legacy.
- Define a preliminary Conceptual Site Model ('CSM') of plausible source-pathway-receptor linkages and undertake a qualitative assessment to evaluate the level of risk associated with each linkage in accordance with the proposed development end use scenario.
- Outline preliminary development recommendations, and
- Provide advice on any additional stages of LCRM assessment that may need to be completed to satisfy the concerns of the regulatory authorities, this including Stage 1 generic or detailed quantitative risk assessment with ground investigation, Stage 2 options appraisal ^[5], and/or Stage 3 remedial actions ^[6].

1.4 Scope of Works

Assessment undertaken within the context of this report comprised a review of the following sources of information:

- British Geological Survey ('BGS') 1:50,000 scale series geological mapsheets ^[7,8]
- British Geological Survey Onshore GeoIndex records database ^[9]
- Other geological text ^[10]
- Emapsite - Enviro+GeoInsight Data Report (Appendix A) ^[11]
- Emapsite - Historical Ordnance Survey ('OS') Plans (Appendix B) ^[12]
- Coal Authority Consultant's Coal Mining Report (Appendix C) ^[13]
- Zetica UXO (Appendix D) ^[14]

1.5 Previous Ground Investigation Reports

Groundsmen are not aware of any historically issued ground investigation data that relates to the Site.

1.6 Limitations of Study

This appraisal has been undertaken subject to the limitations detailed in Section 8 and any other limitations stated specifically in the report text. Where further works are identified, these shall



be completed within the framework of LCRM and/or any other current regulatory requirements.

No intrusive ground investigation works have been completed at this time.



2 SITE SETTING

2.1 Details & Description

A general summary of the Site's setting is given in Table 2.1, below. A general record of the Site area is indicated in Plates 1 to 8, as appended.

Table 2.1 - General Site Details

National Grid Reference	The National Grid Reference (NGR) for the Site is indicated to be 386358mE 401397mN.
Area of Development	The indicated area of development is approximately 0.98 ha.
Ground Elevations	General topographic data indicates that the Site lies broadly at 75m AOD. Some localised variation should be assumed.
General Boundary Development	The Site is positioned between Church Lane and Moss Brook Road within a predominantly residential area. Given the irregular shape to the Site, boundary conditions vary, but generally the Site is bounded by residential property. A children's daycare nursery is also present towards the north-eastern boundary, and a dog's rehoming charity is located to the south. To the south-east is an area of open wooded ground.
Site Condition	It is understood that the Site was formerly used for the keeping and riding of horses, with the south-eastern portion of the land comprising various small paddocks and manège, a building, and a hard-stand parking area. The remaining parts of the Site were grassed and/or tree planted and undeveloped. Since closure of the Site, it has become derelict and overgrown.
Invasive Species	No invasive plant species were observed, although further assessment should be completed by a specialist ecologist as required given the presence of areas of dense vegetation.

2.2 Anticipated Geology & Hydrogeology

A summary of the salient geological data for the Site is given in Table 2.2, below and overleaf.

Table 2.2 - Published Geological Conditions

Radon	Third party data indicates that <1% of properties exceed the Radon Action Level in the area. No radon protective measures are indicated to be required in construction on this basis. This should be confirmed with Building Control as they may have different requirements.
Coal	Salient information obtained from the Coal Authority indicates that there are no records of past underground mining within the zone of likely physical influence, no probable unrecorded shallow workings at <30m below ground level, no mine entries within 100m, no on-Site coal outcrops, or any records of coal mining subsidence. Risk from shallow coal mining would not therefore be expected on this basis.

Table Contd./



Bedrock Faults

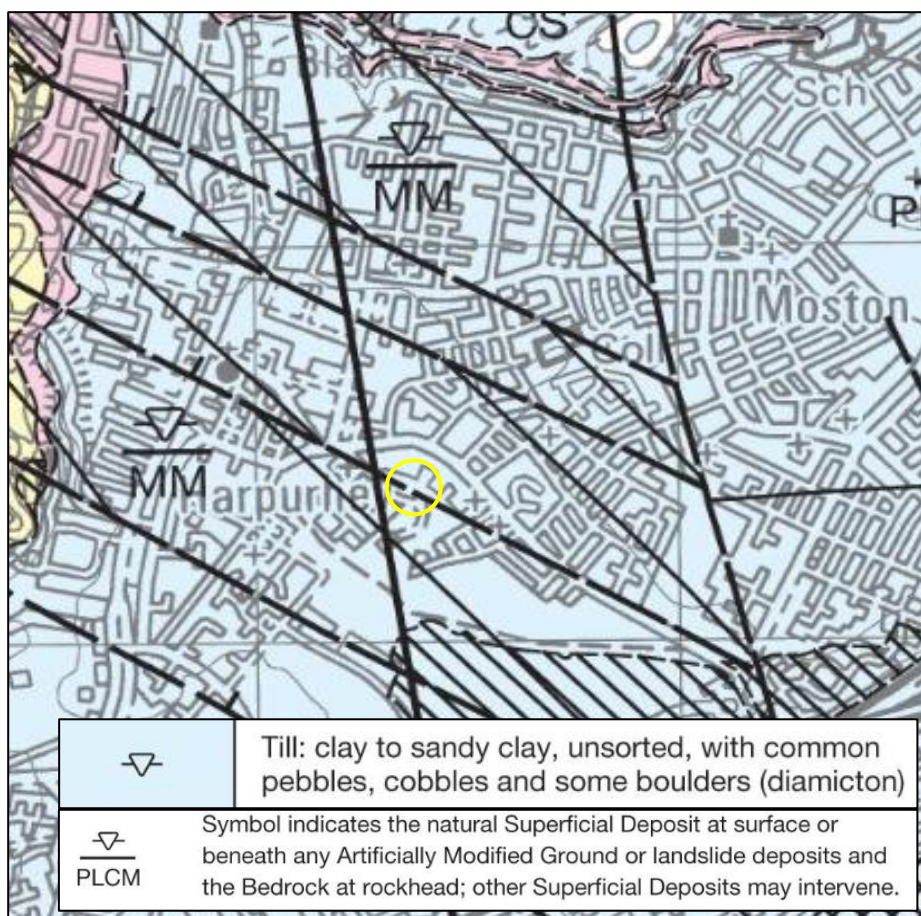
The inferred position of a normal geological fault is mapped as crossing centrally through the Site in a broadly north-west south-east direction.

Infilled or Made
Ground Deposits

There are no apparent made ground or artificial deposits recorded as being present on-Site (see Section 3.1 below for further discussion).

Superficial Geology

Data obtained from the BGS states that the Site is underlain by glacial till (Diamicton). These deposits are typically poorly sorted sediments with a wide range of clast sizes from clay to boulders, often suspended within a matrix of mud and/or sand. Their composition may include rudaceous, arenaceous, and/or argillaceous materials. The thickness of these deposits within the boundary to the Site is currently unknown.



Source: BGS Map Sheet 85. Manchester (1:50,000 scale) (2011). Bedrock & Superficial.

It should be noted that the superficial deposits that are actually present on-Site could differ slightly to those as mapped. There have been instances on other sites where other sedimentary deposits have been present from the surface, so some variation in material condition and strength should be anticipated until confirmed.

