Edlington
Consulting Group Limited

MEREBRIDGE CONSTRUCTION LTD

PHASE 2 GROUND INVESTIGATION REPORT

Land at 48 Store Street
Manchester
M1 2WA

REPORT No. E250321

September 2025

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DOCUMENT RECORD

Report Title	Phase 2 Ground Investigation Report
Project Address	Land at 48 Store Street, Manchester, M1 2WA
Project Number	E250321
Client	Merebridge Construction Ltd

	Signature	**Name and Qualifications**
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For and on behalf of Edlington Consulting Group Limited

Issue No	**Date**	**Status**
1	September 2025	Final Report

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PHASE 2 GROUND INVESTIGATION REPORT

Introduction

A combined Phase 2 geotechnical and geoenvironmental ground investigation has been undertaken for a proposed multi-story residential apartments development of land at 48 Store Street, Manchester, M1 2WA. A Site Location Plan is provided in Appendix A. The Ordnance Survey National Grid reference for the approximate centre of the site is 384986, 398081.

Instructions to undertake the investigation were received from the Client by way of their email instruction dated 18th May 2025.

This report describes the intrusive site investigation activities carried out by Edlington Consulting Group Limited in order to provide an evaluation of the ground conditions and the extent of soil contamination on the site. On the basis of those findings, and subsequent laboratory testing and with regard to the proposed development, the report presents: initial human health and groundwater risk assessments (using the source-pathway-receptor risk assessment methodology); and geotechnical assessment and recommendations.

This report has been prepared for the sole use of the client and their professional advisors. This report shall not be relied upon by third parties without the express written authority of Edlington Consulting Group Limited. If an unauthorised third party comes into possession of this report, they must not rely on it and the authors owe them no duty of care and skill.

Scope of the Investigation

The scope of the investigation, as defined and agreed Client, was to undertake a review of the previously completed combined Phase 1 desk study and undertake a follow-on Phase 2 ground investigation to provide an assessment of the geotechnical engineering properties of the ground and the extent of soil contamination on the site.

A Tier 1 and Tier 2 contaminated land risk assessment was undertaken based on the methodology and criteria provided in the Environment Agency's publication Land Contamination Risk Management (LCRM).

Proposals

We understand the redevelopment proposal comprises a reduced level dig to lower ground levels at the site to an elevation broadly consistent with Store St and construction of a multi-storey residential apartment development across fourteen floors.

The footprint of the proposed development structure is understood to extend across the majority of the site area with a limited external paved communal area running down the western side of the site to give access to the rear of the structure.

No external garden or communal soft landscaped areas are understood to be proposed as part of the redevelopment with the only vegetation understood to be localised containerised trees and shrubs.

Site Information and Walkover Survey

An updated walkover survey of the site and its immediate surrounds was undertaken on the 19th August 2025.

The site is situated within the Eastern Quarter of Manchester directly to the south of Store St and forms a five-sided parcel of land covering an area of approximately 0.07 hectares.

The site lies above and to the south of a stone-faced retaining wall which runs parallel with the pavement to Store Street and which forms the northern site boundary. The retaining wall is approximately 2.50m high at its south-western end but steps up to approximately 3.30m at its northeastern end, has weep-holes at regular intervals and appears to be of concrete construction with stone facing.

The south-western edge of the site is supported by a brick or brick-faced retaining wall of approximately 2.50m height adjacent to Store Street but rising towards its south-eastern end. At the top of the retaining walls there are metal railings/fencing which forms the south-western and western site boundary.

The ground behind the retaining wall rises by approximately 4.0m to 5.0m to the eastern boundary and comprises an open area of broken ground with abundant brick, crushed concrete and occasional glass, plastic and metal content.

The site is surrounded by mixed development and land usage as follows;

- To the north and northwest lies Store Street with residential development beyond.
- To the southwest, the site is bordered by commercial units of the Gateway Industrial Estate at lower land level concurrent with pavement level on Store St.
- To the south and east, the land use comprises four-storey residential developments with associated vehicle access and parking. Land levels continue to rise by approximately 1.00m to 1.50m beyond the site to the south, with this change in land level facilitated by a masonry retaining wall which forms the southern boundary of the site.

A localised concrete slab was observed to be present measuring approximately 5m by 5m on the high-side of the site and positioned mid-way along the southwestern boundary of the site adjacent to the neighbouring commercial units of the Gateway Industrial Estate.