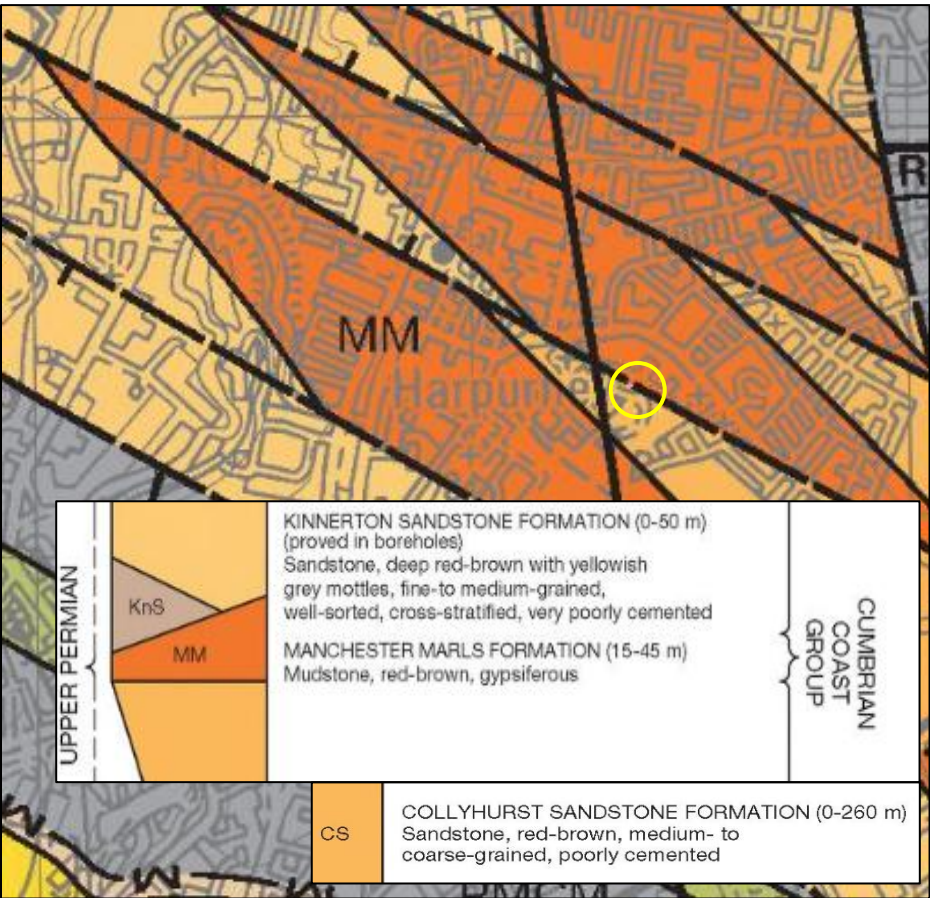
Bedrock Geology

The solid geology underlying the Site to the north of the indicated fault line is mapped as being deposits of the Manchester Marls Formation, whilst to the south the bedrock is identified as being sandstone of the Collyhurst Sandstone Formation.

Table Contd./



The Manchester Marls Formation typically comprises red, locally-green, slightly sandy, slightly pebbly calcareous mudstone with frequent thin or lenticular highly fossiliferous dolomitic limestones or red-stained non-magnesian limestones. These deposits have been found to be typically up to between 45-61m thickness. The Collyhurst Sandstone Formation, which underlies the Manchester Marls in succession, is recorded as being a typically soft red deposit with abundant beds of ‘millet seed’ sand grains, fine-grained ‘sharp sand’, and having interbedded horizons of grey sandstone. The coarse well-rounded millet grains indicate the aeolian (wind-blown) origin of the material. Dip rates for the bedrock across the area of limited, although where given this is indicated to be c.15° with the general dip direction being broadly towards the south. The deposits are faulted, so some variation to this should be expected.



Source: BGS Map Sheet 85. Manchester (1:50,000 scale) (2010). Bedrock.

Hydrogeology

Aquifer within Superficial Deposits on Site: Secondary Undifferentiated (soils previously designated as both minor and non-aquifer due to the variable characteristics of the rock type).

Aquifer within Bedrock on Site: Principal (formerly major aquifer and therefore high water bearing) for the Collyhurst Sandstone Formation, and Secondary B (lower permeability) for the Manchester Marls Formation.

Source Protection Zones: The Site is not indicated to lie within 500m of a source protection zone.

Source Protection Zones within Confined Aquifers: There are no source protection zones within confined aquifers within at least 500m.



Hydrology

Groundwater Vulnerability Zones: The soil/surface leaching potential is classed as being low (<40% infiltration with >550mm/year dilution). Furthermore, the vulnerability of the surficial geology and the bedrock geology is indicated to be low. Groundwater flow through the bedrock would be expected to be via secondary porosity mechanisms.

Groundwater Vulnerability – Soluble Rock Risk: There are no records associated with soluble rock risk within at least 1km.

A surface water feature is indicated to be culverted beneath the Site, passing broadly through its centre from the residential dwellings situated to the north-west and the wooded area to the south-east.

The Site is indicated to lie within a Water Framework Directive Surface Water Body catchment, this being associated with:

- River Irk (Ref. GB112069061131).

Furthermore, the Site is indicated to lie within a Water Framework Directive Groundwater Body catchment. Data provided by the Environment Agency ^[15] indicates that the groundwater body associated with the 'Manchester and East Cheshire Permo-Triassic Sandstone Aquifers' achieved an overall classification of 'Poor' in 2019.

2.3 Designations

The Enviro+GeolInsight report provides details on property-specific environmental designations in addition to other potential actions associated with non-environmental search returns such as planning constraints. The following salient information is presented in Table 2.3, below and overleaf.

Table 2.3 - Summary of Designations & Other Potential Actions

SSSI	There are no statutory protection sites within at least 2km.
Ramsar	There are no records relating to conserved wetland areas under the Convention of Wetlands of International Importance within 2km.
SAC	There are no records of Special Areas of Conservation having been designated under the EC Habitats Directive within 2km.
SPA	There are no records of sites having been classified by the UK Government under the EC Birds Directive within 2km.
NNR	There are no records relating to important natural or semi-natural terrestrial ecosystems within 2km.
Nature Reserves	The nearest recorded local nature reserve lies 748m to the north.
Designated Woodland	The nearest recorded area of ancient woodland lies 843m to the north.
Green Belt	The are no recorded areas of greenbelt within at least 2km.

Table Contd./



Nitrate Sensitivity	There are no records relating to nitrate sensitive areas within at least 2km.
Nitrate Vulnerability Zones	The Site lies within a nitrate vulnerable zone (Ref. River Irk (Moston Brook to River Irwell) NVZ 638).
Visual & Cultural Designations	There are no world heritage sites, areas of outstanding natural beauty, national parks, scheduled ancient monuments, conservation areas, or registered parks and gardens within at least 250m.
Habitat Networks	There are no records relating to on-Site priority habitat inventories, habitat networks, open mosaic habitats, or limestone pavement orders.
Archaeology	The potential for below-ground archaeology has not been identified within the remit of this study. Other assessments should be completed as required, if such studies have been identified by the Local Planning Authority.
UXO	Preliminary information obtained from Zetica (https://zeticauox.com) suggests that the Site lies within a low risk zone from Unexploded Ordnance. Further, more detailed risk assessment is unlikely to be required on this basis.

2.4 Environmental Records

A summary of salient published environmental data is presented in Table 2.4, below and overleaf.

Table 2.4 - Environmental Data

Landfill	Records indicate the presence of former landfill activity within 250m of the Site at the following locations: - Dated 1974-1977, from 103m south. Operated by Manchester City Council. Inert, industrial, commercial, household, special and liquid waste site at Moston Brook, Northampton Road, Harpurhey; - Dated 1979, from 217m south. Operator unknown. Ground workings and refuse heap. Address unknown.
Flooding	Assessment of risk against flooding events is not within the remit of this study, so specialist advice should be sought as required, with all necessary studies and reports being completed to obtain regulatory sign-off. <u>River & Coastal Flooding:</u> The Site is not indicated to lie within either a Flood Zone 2 or Flood Zone 3 area. <u>Surface Water & Groundwater Flooding:</u> The highest risk from on-Site surface water flooding and within 50m is indicated to be 1 in 30 years (0.3m – 1.0m). For groundwater flooding, risk on-Site and within 50m is indicated to be low. It is understood that the brook is culverted beneath the Site, the alignment of which is marked on the appended plan Ref. 4450/S0/105/G.

Table Contd./



Potable, Surface, and Groundwater Abstractions	There are no surface water or potable water abstractions within 2km, whilst the nearest groundwater abstraction lies 1.5km to the south on Norton Street, Miles Platting. The operator of this abstraction is indicated to be Hanson Quarry Products Europe Limited.
Public Register of Contaminated Land	There are no sites determined as being Contaminated Land under Part 2A of the Environmental Protection Act (1990) within 500m.
Dangerous or Hazardous Sites	There are no COMAH recorded sites within 500m.
Radioactive Substances	There are no live radioactive substance authorisations within 500m.
Fuel Sites	There are no records of historical, current, or recent petrol stations within 500m.
Garages/Workshops	There are no records of historical garage sites within at least 492m.
Military Land	There are no records of historical military land within at least 500m.
National Grid	There are no records relating to National Grid high pressure gas transmission pipelines or high voltage underground electricity transmission cables within 500m.
Mine Gases	Mine gas emission requiring action by the Coal Authority is not anticipated. This does not preclude, however, the presence of biogenic ground gases that may be derived from other sources such as glacial till material or where parts of the Site have been infilled. Further assessment should be undertaken where indicated within the context of this report.

2.5 Site History

It is not the intention of this report to reproduce or describe in detail all of the changes that may have occurred on, or within a radius of 250m to the Site, although a general review of available historical OS maps has been undertaken to identify any potentially significantly contaminative former land-uses that could impact upon the proposed development. It should be noted that defined boundary on some of the maps may not fully align with the Site's position. Furthermore, some of the OS map editions may not be fully complete. It is possible, therefore, that additional land uses to those presented on the plans could have occurred in the past. A general summary of the historical land use at the Site and within its surrounding area is presented in Table 2.5, below and overleaf.

Table 2.5 - Summary of General Historical Ordnance Survey Features

Year	Principal On-Site Features	Principal Off-Site Features
1848-1893	The first edition 1848 OS plan shows the Site to be undeveloped and to comprise a mixture of open field and semi-wooded 'valley'. Two surface water features are mapped, with these broadly flowing west to east across the Site.	Surrounding land is largely undeveloped and consisting of open fields to the north, south and west, but with the wooded 'valley' being present to the immediate west and east.

Table Contd./



Year	Principal On-Site Features	Principal Off-Site Features
Contd./	By 1891, the Site is mapped as being partly developed. This comprised <i>Brook Villas</i> within the northern-most part of the Site, and <i>The Glen</i> towards its eastern corner. Each block of property had corresponding formal garden curtilage.	Subsequent OS mapping from c.1891-1893 indicates general redevelopment of the surrounding land for housing.
1906-1938	No significant changes are mapped, although the 1932 OS plan denotes the presence of embankments along the southern side of the water feature.	Aside from housing, c.1909 OS mapping indicates the presence of an athletics and football ground, along with a dog's rescue centre, to the south-west. Housing is mapped at the position of the sports ground from c.1922, along with an adjacent bowling green. Allotment gardens are mapped adjacent to the watercourse from c.1932, with these extending down towards Moston Bottoms and Moston Brook. The 1931 OS plan indicates the presence of a small substation on Church Lane (east of Brook Villas) and a free-standing structure with open ground and a flagpole to its south (assumed cadet hut or Scout Hall) from c.1949.
1950-1987	From c.1950 the OS plans show more embankments within the Site's boundary, with these extending northwards to as far as Church Lane. A footpath is indicated on the southern side of the watercourse, with this having a footbridge over it. On the eastern boundary, refuse tipping is also mapped. The 1975 OS plan indicates the presence of a row of garages within the northern-central part of the Site (south of Brook Villas), whilst the 1979 OS plan shows additional garages as having been built at the position of the former The Glen property. Mapping on the 1979 OS plan also indicates that significant alteration to the Site has occurred. Mapping detail is very limited and suggests that large-scale infilling of the former 'valley' has been or is being undertaken. Culverting of the watercourse may have occurred at or around this time? Steep embankment around the Site's south-eastern boundary is subsequently shown.	Small-scale refuse tipping across the Site's eastern boundary is mapped c.1950, whilst more significant infilling along the alignment of Moston Brook, to the far south, occurred c.1979-1980. The 1980 OS plans onwards show the substation to remain, but for the cadet hut/Scout Hall and grounds to have been replaced with housing along Glenwood Drive and a smaller structure (labelled as Scout Hall or Hall from c.1982 onwards). Since 2014 the former Scout Hall has been in use as a children's nursery and pre-school; this remains operational to date. No further significant changes are noted.
1988-2001	No significant changes are mapped.	

Table Contd./



Year	Principal On-Site Features	Principal Off-Site Features
2003-2024	Other information (namely aerial imagery) dating back to c.2000 shows the Site to have been cleared of all previous housing and garaging, and with new development comprising a manège and a small barn(?) or similar structure within the central area for Moston Riding School. This infrastructure developed over subsequent years across the eastern part of the Site to create other paddocks and areas for horses, although it appears that the western portion of the Site and the area extending up towards Church Lane remained disused. Clearance of the northern area is indicated c.2018/2019, possibly in relation to proposals to build a 28 No. apartment unit with associated parking and landscaping, although that development never materialised and the land remained derelict.	



3 PRELIMINARY ENGINEERING APPRAISAL

3.1 Soils

Made Ground

The historical OS plans indicate that infilling of the former wooded valley that was once present on-Site occurred during the late 1970s. The watercourse that passed through the Site is thought likely to have been culverted at this time, thus directing water beneath the Site from the (now) aged-persons bungalows in the west to Moston Vale in the east.

Having searched for information on this infilling, there appear to be no publicly available records available for review. The thickness, extent, composition, and the geotechnical and environmental condition of these soils will need to be assessed in detail as part of a phase of intrusive ground investigation given that they will likely affect the proposed development from both a geotechnical and contaminated land perspective. The origin of the soils is unknown.

Natural Strata

Superficial deposits are indicated to be present across the Site, with these being attributed to Devensian Diamicton. The thickness of these soils is currently unknown, as is the depth to them given the indicated presence of infill soils used to raise/level the Site across a large part (or indeed all?) of its footprint. Similarly, the strength profile of the deposits with depth is unknown, and by association the presence of any laterally and/or vertically discontinuous layers/horizons of soft or otherwise unsuitable material. It would be anticipated, however, for these soils to exhibit soft and/or firm becoming stiff to very stiff consistencies, likely increasing in strength with increasing depth, and for variable and interbedded horizons of water bearing silt, sand, and gravel to potentially be present also.

As indicated above, the underlying bedrock soils are indicated to comprise a combination of mudstone (Manchester Marls Formation) and sandstone of the Collyhurst Formation (formerly Permian Sandstone). The geological boundary between these deposits is just south of Site centre, trending broadly north-west south-east. Due to the mapped superficial deposits and the infill soils that are to be encountered, bedrock is not expected to be present from shallow depth however.