The site was effectively land-locked at the time of the ground investigation; however, a temporary access has recently been created through localised removal of the corner boundary wall structure on the north-western corner of the site directly onto Store St.

At the same time, a re-grading exercise was being undertaken across the site with land levels on the southern portion of the site being reduced by approximately 750mm to create a level platform for the ground investigation. Further lowering and ground reprofiling was undertaken along the northern side of the site to create a lower-terrace platform to facilitate drilling rig access at approximately 1.50m higher than Store St pavement level.

No visual or obvious evidence of ground contamination was noted during the site walkover and no evidence of chemical storage was observed at the site.

Summary of Previous Work

Previous phases of site investigation are understood to have been undertaken for the site, pertaining to planning for the current redevelopment. The following reports are known to exist;

- *Phase 1 Desk Study Report,* prepared by LK Group Ltd (report ref. LKC 21 1259, June 2021)
- *Preliminary Risk Assessment,* prepared by Geotechnics Ltd (report ref. PN143266, September 2014)

A copy of the above report reviewed prior to undertaking the current ground investigation. The full report should be referred to; however, the salient points are summarised below;

Context

The Phase 1 report comprised a desk study which used information obtained via a walkover survey and review of environmental database searches to develop a Conceptual Site Model and Preliminary Risk Assessment for the site in accordance with BS10175:2011+a2:2017, CLR11 "Model Procedures for the Management of Land Contamination and LCRM "Land Contamination Risk Management.

Phase 1 Desk Study Findings

A review of historical mapping indicated that the site comprised undeveloped land at the time of the earliest mapping records (dated 1801) and continued as such until the next available mapping dated 1848. Between this time, a small watercourse (Shooters Brook) is initially indicated to be traversed the site but is not shown in subsequent mapping after 1848. An unnamed building is evident immediately to the southwest of the site and another lies approximately 30m to the northeast.

Records dated 1851 indicates that a Smithy a Saw Pit and a Timber Yard are located within the local area to the east of the site. To the north of the site (on the opposite side of Store St) a cotton mill is recorded.

Mapping dated 1889 indicates development encroaching onto the northernmost and southernmost corners of the site comprising a Packing Case Factory and the southernmost a Warehouse and Stables. A wooden building is also shown within the site, adjacent to the Packing Case Factory. To the south-west of the Warehouse and Stables a Timber Yard and Timber Shed are shown whilst on the opposite side of Store Street, Store Street Mills are shown to include Various Factories including a Tin Plate Factory.

Between 1908 and 1922, some demolition of aforementioned structures is indicated to have taken place. Between 1928 and 1954, records continue to show the earlier Packing Case Factory in the northernmost corner of the site but the remainder of the site is primarily occupied by part of a *Saw Mill* with associated yard for *Timber & Logs* and a *Travelling Gantry*. To the south and east of these lie a further *Saw Mill*, *Timber Yard* and *Timber Store*, a *Wood Working* workshop and a *Lead Shop*.

No significant changes are shown on the 1969 map, however, by 1972 the earlier buildings to the west of the site and to the north of Store Street had been demolished as had those to the east and southeast by 1978.

By 1985 the current buildings immediately to the southwest of the site (Gateway Industrial Estate) had been constructed and the site itself appears to comprise only remnant walls from the earlier development.

The desk study identified that the local anticipated geology comprised potentially deep Made Ground onto Glacial Till, further underlain by a significant thickness of sandstone bedrock associated with the Sherwood Sandstone Group. Pennine Coal Measures strata are recorded at significant depth beneath the site.

The desk study data indicated that there were no recorded historical or active landfill sites or waste management facilities present within 500m of the site.

The site was identified to be located within a region historically associated with deep underground coal mining activity and consequently within a Coal Mining Reporting Area, however the site was not deemed to be located within a Development High Risk Area. Information obtained from the Coal Authority suggested that there were known / recorded worked coal bearing seams within the Pennine Coal Measures Formation at significant depth beneath the site.

Whilst part-reproduced and discussed later within this report as required, specific reference should be made to the technical detail set out within the previously compiled Coal Mining Risk Assessment set out within the Phase 1 Desk Study Report produced by Geotechnics Ltd their 2014 Preliminary Risk Assessment.