As with the made ground deposits, the nature and strength profile of the underlying glacial soils will need to be confirmed as part of a detailed ground investigation as this information will facilitate construction of the most appropriate foundation solution for the proposed development. Deeper assessment of the underlying marls/sandstone bedrock may also be required, should data collated for the nearer surface deposits be insufficient to progress a workable foundation design.

Groundwater

On the basis of the Site's setting and indicated geology, shallow-depth groundwater should be anticipated within the made ground and/or superficial deposits.



3.2 Landslip (Mass Movement Deposits)

In providing a preliminary assessment of risk associated with potential landslip, consultation was made with the data presented by GroundSure at the 1:10,000 and 1:50,000 scales. Information presented in the report indicates that there are no records of mass movement deposits within 500m, whilst the hazard rating for slope instability (landslide potential) on-Site and within 50m is very low. The GroundSure data also indicates that there are no records of landslip permeability (i.e. the estimated rate of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposit) within 50m.

3.3 Foundations

Although the specific foundation design for the proposed development lies outside the remit of this assessment, it is considered at this stage that various factors need to be taken into account and that detailed ground investigation is needed to provide the information from which informed decisions can be made.

The historical OS plans indicate that significant infilling has occurred within the boundaries to the Site, although more likely to be greater within the southern and central parts. Since the extent, thickness and condition of those soils is yet to be confirmed, it is anticipated at this stage (excluding any contaminative risk they may also present) that they will be of poor condition, their compaction will be non-engineered, and that general geotechnical instability (including cross-boundary instability at the south-eastern end of the Site adjacent to the wood) will be recorded. As with all non-engineered made ground therefore, such soils would not be suitable founding stratum and that a nil allowable bearing capacity value would need to be applied.

Natural Strata

Notwithstanding the made ground, the Site is mapped as being underlain by glacial soils that could likely exhibit significant variation in terms of consistency, strength, and thickness. Indeed, limited information derived from investigation works undertaken beyond the Site's southern boundary suggest the presence of shallow perched water from c.2m, firm clays, and for the soils to also include gravelly sands and appreciable layers of very soft and soft consistency clayey silts to in excess of 5m depth. Since the Site formerly also had two surface water features passing through it, it would be expected for soft underlying deposits associated with these to be present too at depth.

With respect to foundations, it is anticipated at this stage that a pile and ground-beam arrangement will be required for the proposed dwellings given the expected thickness of made ground, the general geometry of the original ground surface, and soft underlying material. Piles would require being taken down through the vertical thickness of the made ground and any other unsuitable materials to be founded in natural undisturbed strata of appropriate load-carrying capacity; this could be Diamicton or the underlying bedrock material¹.

¹ It is noted that other nearby investigations did not prove either the Manchester Marls or Collyhurst Sandstone bedrock deposits during investigation. It could be that these soils lie too deep beneath the glacial cover, although if penetration resistance to SPT N = 50 is not achieved within the Diamicton additional and more robust drilling to acquire ground information from depth would be required.



Where piles are to be used, they should be designed to withstand any additional loading and down-drag (negative skin friction) that could potentially be generated from movement within the surrounding ground. Pre-drilling may be required to achieve requisite pile lengths, aid penetration through any dense soil layers, to seat (socket) piles into the underlying rock stratum, or to clear obstructions that can impede installation of piles to design elevations. Furthermore, the depth of founding would likely vary across the footprint to the Site so adjustments to final depth may likely need to be based on the progress of construction and in discussion with Building Control.

In order to determine the most expedient foundation solution, the condition and bearing characteristics of the underlying soils will need to be confirmed through detailed and Site-wide ground investigation and geotechnical laboratory analysis.

Once all ground investigation works have been completed, it would be advisable for a bearing capacity assessment to be completed by the Designing Engineer during the foundation design stage to ensure that the serviceability limit state of the proposed structures is not compromised in any way. This should also take account of the amount of total and/or differential settlement that could potentially occur². Independent field tests should be completed by a piling contractor to facilitate pile design and installation, if a full- or part-piled solution is to be adopted.

3.4 Floor Construction

It is anticipated at this stage that ground floor construction will be suspended. However, the proposed floor construction and the loadings that will need to be carried is outside the remit of this study and will need to be established in consultation with the Designing Engineer once ground conditions have been confirmed and the foundation solution(s) chosen.

The allowance for the inclusion of ground gas precautions to Characteristic Situation 2 ('CS2') of BS8485 ^[16] for carbon dioxide, methane, or both, should be made at this time, until confirmed otherwise. This is because the Site is located above infilled ground of unknown origin, potentially organic material, and lies within proximity to adjacent infilled ground and former refuse tipping.

3.5 Heave Precautions

The combination of shrinkable soils and trees, hedgerows, and shrubs represent a potential hazard to foundations and supported structures due to the effects of volume change and ground movement.

Foundations would need to be provided in accordance with current heave precautionary guidelines ^[17] if they lie within the zone of influence of removed, existing, or proposed planting when in cohesive soils. Information with respect to the plasticity indices and worst-case volume change potential of any proven or suspected cohesive soils will need to be obtained to

² If better than expected ground conditions are encountered, such as within the northern part of the Site and towards Glenwood Drive (i.e. on 'higher' ground as it originally was), it could be that more traditional foundations may be suitable providing that foundations are cast into soils of appropriate allowable bearing capacity.



assist with foundation design. The need for precautions in construction and how these interact with the foundation solution(s) should be discussed further with the Designing Engineer once ground investigation and all necessary laboratory analytical works have been completed.

3.6 Slope Stability

Global slope stability problems are not expected on the basis of available information. However, due consideration to potential problems associated with adjacent land impacting on the Site and its intended development will need to be made. Of note, the Site's south-eastern boundary lies adjacent to a marked elevational change. This is because of the infilling that has occurred. Stability problems for dwellings built within this part of the Site may therefore exist.

Where there is the possibility of weak/unstable ground being present or passing across any boundary, a geotechnical risk assessment of the integrity/stability should be undertaken prior to any construction being carried out. Designed and engineered measures should be deployed as required to ensure the continued integrity of the Site and its infrastructure.

3.7 Superstructure Precautions

The need for superstructure precautions should be discussed further with the Designing Engineer once all ground investigation works and assessments have been completed.

3.8 Excavation

Given the anticipated ground conditions, the instability of excavations for where service connections (and/or for any new foundations) are required should be expected, particularly during periods of wet weather, where soils are loose, excavations are deep, where they are left open for protracted periods of time, and/or if shallow perched water exists. Excavations may unduly widen if material collapse is encountered under these conditions.

All excavation works should be carried out in accordance with current HSE guidance, 'Structural Stability During Excavation' ^[18]. Designed and engineered temporary measures should be deployed as required to ensure the continued integrity of excavations made during construction.

3.9 Natural Ground Subsidence

With respect to natural ground subsidence, the Site has been classified as follows:

- 'Very Low' risk rating for shrink swell clay soils, running sands, collapsible deposits, and landslides hazards, and a
- 'Negligible' risk rating for compressible deposits and the ground dissolution of soluble rocks hazards.

3.10 Obstructions

Historical OS plans suggest that built-development at the Site has been relatively limited, with this being attributable to some residential dwellings, garage units, and the more recent barn-type structure within the equine area. Remnant obstructions associated with previous



development should therefore be expected within the relevant parts of the Site, although these are not expected to be particularly deep. Where remnant substructure or such other obstructions in the ground are proven, it may be that these will need to be grubbed out in their entirety, or at least where they interact with new foundation construction so as not to create 'hard spots'.