Two hand-held dynamic sampler boreholes were advanced in the north-western corner of the site as part of the Geotechnics Ltd Preliminary Risk Assessment in 2014 to provide initial ground proving information. The boreholes were advanced to depths of 2.55m bgl (WS01) and 0.70m bgl (WS02) on the 26th August 2014.

Both boreholes encountered Made Ground comprising typically '*friable dark brown slightly gravelly sandy clay with a low cobble content of concrete and bricks. Gravel is fine to coarse angular including clinker, slag, slate, sandstone, concrete and brick with occasional glass, porcelain and plastic fragments*'. Both boreholes terminated on obstructions (presumed demolition rubble).

Initial geoenvironmental screening of six samples from the Made Ground was undertaken. Exceedances of the relevant GACs at the time were observed in respect of Lead, (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene and Chrysene. In addition, one sample of the Made Ground tested identified traces of Chrysotile fibres recovered from WS01 at a depth of 0.90m bgl.

The Phase 1 desk study recommended that a proportionate Phase 2 intrusive site investigation be undertaken in order to determine the ground conditions beneath the site, undertake appropriate laboratory soil analysis and assess the potential Source-Pathway-Receptor linkages identified.

The focus of this further work was to target both areas of potential soft landscaping (where end users may come into contact with soils) and also to allow an assessment of the ground properties to facilitate the structural design process.

Ground gas monitoring was recommended to assess the potential for methane and carbon dioxide to form a pathway to residential end users.

Unexploded Ordnance and Bomb Sites

The Zetica bomb risk map shows that the site is located in an area where there is a 'Moderate' risk of unexploded ordnance (UXO). Under the Zetica mapping scheme, areas are denoted 'High', 'Moderate' or 'Low' risk depending upon the nature of the land-use and proximity to known, mapped or otherwise recorded and established wartime activity. The national background land risk classification is that of 'Low' risk and moderate-risk regions are those with a statistical bombing density of 10 to 50 bombs per 1,000 acres.

To further develop a site-specific assessment of the potential risks posed by UXO at the site, a Detailed UXO Risk Assessment was commissioned as part of the Phase 2 ground investigation by ECG Ltd. The assessment was completed by Alpha Associates Ltd (report ref. 377774476_1, dated June 2025 and a copy of the report is presented at Appendix D for reference.

The assessment concluded that the site was likely to be at 'medium' risk of UXO. The principal factor in this assessment were an identified 25 bomb strikes recorded within 1km of the site, with the nearest being located 235m to the southeast.

In light of these findings and in accordance with CIRIA's publication on managing UXO risks, it was recommended that safety and awareness briefings were undertaken prior to any ground investigation works, although the use of magnetometer / geophysical survey techniques was not considered necessary.

Geology

Published Geology

Reference to the British Geological Survey (BGS) 1:50,000 scale map Manchester (Sheet No. 85) and other published geological information on the area indicates that the site is underlain by a potential cover layer of Glacial Till (Boulder Clay), further underlain by bedrock of the Sherwood Sandstone Group (within the Chester Pebble Beds Formation sub-group) of Triassic-age.

The Ardwick Fault is recorded some 100m to the southwest of the site (trending on a northwest to southeast axis) with the bedrock strata to the east of the fault indicated to be downthrown at a dip angle of approximately 16 degrees. The underlying recorded Coal Measures of Carboniferous-age are anticipated to be present at a depth of around 300m bgl.

Although no infilled or Made Ground deposits are recorded on the site on published geological records, the land-levels across the site and the history of on-site and neighbouring development suggest that the site is likely to be underlain initially by a potentially significant thickness of Made Ground comprising demolition rubble and possibly also including waste materials from nearby industry.

The recorded Glacial Till likely to be present beneath the Made Ground at the site is likely to form variable silty sands and clays and, based on nearby historical borehole records, is likely to be typically 3m to 8m in thickness. Due to the dynamic depositional environment of glacially derived soils, these strata should be expected to display a degree of vertical and horizontal variability in composition and may contain pockets of perched water.

The recorded bedrock Sherwood Sandstone Group is considered to likely be in excess of 250m in thickness generally beneath the site before transitioning to the underlying Pennine Coal Measures stratum. The stratum is described in the local memoir as: '*Sandstone, red, yellow and brown, part pebbly; conglomeratic in lower part; pebbles generally extraformational quartz and quartzite, with some intraformational clasts; subordinate red mudstone and siltstone*' and is likely to be progressively weathered towards the upper horizon, forming a residual silty clayey sand with lithorelicts of the parent sandstone and siltstone either as bands or disseminated fragments.