Excavation/breaking machinery of sufficient size and strength, including the need for any shoring, will need to be allowed for.

3.11 Concrete

Protection would be required in accordance with current guidance ^[19] where buried concrete products are to be in contact with soils that exhibit elevated concentrations of sulphate. Specialist advice should be sought to confirm the ACEC and Design Chemical class of concrete to be adopted at the design stage to the build once representative samples of the underlying soils have been tested. The Designing Engineer should refer to BS8500-1 ^[20] as necessary.

3.12 Stress Relief

Risk associated with stress relief is not anticipated.

3.13 Pavement

The design of future trafficable areas would need to be such that it allows for the effects of any soft underlying or variable materials and for the potential reduction in the strength of any replacement material to its long-term CBR value.

At this stage, it is anticipated that a design CBR <2.0% should be assumed. All necessary in situ testing in compliance with Manchester City Council (Highways) requirements will need to be undertaken to facilitate detailed design work.

Notwithstanding usual road construction requirements, a geogrid to increase load carrying capacity may be required.

Frost susceptibility should be assumed.

3.14 Site Drainage

For surface water, should soakaways be proposed, infiltration testing in accordance with BRE365 ^[21] would need to be completed as required. It should be noted, however, that it would be inappropriate for i) unstable, ii) potentially unstable, and/or iii) contaminated strata to receive point-source flows of water from dedicated soakaways. Based on the anticipated nature, thickness, and composition of the made ground to be encountered, it is likely that all three of these conditions could be met and that a sealed piped connection will be needed.

The drainage solution to be adopted should be explored with a competent drainage engineer. All drainage proposals will be subject to obtaining the necessary approvals.



4 PRELIMINARY ENVIRONMENTAL APPRAISAL

4.1 Introduction

Current UK legislation on contaminated land is set out in Part 2A of the Environmental Protection Act 1990 ^[22], which was retrospectively inserted by Section 57 of the Environment Act 1995 ^[23]. The Contaminated Land Regulations 2000 ^[24] were amended in 2005. The Environmental Protection Act 1990: Part 2A Contaminated Land, Statutory Guidance, Edition 2 (2006) promulgates the revised statutory guidance with respect to the operation of the Contaminated Land Regime following the implementation of the Contaminated Land Regulations, 2005. The definition of contaminated land is central to the operation of Part 2A.

Legislation adopts the principle of a 'suitable for use' approach for the assessment of contaminated land, the rationale being reflected in the site-specific risk assessment and determination of remedial strategy; action is only required if unacceptable risks are posed to human health or to the environment, considering the site's land use and geo-environmental setting.

The legislation places a responsibility on the Local Planning Authority to determine whether the land under its jurisdiction is contaminated by consideration of whether:

- The presence of substances (potential contaminants) are present at concentrations that are causing significant harm or have the significant possibility of causing significant harm;
- There are receptors which may be harmed (e.g. the water environment, human health, buildings, fauna and flora), and
- There is in existence a pathway between the identified sources and receptors.

To qualitatively assess the level of risk at the Site, the above rationale has been applied. This approach is consistent with the preliminary risk assessment procedure defined in LCRM. The following section summarises the preliminary CSM which has been produced following the review of available pertinent third party information. The CSM summarises Groundsmiths' current understanding of surface and sub-surface features, the potential sources of contamination, transport pathways and receptors in order to support the identification and assessment of plausible potential contaminant linkages.

4.2 Potential Sources of Contamination

A potential source is defined as 'a contaminant which is in, or under the land and has the potential to cause harm to human health or to cause contamination of controlled waters receptors'.

Although the available historical information for the Site suggests it's had limited actual use, it is evident that anthropogenic activity has occurred which could present a contaminative risk to Site end users and the wider environment. There are also some potential off-site sources of contamination that have been identified. On this basis, the following potential source-pathway-receptor linkages that may be associated with the Site have been considered. These are summarised in Table 4.1, overleaf.



Table 4.1 - Summary of Potential Sources and Contaminants

Potential Sources	Potential Contaminants (not limited to)
Potentially contaminated made ground and/or shallow underlying natural strata	Metals, metalloids, inorganic contaminants, phytotoxic contaminants, sulphate, PAHs (e.g. Benzo(a)pyrene), TPH, Monoaromatics, VOC and SVOC, and asbestos
Former development where garages were once present	Asbestos containing materials (profiled sheeting)
Substation to the east of the Site	PCB's
Sources of ground gas (e.g. deep made ground, on- and off-Site refuse tipping)	CO ₂ and CH ₄

4.3 Potential Migration Pathways

Migration pathways are routes by which contaminant sources may come into contact with receptors. Potential pathways for different types of contaminants vary depending on the properties of the contaminant, the mechanism of its release and the nature of the receptor.

The principal potential contaminant pathways by which receptors might become exposed to potential contamination at the Site are summarised as follows in Table 4.2, below.

Table 4.2 - Summary of Plausible Pathways

Potential Sources	Pathways
Potentially contaminated made ground and/or shallow underlying natural strata, off-site substation, and previous area of garages	Direct ingestion, dermal contact, dust, fibres, and/or vapour inhalation
	Direct ingestion and/or dermal contact with liquid contaminants
	Leaching and direct contact with potable water supply pipes
	Leachable contaminants via surface run-off, vertical and lateral migration via any permeable strata with the potential to impact controlled waters receptors
	Soft landscaping (to garden curtilage and public open spaces)
Sources of ground gas (e.g. deep made ground, on- and off-Site refuse tipping)	Migration of gases and/or accumulation in void spaces via transport through service conduit, any permeable made ground and/or any permeable underlying natural strata



4.4 Potential Receptors

A receptor is the potential target of the source contaminant, to which either significant harm or deterioration in quality may be caused. The potential sensitive receptors with respect to the potential contamination hazards identified above are considered in Table 4.3, overleaf.

Table 4.3 - Summary of Potential Receptors

Potential Receptor	Comment
Human Health	Site end-users in the residential with home-grown produce end use scenario (this being the primary risk scenario for Site end users) and where public open spaces are proposed Site operatives (during construction phase only) Future workers involved with any in-ground maintenance works
Construction	Potable water supply pipes Foundations and service conduit
Controlled Waters	'Secondary Undifferentiated' and 'Principal' aquifer soils

4.5 Environmental Risk Assessment

Risk assessment and the procedure of identifying sources, pathways and receptors is recognised as an approach to determine the extent and significance of contamination either within the context of Part 2A (when assessing current site status or when considering the acquisition of an existing development) or the planning process (for the redevelopment of an existing site, or when considering the acquisition of a site for redevelopment purposes). Either way, the 'suitable for use' approach is adopted when assessing risk and the source-pathway-receptor assessment defines the conceptual model for the site.

The statutory guidance describes a risk assessment methodology in terms of 'significant contaminants' and 'contaminant linkages', using the 'source-pathway-receptor' scenarios for the site. Contaminant linkages are formed when there is a linkage between a contaminant source and a receptor by means of a pathway. The existence of a contaminant linkage is dependent on site use, as well as environmental conditions. If no contaminant linkages can be proven, then the risks may be discounted. However, it is not to say that remediation is required if contamination is proven. The identified potential contaminants and receptors have been considered in relation to the pathways that may link them. The risk classification has been estimated in accordance with those methods prescribed in CIRIA C552 ^[25]. Risk is regarded as a combination of the likelihood of an 'event' occurring and its severity: both elements must be considered when assessing risk. The method for risk assessment, or evaluation, is purely qualitative. As defined in CIRIA C552, the magnitude of the potential 'severity' of risk occurring may be assessed against:

- **Severe (acute):** short term risk to human health likely to result in significant harm as defined under Environmental Protection Act 1990, Part 2A. Short term risk of pollution to sensitive water receptor (may result in death).
- **Medium (chronic):** long term risk and significant harm to human health, contamination of sensitive water resource or significant change to an ecosystem or specific organism



(may result in death).