The underlying bedrock Pennine Lower Coal Measures Formation strata is described as*: "interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base, and several such marine fossil-bearing mudstones in the upper half of the unit".*

Further, site-specific, information on the potential risks posed by coal mining is provided in the Geotechnical Hazards section of this report.

Historical Boreholes

Several historical borehole records are presented within the Phase 1 desk study report for the site as follows;

Borehole SJ89NW5 is located some 40m to the southwest of the site and the record identifies that the borehole encountered 'clay' (interpreted as possible Glacial Till) to an approximate depth of 9.45m bgl.

In addition, records from two historical ground investigations undertaken locally by Geotechnics Ltd were presented for reference within the Phase 1 desk study report. These were located c.70m to the west and c.130m to the south-south-east and recorded ground conditions as follows;

South-south-east: Ground level c. 43.3m OD

0.00m – 1.60m : Made Ground

1.60m – 5.80m : Firm/stiff Clay - (Considered to represent Glacial Till)

5.80m – 10.50m : Sandstone - (Considered to represent bedrock Sherwood Sandstone Group)

West: Ground level c. 37.9m OD

0.00m – 0.90m : Made Ground

0.90m – 1.50m : Dense Sand - (Considered to represent Glacial Till)

1.50m – 7.50m : Stiff/very stiff Clay - (Considered to represent Glacial Till)

7.50m – 8.30m : Dense Sand - (Considered to represent Glacial Till)

8.30m – 10.00m : Sandstone - (Considered to represent bedrock Sherwood Sandstone Group)

Hydrology

The nearest current surface watercourse is recorded 25m to the north of the site and comprises the Ashton Canal. The canal is elevated above general site level. Review of historical mapping records dated c.1801 indicate another watercourse (Shooters Brook) to run along the line of Store St and possible passing through the site however this feature is not shown on subsequent mapping and may have been diverted.

Hydrogeology

EA datasets indicate the site is located on Unproductive Strata comprising the Glacial Till overlying a Principal Aquifer comprising the bedrock Sherwood Sandstoen Group. The site is not recorded to be located within a Source Protection Zone (SPZ).

The aquifer designation data is based on geological mapping provided by the BGS. The maps are divided into two different types of aquifer designation:

- **Superficial** - the youngest geological deposits formed during the Quaternary period, resting on Bedrock geology.
- **Bedrock –** the main mass of rocks forming the Earth and present everywhere, either exposed at surface or concealed by Superficial Deposits or water.

Updated Conceptual Site Model

A review of the Tier 1 Preliminary Risk Assessment presented in the previously completed Phase 1 desk study has been carried out in accordance with the current LRCM risk assessment evaluation criteria using the source-pathway-receptor principle to create a conceptual model for the site.

This method is predicated on the principle that a pathway must exist between a potential source of contamination and a potential receptor for there to be a risk to that receptor.

Potential sources of contamination and potential receptors relevant to the site have been assessed using the LRCM (2020) guidelines and are detailed below, together with the possible pathways that might allow contaminant linkages.

We understand the redevelopment proposal comprises a reduced level dig to lower ground levels at the site to an elevation broadly consistent with Store St and construction of a multi-storey residential apartment development across fourteen floors.

The footprint of the proposed development structure is understood to extend across the majority of the site area with a limited external paved communal area running down the western side of the site to give access to the rear of the structure.

No external garden or communal soft landscaped areas are understood to be proposed as part of the redevelopment with the only vegetation understood to be localised containerised trees and shrubs.

Potential Sources Contamination

Potential Solid-, Liquid- and Vapour-phase Contamination Sources

The results of the desk study and walkover survey has identified the following potential sources of soil or groundwater contamination may be present at, or in close proximity to, the site:

Potential Source	Potential Contaminants
Legacy use of the site as a Packing Case Factory, Warehouse, Stables, Saw Mill and Timber Yard at variable periods since the mid-19th Century.	Variable: may include heavy metals, petroleum hydrocarbon, non-metals, metalloids and poly-cyclic aromatic hydrocarbon contamination, organic matter and asbestos.
Historical demolition of previous structures both within and adjacent to the site.	
Made Ground from previous development and demolition and likely infilling / deposition of local fill and construction waste.	
Possible contamination from local development and historical off-site land use in the vicinity including a Smithy, Saw Pit/Mill, Canal Docks, Cotton Mill, Timber Yard/Warehouses, Metal Factories and Works.	