- **Mild (chronic, but applicable to less sensitive receptors):** contamination of non-sensitive water resource but significant damage to crops, buildings, structures and services or the environment.
- **Minor (not significant):** harm, which may result in financial loss, or expenditure to resolve. Non-permanent effects to human health. Easily repairable effects of damage to buildings, structures, and services.

Similarly, the classification of the magnitude of the 'probability' of the risk occurring may be assessed against:

- **High Likelihood:** a contaminant linkage exists and an event appears very likely in the short term, or almost inevitable in the long term, or contamination is causing harm at the receptor. Urgent action is required.
- **Likely:** a contaminant linkage exists and it is probable that an event will occur. An event may not occur, but it is possible in the short term and likely over the long term.
- **Low Likelihood:** a contaminant linkage exists and it is possible that an event will occur. It is not certain that an event will occur over time, but it is less likely in the short term.
- **Unlikely:** a contaminant linkage exists but it is not possible to say if an event will occur even over a very long time.

Following completion of the severity and probability assessment, classifications can be compared to indicate the actual risk each contaminant linkage presents: this can only be undertaken where there is a possibility of there being an active linkage. The risk categories which can be assigned are presented in Table 4.4, below, and range between 'very high' to 'very low' (NB - it is not possible to classify an identified risk as 'no-risk').

Table 4.4 - Risk Categorisation

		Consequence			
		Severe	Medium	Mild	Minor
Probability	Highly Likely	Very High	High	Moderate	Moderate / Low
	Likely	High	Moderate	Moderate / Low	Low
	Low Likelihood	Moderate	Moderate / Low	Low	Very Low
	Unlikely	Moderate / Low	Low	Very Low	Very Low

Source: Table 6.5, C552 (2001).

- **Very High** – there is a high probability that severe harm could arise or that severe harm is occurring. Urgent investigation and remediation are likely to be required.
- **High** – harm is likely to occur, and that urgent investigation and remediation may be needed in the short term, but are likely over the longer term.
- **Moderate** – harm could occur. It is unlikely to be severe, most probably relatively mild. Investigation is normally required to clarify the risk with some remedial works being required in the longer term.
- **Low** – it is possible that harm could occur, but if it did, at worst it would be mild.



-
- **Very Low** – low possibility of harm arising, and that if it does it is not likely to be severe.

The identified potential contaminants and receptors have been considered in relation to the potential pathways that may link them. The resulting contaminant linkages are presented in Table 4.5, overleaf.



Table 4.5 - Summary of Environmental Risk (Current Site Condition without Mitigation)

Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating	Comment
Potentially contaminated made ground and/or shallow-underlying natural strata, off-site substation, and previous area of garages	<u>Human Health</u> Site end-users, inc. maintenance and site workers (short term risk during redevelopment)	Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour (Site end user)	Likely	Mild	Moderate / Low	A moderate/low risk is anticipated with respect to general contamination within the underlying soils for Site end users and construction/other in-ground workers. A formal environmental investigation will need to be undertaken to check on contaminant levels.
		Inhalation of asbestos fibres in made ground soils (Site end user)	Likely	Severe	High	
		Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour from any substation-derived contamination (Site end user)	Unlikely	Medium	Low	For asbestos, the level of risk is based to some extent on the severity rating of the contaminant and the risk profile that can be assigned at this time. Risk to Site end users is considered to be high at this time, although a greater perceived risk exists for those involved with in-ground works. Again, confirmation of presence through testing would need to be established, both generally and within the former garages area, before a final risk determination can be given.
		Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour (In-ground worker)	Likely	Mild	Moderate / Low	
		Inhalation of asbestos fibres in made ground soils (In-ground worker)	Likely	Severe	High	
		Direct ingestion, dermal contact with soil or inhalation of dust and/or vapour from any substation-derived contamination (In-ground worker)	Unlikely	Medium	Low	Risk from contamination associated with the substation is not expected given that it is isolated and contained within a brick-built structure approximately 8-9m from the Site's boundary. Land between the substation (now disused) and Site has been redeveloped over the years; the former Scout Hall to the south has been in use as a children's daycare centre for 11 years and other residential development has occurred adjacent to this. A low risk is postulated and further testing is not considered necessary.
		Direct ingestion and/or dermal contact with liquid contaminants (Site end user / In-ground worker)	Unlikely	Mild	Very Low	
	Potable Water Supply Pipes	Direct contact/leaching (tainting)	Likely	Mild	Moderate / Low	The need for precautions in construction will need to be confirmed given the brownfield status of the Site.
	Vegetation	Uptake via root system in soft landscaping	Likely	Mild	Moderate / Low	Capping to 600mm could be needed in soft landscaped areas.



Potential Sources	Potential Receptors	Plausible Pathways	Probability	Severity	Risk Rating	Comment
Contd./	Foundations	Direct contact/leaching	Likely	Mild	Moderate / Low	The need for sulphate precautions for new buried concrete products and piles will need to be confirmed.
	Controlled Waters	Vertical and/or lateral migration	Unlikely	Mild	Very Low	No particular risk is anticipated, although soils leaching should be confirmed through testing if gross contamination is encountered.
Ground gas sources	Site End Users	Inhalation (via ingress and accumulation into buildings)	Likely	Medium	Moderate	Allow for Characteristic Situation 2 precautions in accordance with BS8485 until confirmed otherwise.



General Soil Contaminants

It is anticipated at this stage, on the basis of available information and the preliminary risk assessment presented herein, that some or all of the on-Site made ground soils could present an unacceptable level of risk in relation to the potential for elevated concentrations of inorganic and organic contaminants of concern to be present at levels above residential with home-grown produce GAC threshold values, these being DEFRA's Category 4 Screening Levels ^[26], the LQM/CIEH Human Health Values ^[27] and/or other in-house derived GAC's calculated by Groundsmiths for organic contaminants ^[28].

The nature of the Site in its current condition suggests that the overall risk to Site end users without mitigation could be moderate to low as there currently remains the possibility for elevated levels of contamination to be present on a Site-wide basis. At this stage, therefore, it is considered that a check on contaminant levels should be made within the remit of a detailed intrusive ground investigation so that the levels to which any contamination may be present to in excess of relevant residential GAC values may be quantified.

Asbestos Containing Materials (ACM)

A high risk is currently perceived in relation to the potential for asbestos containing materials, although the level of risk postulated is, however, elevated to some extent by the consequence (severity) of the contaminant and the risk assessment framework that may be adopted at this time.

Given the history of the Site and that the origin of the made ground soils is unknown, it could be that there are asbestos fibres or potential sources of asbestos fibres present within the on-Site buried soils. Furthermore, and as indicated in the available OS plans, some garaging was present within the Site's boundary for a period of time; asbestos containing materials and/or loose fibres associated with the profiled sheeting that was widely used on such structures could therefore exist.

As with general soil contamination, it is considered that a check on the presence of any fibres that may exist within the near surface soils should be made within the remit of an intrusive ground investigation, including within the area of former garaging where access permits.

PCB's

PCB contamination associated with the substation is not expected within the on-Site soils, and it is considered therefore that no formal testing for such contamination is warranted.