Potential Gaseous-phase Contamination Sources

The main groups of gaseous-phase contamination considered to be relevant at the site are gases (including methane and carbon-dioxide) that result from organic decomposition of constituents in the ground. As such, there is considered to be a potential risk of ground gases at the site.

In consideration of the source-pathway-receptor methodology for ground gas risk assessment set out in CIRIA C665, the sensitivity of the proposed redevelopment is considered to be moderate (residential).

We have provisionally assessed the risk of ground gas impacting the site, by reference to the CL:AIRE research bulletin RB17, "A pragmatic approach to ground gas risk assessment", 2012.

The following potential sources have been assessed:

- There are no recorded landfill sites within 500m of the site.
- The site is likely to comprise an area of significantly infilled ground with historical mapping suggesting that the site has formed a repository for demolition and local construction process waste dating back to the 1800s. Further recorded Made and In-filled Ground is recorded some 25m to the north of the site along the alignment of the Ashton Canal which follows a historical embankment through the local area.
- Given their proximity and scale, the above referenced features are considered to form a potentially credible (albeit low likelihood) source and pathway for ground gas migration.
- Made Ground may currently be in excess of 5m deep or in excess of an average of 3m in thickness, however the proposed reduction in site levels as part of pre-development groundworks is likely to reduce this significantly.
- Radon protection measures are potentially required subject to discussion with the Local Authority.

At this stage, the site is not considered to be at significant risk from migrating off-site ground gasses, however credible onsite potential sources of ground gas generation (notable Made Ground and deep historical coal mining) have been identified.

As a precautionary measure, and to further inform this assessment in line with best practice, a detailed monitoring programme for on-site ground gas emissions is considered appropriate to assess and address the above referenced risk. This aligns with the recommendations from the previous Phase 1 assessment.

Receptors

The following most sensitive receptors have been identified at the site:

Human Health

- Long-term risk group: end users of the site – residents and visitors (children and adult)
- Long-term risk group: neighboring land users – residents, staff and visitors (children and adult)
- Short-term risk group: construction workers (adult)

Environmental

- Controlled Waters - the superficial Glacial Till – classified as an Unproductive Strata.
- Controlled Waters - the bedrock Sherwood Sandstone Group – classified as a Principal Aquifer.
- Controlled Waters - nearest surface watercourse is recorded some 25m to the north of the site and comprises the Ashton Canal. The canal is elevated above general site level and, as such, it is considered unlikely to be hydraulic flow between the site and this watercourse.

Built Environment:

- The proposed building foundations
- Buried services, including water supply pipes

Pathways

It is considered that a number of potential pathways exist between these potential sources and the above-identified receptors.

For the human receptors these include:

- Direct soil ingestion in areas of exposed soil
- Inhalation of indoor and outdoor vapours and dust
- Dermal contact with contaminated soil
- Inhalation of soil gases or vapours migrating through permeable strata into the building

For Controlled Waters, the pathways include:

- Migration of contaminants through the unsaturated zone
- Migration of contaminants through the groundwater
- Movement of contaminants through drains or services runs

For the proposed substructures and buried services, the pathways include:

- Leachable or corrosive contaminants within the soil
- Leachable or corrosive contaminants within the groundwater

Potential Linkages

The relationship between a source, a pathway and a receptor is identified as the 'pollutant linkage' and if this is not complete then land does not present a risk to receptors. The potential linkages are summarised below, based on a proposed potential residential end use:

Potential Contaminants	Pathways	Receptors	Risk rating	Comment
Heavy metals, metalloids, non-metals, various hydrocarbons and asbestos in near-surface soils – from historical use of the site as a Packing Case Factory, Warehouse, Stables, Saw Mill and Timber Yard. Possible contamination from local development and historical off-site land use in the vicinity including a Smithy, Saw Pit/Mill, Canal Docks, Cotton Mill, Timber Yard/Warehouses, Metal Factories and Works.	Contact, ingestion, inhalation	Construction & maintenance workers	Medium (Short-term)	Contaminants in soil may be disturbed during groundworks. Risks could be reduced with use of appropriate personal protective equipment
		Site end users and neighboring site users / residents	Low (Long-term)	The linkage will only be complete through areas of soft landscaping
	Contact	Infrastructure	Low to Medium (Long-term)	Risk could be reduced by corrective selection of materials
	Migration	Controlled Waters	Low to Medium (Long-term)	Where the site has a cover of hardstanding, this may serve to inhibit migration
Various volatile hydrocarbons and poly-cyclic aromatic hydrocarbon contamination - from potential Made Ground, and from historical development/demolition of the wider site and adjacent land, landscaping / infilling of the site.	Contact, ingestion, inhalation	Construction & maintenance workers	Medium (Short-term)	Contaminants in soil may be disturbed during groundworks. Risks could be reduced with use of appropriate personal protective equipment
		Site end users and neighboring site users / residents	Low (Long-term)	The linkage will only be complete through areas of soft landscaping
	Contact	Infrastructure	Low to Medium (Long-term)	Risk could be reduced by corrective selection of materials

Based on the desk study research alone, the sources, pathways and receptors listed in the CSM are considered to have the potential to be present as complete pollutant linkages.

This model should be tested by means of an intrusive phase of fieldworks, inspection and chemical laboratory analyses of soils and (if necessary) groundwater and gas monitoring.

Geotechnical Conceptual Site Model

Due to the history of the site, apparent landscaping / infilling activities and redevelopment of adjoining land, a significant thickness of Made Ground is anticipated beneath the site.

The desk study review of published records and mapping has indicated that the site is likely to be underlain by a superficial (but potentially significant) thickness of Glacial Till, further underlain by the Sherwood Sandstone Group bedrock which is likely to continue to >75 to 100m depth before transitioning to the underlying Pennine Coal Measures.

The Made Ground is likely to derive material both from local historical development (possibly dating back to the construction of the Aston Canal to the north prior to 1800) and also contemporary demolition waste from redevelopment of neighbouring structures within the 20th Century.

The underlying superficial natural soils (possible Glacial Till) are likely to contain areas of both coarse and fine-grained material with a high propensity for both vertical and lateral variability. Coarse-grained portions of the stratum may be water bearing and prone to instability in unsupported faces whilst fine-grained portions of the stratum may exhibit a volume change behaviour.

The underlying Sherwood Sandstone Group bedrock is likely to comprise a weathered sandstones with bands of harder siltstones, however this is expected to weather progressively towards the upper horizon to a residual silty sand / gravel. Perched groundwater may be present at shallow depth beneath the site.

The above issues may significantly affect foundation design and geotechnical profiling of the stratum will require representative investigation and laboratory testing to derive a reliable classification for design purposes. Depending upon the nature of the ground, aggressive chemical conditions may be present which could pose a long-term integrity risk to embedded concrete.

Discussion on risks associated with historical coal mining

The previously compiled Preliminary Risk Assessment undertaken by Geotechnics Ltd in September 2014 included a Coal Mining Risk Assessment (CMRA) report which was based on detailed interpretation of geological mapping, review of local published archive data and supplemented by a Consultants Coal Authority report; commissioned through the Coal Authority.

The CMRA identified the site to be located within a Coal Mining Reporting Area however the site was not deemed to be located within a Development High Risk Area.

The CMRA indicated that the site is underlain at depth by Coal Measures bedrock (beneath the overlying Sherwood Sandstone Group) and is likely to be within the zone of influence from workings in two seams of coal at 1050m and 1090m depth, which were last worked in 1961.

No known coal mine entries or shafts were identified within 20m of the site boundary and, given the significant depth to recorded historical workings (and the thickness of bedrock overburden), the CMRA concluded that the ground stability risks posed by historical underground mining activities at the site was low.

The Coal Authority report notes that if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

A preliminary ground gas risk assessment was undertaken to assess the potential for mine gases to migrate onto site from the aforementioned historical workings. The risk assessment concluded that there was a plausible (albeit low-likelihood) source-pathway-receptor linkage relating to underground coal mining ground gas emissions and that this assessment should be further developed by on-site monitoring as part of the Phase 2 ground investigation.

Exploration and Testing

Eight exploratory holes were formed at the site between the 19th August 2025 and the 3rd September 2025. These included two Rotary Cored Boreholes with SPT testing and six machine-dug trial pits.

Exploratory Hole Type	Reference
Rotary Cored Boreholes	RCBH01 to RCBH02
Machine-dug Trial Pits	TP01 to TP06

The positions of all exploratory holes undertaken at the site as part of this investigation can be seen on the Exploratory Hole Location Plans in Appendix A. The logs are provided in Appendix B and the results of the geotechnical laboratory testing are provided in Appendix C.

Engineering conclusions given in this report are based on data obtained from these sources, but it should be noted that variations, which affect these conclusions, may inevitably occur between and beyond the test locations. Also, water levels may vary seasonally and with other factors.

Limitations

The investigation fieldworks were undertaken whilst the site was being re-levelled and a significant quantity of historical Made Ground was present at the site resulting in land levels across the site rising steeply by around 5.00m from the north side of the site (adjacent with Store St) and the southern side. Initial plant access had been made onto the northern and western sides of the site to facilitate rotary borehole drilling, however the available space and location options for positioning exploratory work were somewhat restricted.

Methodology

Sampling Strategy

The investigation was undertaken in accordance with the scope of works agreed with the Client. The positions of the exploratory holes were selected to provide a balanced wide coverage of information on the site area whilst working within the overall access limitations across the site.

The exploratory locations were targeted on the following basis;

Test Location	Rationale
RCBH01 to RCBH02	To determine the deeper ground conditions beneath the proposed development footprint, inform pile foundation design & enable geoenvironmental / geotechnical testing.
TP01 to TP06	To facilitate additional geoenvironmental sampling and ground proving and permit installation of gas and groundwater monitoring standpipes.

Health and Safety

Prior to commencement of boring/testing, and in order to minimise the dangers from/to buried services, the proposed locations were scanned using a Cable Avoidance Tool. At the borehole locations, a service avoidance pit was dug, using hand tools, to a depth of around 1.2m below ground level (bgl).

Exploratory Holes

Rotary cored boreholes, RCBH01 and RCBH02 were put down using a Fraste ML rotary / sonic drilling rig to a depth of 24.0m bgl. Boreholes were advanced using a plastic lined steel barrel tube system using water flush. The drilling process was advanced by top drive percussive hammer action from the base of the hand-dug inspection pits at 1.20m bgl though the initial near surface Made Ground to the Glacial Till whereupon advancement of the boreholes was made via rotary sonic coring with water flush.

A near continuous 90mm diameter core sample was recovered for examination and laboratory testing. Standard Penetration Tests (SPTs) were taken at 1.5m intervals between each core run. Core samples were logged on-site by a Chartered Engineering Geologist and selected core samples were taken for subsequent strength testing at a UKAS accredited testing laboratory.

Trial pits, TP01 to TP06 were excavated using a 13-ton mechanical excavator to a maximum depth of 2.70m below ground level to examine / sample the near-surface soils and permit the installation of ground gas monitoring standpipes.

Small-disturbed samples were taken at regular intervals down to the base of the holes for subsequent laboratory testing. On completion, all boreholes and trial pits were carefully backfilled with arisings in thin layers, ensuring that excavated material was replaced in the same order as it had been removed.

Installations

On completion of the boring, trial pits (TP01 to TP04) were utilised for the installation of 33mm diameter slotted uPVC standpipes from 3.0m depth to 0.5m below existing ground level. From 0.5m depth up to ground level a plain pipe was added. The slotted section of the standpipes were surrounded with pea gravel, while expansive bentonite clay was added around the plain pipe and below the slotted section to seal the borehole. The standpipes were finished with a rubber bung and gas tap.

In-situ Testing

Correction to the field 'N' values (to 'N_{60}' values) for the effects of energy delivery have been applied to the SPT (Standard Penetration Test) results from this investigation, in line with the recommendations given in BS EN ISO 22476-3, 2005, National Annex A.

Ground gas monitoring was carried out on six occasions using a calibrated Geotech GA 2000 gas analyser, and comprised standpipe measurement of methane, carbon dioxide, oxygen, well pressure and well flow rate, together with ambient atmospheric pressure and groundwater levels.

Weather reports from nearby weather stations were referenced and recorded for the atmospheric pressure conditions leading up to the monitoring visits.

Ground Conditions

The intrusive investigation revealed that the general succession of strata was represented by deep Made Ground, overlying Glacial Till, further overlying bedrock of the Sherwood Sandstone Group.