The substation is noted to have been built in the 1930s and has remained constrained within its brick structure; it would have been expected to have undergone maintenance and upgrades over the years, notably when PCBs in insulating oils were banned in the late 1970's/into the 1980's. It lies approximately 8-9m from the Site's boundary, at its nearest point, and has seen development take place along its western boundary (between itself and Site) and to its south many years ago.

It is noted that the former cadet hut/Scout Hall and its grounds to the south of the substation were demolished and redeveloped, with a new hall having been built on a smaller plot of land



and the remaining area becoming part of the domestic curtilage to the row of houses that were built close-by. The hall has since been occupied by a children's daycare nursery since 2014, and the houses and their gardens remain.

If the substation had been located within the Site's boundary, and there was visual and/or olfactory evidence to suggest that it had leaked, it would be prudent to test locally around it to confirm the levels of any contamination present within the near surface soils. Since the transformer and its housing lies some way from Site, and sensitive development has occurred and remains immediately adjacent to it, it is considered that the level of risk it presents to the Site is low. Contaminant migration is unlikely to have occurred to the extent that it could impact upon the Site. Testing is not considered necessary unless currently unforeseen gross contamination is encountered during development.

Unforeseen Soil Contamination

As with any development site, there is the potential for contamination to be present that has not been identified at this stage. This is unavoidable so allowance for additional assessment should be made.

Ground Gases

There is a perceived moderate risk associated with potential fugitive ground gases at the Site, although this level of risk is determined to some extent by the consequence (severity) of the contaminants, rather than whether elevated concentrations are present, or not. As such, it is possible that concentrations of carbon dioxide and/or methane could be lower than currently anticipated.

Ground gas concentrations will need to be checked via a period of monitoring (minimum of 6 No. bi-weekly return visits) to establish baseline conditions. The need for any remedial measures to be implemented in construction will be dependent on the outcome of those works. Allowance for residential (Type A) Characteristic Situation 2 precautions in construction should be made until confirmed otherwise.

Controlled Waters Receptors

A very low risk is anticipated in relation to the potential for any mobile contaminants of concern to enter into controlled waters receptors. Further assessment should be completed if currently unforeseen gross contamination is encountered.

Potable Water

Water providers are required to maintain the safety of staff, contractors, and customers. On this basis, water providers work with a range of trigger values when laying mains pipes or services in contaminated ground, in the same way that assessment is made by contaminated land practitioners.

Testing in full accordance with UK Water Industry Research ('UKWIR') ^[29] published guidance will need to be completed so that informed decisions may be made. It is recommended that



additional testing for corrosiveness (electrical conductivity and redox potential) is also completed within the analytical suite.

Protection consistent with brownfield development (e.g. Protecta-Line) could potentially be required for all proposed dwellings.

Soils Disposal (Waste Acceptance Criteria)

Where any arisings are generated during redevelopment works, and they are intended for disposal to landfill, there is a requirement to determine if they would be classified as inert, non-hazardous, or hazardous.

Technical Guidance WM3^[30], which was introduced on the 1st July 2015 and is adapted from the third edition of Technical Guidance WM2³, sets out the requirement for classification. The classification assesses the composition of the material and determines the concentrations of hazardous substances within it, in relation to particular thresholds.

Given that it is a statutory requirement to ensure that wastes are characterised to meet specific acceptance criteria if disposal to landfill is to be undertaken, Waste Acceptance Criteria (WAC) testing would need to be completed in parallel with standard soils analysis. This testing would need to be undertaken on representative samples of any soils that are to be disposed of (e.g. from foundation excavations), prior to being removed from Site.

³ Environment Agency (2011). Technical Guidance (WM2). Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste (2nd Edition, Version 2.3).



5 FURTHER WORKS

5.1 Introduction

The overall objective of this preliminary assessment was to contribute towards the understanding of the ground conditions underlying the proposed development site located off Church Lane, Moston, Greater Manchester. Research into the history and evolution of the Site up to the present day has been undertaken, which allows a fair assessment of the risks posed to development to be made at this stage.

It is considered that the study has provided sufficient background data in terms of the historical land use to the Site and its surroundings, together with details of the general geology, hydrogeology, mining legacy, and anticipated sources of soil and ground gas contamination.

The preliminary environmental risk assessment, when considered within the context of proposed end-use, indicates that some potential contaminant linkages may present an unacceptable level of risk to human health in relation to the identified source-pathway-receptor linkages for the Site. On this basis, it is considered that further works are warranted prior to the Site's redevelopment so that Site-specific data can be obtained.

5.2 Objectives of Investigation

In relation to the proposed development, the objectives of an intrusive (geotechnical and environmental) ground investigation would be to:

- a. Investigate the general nature and thickness of the made ground and the depth to, condition, and nature of the underlying natural strata to facilitate foundation design.
- b. Determine the geotechnical parameters of the underlying natural strata via in situ testing (to refusal) and laboratory based analysis, as required.
- c. Report the presence of any buried obstructions and/or other excavation difficulties encountered during the works.
- d. Investigate the shallow-depth hydrogeological regime beneath the Site.
- e. Identify the nature and concentration of any contamination (including asbestos associated with any former garaging) within individual soil matrices, including sulphate analysis to assist with buried concrete design, and undertake Waste Acceptance Criteria testing for soils disposal purposes.
- f. Investigate the general level of risk associated with any on- and off-Site fugitive ground gases, and
- g. Provide general advice in relation to any environmental or geotechnical issues associated with the Site and/or any other recommendations needed to facilitate the proposed development, including, where necessary, identifying any additional



phases of investigation, assessment, or remediation that may need to be carried out.

5.3 Proposed Methods of Investigation

It is recommended that the following works given in Table 5.1, below, be completed. The positioning of exploratory locations would be subject to any access constraints and the presence of any underground utilities (and including the culvert and its easement) which would need to be confirmed beforehand.

Table 5.1 - Phase 2 Investigation Recommendations

	Anticipated Scope	Likely Investigation Method	Potential Contaminants of Concern including
<i>Environmental Investigation</i>			
1	Determine overall soil types and general contaminant levels (including sulphates for substructure concrete design)	Mechanical excavation and/or boring with sample recovery for environmental testing	A range of metals / metalloids, general inorganics, PAH, TPH, BTEX, Volatiles, and asbestos
2	WAC testing for any waste soils disposal that is to be undertaken		Full WAC Single Stage
3	Ground gas monitoring by 6 No. bi-weekly return visits	Mechanical boring with piezometer installation	CO ₂ , CH ₄
<i>Geotechnical Investigation</i>			
4	Investigation into the thickness and strength profile of the made ground and underlying natural soils through in-situ testing	Mechanical excavation and/or boring (with sample recovery)	-
5	Determination of plasticity indices (i.e. Atterberg, Water Content etc) and any other associated works required to facilitate development	Geotechnical laboratory testing	-

5.4 Testing

Geotechnical

With respect to geotechnical works, the nature, thickness, and integrity of the on-Site made ground soils should be investigated. Similarly, the nature of the underlying natural glacial strata would need to be confirmed. Representative soil samples should be taken for a suite of geotechnical laboratory testing, with dynamic probing and in situ strength testing (e.g. SPT) also being undertaken throughout the vertical soils profile to refusal (N = 50) at selected positions across the Site so that bearing capacities and the depth to competent strata for



foundation design may be established. Additional deeper boring into the underlying bedrock deposits could also be required.

These works will need to be undertaken in general accordance with the requirements of BS5930, BS10175, BS EN 1997-1 (2004+A1:2013) ^[31] and BS EN 1997-2 (2007) ^[32]. All works will need to be logged on-site by a competent engineer, with standard strata descriptions of the soils encountered being in general compliance with BS EN ISO 14688-1 (2002+A1:2013) ^[33], BS EN ISO 14688-2 (2004+A1:2014) ^[34] and BS EN ISO 14689 (2003) ^[35].

Environmental

All sampling undertaken as part of the ground investigation works would need to be in general accordance with those guidelines prescribed in BS10175 and any specific requirements of the testing laboratory. All environmental soil samples would need to be collected in a combination of 500ml plastic tubs with sealable lids, 250ml glass amber jars and 60ml glass amber vials (this being subject to analytical requirements). This would also be the case for where WAC samples were taken for soils disposal purposes.

Care would need to be taken to minimise cross contamination between sampling. All of the environmental samples would need to be packed into cool boxes and transported to an MCERTS and UKAS ^[36] accredited laboratory of Groundsmiths' choosing for analysis and subsequent storage / disposal. Standard retention times would apply.

The analytical strategy adopted for the environmental investigation would be designed to provide an overall assessment of potential contaminants thought likely to be present within the on-Site soils as encountered.

5.5 Outline Remediation Requirements

Soil

It is currently unknown if soil remedial activities for contamination will be required within the context of the proposed development. Any remediation works to be completed would need to be undertaken in accordance with the requirements of guidance prescribed by Manchester City Council ('MCC') ^[37].

Where remediation is to be completed, LCRM Stage 3 proposals and verification methodology would need to be submitted to the Local Planning Authority in the form of a standalone Remedial Strategy.

Ground Gas

For ground gas, it would be considered prudent to allow for Characteristic Situation 2 gas precautions in construction until proven otherwise.

For information at this time, and in accordance with BS8485, the structures as proposed would be determined as 'Type A (High Risk)' as they will have small volume internal spaces that will be generally poorly ventilated. As with soil contamination, specific remediation proposals and verification methodology for any gas protection measures that were found to be required



would need to be submitted to the Local Planning Authority in the form of an LCRM Stage 3 Remedial Strategy.

The installation of all gas membranes and associated components to be used would need to be carried out in accordance with manufacturer requirements and / or any other guidance given ^[38,39]. Independent inspection of the membrane and componentry installation would also be required at the time, with relevant documentary and photographic evidence being provided to the Local Planning Authority in a final post-installation Validation Report.

Coal Mining

Risk from mining legacy would not be expected. Further works have not been identified.



6 REGULATORY APPROVAL

This preliminary risk assessment report has been compiled in accordance with good practice guidance for the assessment and management of land that may be affected by land contamination and stability hazards.

The recommendations presented are considered reasonable on the basis of available information and the assessment of the Site as carried out by Groundsmiths. However, it remains the responsibility of the Client to ensure that the Site poses no significant risk to any sensitive receptor(s) and that it remains aligned with the proposed end-use and assessment framework adopted in this report and any accompanying reports.

If at any time in the future, additional information comes to light that puts into doubt the accuracy of the professional opinion or third party information presented herein, then it would be necessary to revisit the assessment.

Works undertaken cannot be guaranteed to gain approval by the regulatory authorities and / or your Warranty provider, so copies of this report should be made available to the relevant organisations for comment and approval, prior to undertaking any irrecoverable works associated with the Site.



7 INFORMATION SOURCES

The following references have been cited in the production of this report:

- 1 BS10175 (2011+A2:2017). Investigation of Potentially Contaminated Sites. Code of practice.
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- 7 British Geological Survey (2010). Manchester, England and Wales Sheet 85. Bedrock. 1:50,000 (Keyworth, Nottingham: British Geological Survey).
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- 19 Building Research Establishment (2005). Special Digest SD1, Concrete in Aggressive Ground.
- 20 BS 8500-1 (2015+A2:2019). Concrete – Complementary British Standard to BS EN 206. Part 1 – Method of Specifying and Guidance for the Specifier.
- 21 Building Research Establishment (2003). Digest 365, Soakaway Design.
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- 23 Environment Act (1995).
- 24 The Contaminated Land Regulations (2000, amended 2005).
- 25 CIRIA C552 (2001). Contaminated Land Risk Assessment – A Guide to Good Practice. D. J. Rudland, R. M. Lancefield & P. N. Mayel.
- 26 Department for Environment, Food & Rural Affairs (2014). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document.
- 27 LQM / CIEH: The LQM / CIEH S4UL's for Human Health Risk Assessment. Land Quality Press, Nottingham, 2015. Publication Number S4UL3339.
- 28 Environment Agency. Contaminated Land Exposure Assessment (CLEA) software version 1.071. <https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool>.
- 29 UKWIR (2011). Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. Ref. 10/WM/03/21).
- 30 Environment Agency (2018). Technical Guidance (WM3). Waste Classification, Guidance on the Classification and Assessment of Waste (1st Edition, Version 1.1).
- 31 BS EN 1997-1 (2004+A1:2013). Eurocode 7. Geotechnical Design. General Rules.
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- 38 CIRIA C735 (2014). Good Practice on the Testing and Verification of Protection Systems for Buildings against Hazardous Ground Gases.
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8 REPORTING LIMITS

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The findings and opinions provided in this document are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described. Factual information including, where stated, a visual inspection of the site, has been obtained from a variety of sources. Groundsmiths assumes that third party data is reliable but cannot independently confirm this as the validity and accuracy of this information is outside our control. No guarantee can therefore be given as to the completeness of the information gathered during the study and no responsibility is accepted for errors or omissions in the third party information used. Groundsmiths' professional judgement and experience is however used to ensure that uncertainties are reduced to a level appropriate to the Site's conditions, the purpose of the investigation and the resources devoted to it by the Client.

Whilst every effort has been made to carry out a qualitative Stage 1 LCRM assessment that enables a realistic preliminary characterisation of the parameters to be identified, the possibility of variation in actual ground and groundwater conditions existing cannot be discounted. The findings and opinions presented in this report are relevant to the time this assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, ground investigation, construction activities, change of site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of this report. Where such information might impact upon stated opinions, Groundsmiths reserve the right to modify the opinions expressed in this report. Where opinions expressed in this report are based on current available LCRM guidelines and/or other legislation, no liability can be accepted for the effects of any future changes to such guidelines and legislation. New information or improved practices and changes in legislation may require reinterpretation of the report as a whole, or in part.

The conclusions and recommendations presented in this report are based on the Site-specific assessment but utilising third party documentary information as appropriate. They are, however, limited to those that could be reasonably made at the time the assessment was undertaken. Where assessments of site areas affected in particular ways are given, these are approximate.

This report does not constitute an archaeological, ecological, arboriculturalist / invasive plant species, or UXO survey. Any comment given in relation to these is for information only. Further assessments to assess these may be required as part of any planning condition and should therefore be undertaken by suitably qualified experts as required.

Groundsmiths reserve the right to edit and / or retract any conclusion or recommendation made in this report should any further information, with respect to the Site, become available.

Groundsmiths disclaim any obligation to update the report for events taking place after the time during which the assessment was carried out.

Groundsmiths do not provide or purport to provide legal advice. Should the Client require such advice then that of lawyers should be sought.

Groundsmiths accept no responsibility if any findings given in this report are not implemented by the Client or their agents.

Groundsmiths accept no responsibility if any further works, as requested by the Local Planning Authority in the discharge of their duty of care, are not implemented by the Client or their agents.

This report could be reassigned to a third party if they require reliance on it in the event that the Site is sold at any time in the future. An administrative fee would be applicable in such instances, payable prior to transfer.