Our Ground Model for the site is as follows:

Made Ground (Historical Fill)

Encountered at all exploratory locations from ground level and proved down to depths of between to depths of between 3.65m and 4.00m bgl within the boreholes (RCBH01 and RCBH02) on the lower terrace of the site. The base of the stratum was tentatively encountered beneath the Made Ground at TP03 on the high-side of the site at a depth of 2.15m bgl, however the encountered clay soils beneath may also be reworked.

Represented by a highly variable material which was typically coarse-grained and comprised material which varied from brown to grey / dark grey silty slightly clayey sand and gravel with pockets of organic matter and roots with abundant crushed brick, stone, concrete, plastic and glass and cobbles of crushed brick and concrete (reinforced in places).

Localised fine-grained dominated content was encountered within the stratum which typically presented as an initial veneer of dark brown / grey very sandy clay with abundant organic matter and frequent roots and contained notable coarse-grained / brick cobble content.

Localised masonry obstructions (boulder-sized demolition rubble) should be expected within the stratum.

The results of the field strength tests, and other relevant data, are summarised below:

Parameter	Range	Comments
SPT Field 'N' Value	12 to 14 at 1.00-1.45m bgl 17 to >50 below 2.50m bgl	Typically, low to locally high strength soils

Glacial Till

Encountered at RCBH01 and RCBH02 beneath the Made Ground from depths of typically between 3.65m and 4.00m bgl and proved down to depths of between 8.40m and 8.50m bgl within RCBH01 and RCBH02. Possible reworked Glacial Till was encountered at a depth of 2.15m bgl at TP03, however this material may be disturbed given the surrounding deep Made Ground at the remaining trial pit locations.

Represented by an initial upper portion comprising typically reddish orange mottled grey brown slightly gravelly clayey sand with clasts of sub-rounded to sub-angular siltstone and quartzite / sandstone inter-bedded with bands of silty sandy clay down to typically between 5.75m and 6.50m bgl.

Below these depths, the stratum was observed to typically grade to firm to stiff brown mottled grey silty very sandy gravelly clay with frequent tabular cobbles of sandstone and coarse angular gravel of extremely weak to weak sandstone with pockets / seams of silty sand.

The results of the field strength tests, and other relevant data, are summarised below:

Parameter	Range	Comments
SPT Field 'N' Value	19 to 20 at 4.00-4.50m bgl Typically, 22 to 29 below 6.0m bgl	Typically, medium to high strength soils

Laboratory testing of the upper weathered portion of the stratum revealed the following results:

Parameter	Range	Comments
Water Content (%)	12 - 25	-
Liquid Limit (%)	25 - 38	Fine-grained portion (dominant matrix) CLAY of Low to Intermediate plasticity (BS5930 Casagrande)
Plastic Limit (%)	11 - 22	
Plasticity Index (%)	11 - 16	
Modified Plasticity Index (%)	8 - 14	Typically, non-shrinkable to Low Volume Change Potential - (NHBC)
Retained on 425µm sieve (%)	15 - 29	BS1377 'coarse soil' fraction
Effective Cohesion (kPa)*	0	-
Internal Angle of Friction (º)*	31.5 / (27.5)	Coarse-grained portion / (Fine-grained portion)
Unit Weight (saturated) (kN/m³)	19.5	-

* *Based on empirical correlation of related laboratory defined parameters with published research resources*

Sherwood Sandstone Group

Encountered at RCBH01 and RCBH02 beneath the Glacial Till from depths of typically between 8.40m and 8.50m and proved down to the base of the boreholes at a depth of 24.0m bgl within RCBH01 and RCBH02.

Represented by an initial highly-weathered upper portion comprising typically very dense to hard light brown to beige-grey fine to medium grained thickly bedded sandstone, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone down to a depths of 13.0m bgl.

Below this depth, detailed core logging established the stratum to progressively grade to a less-weathered state and comprised weak to moderately strong intact reddish brown/grey interbedded siltstone and sandstone, recovered as sandy angular coarse gravel of siltstone / sandstone.

Frequent discontinuities were observed and the stratum was assessed to be thinly bedded (dipping at 7 to 10 degrees). Fractures were noted to be sub-horizontal, very closely spaced to closely spaced, rough and open with orange grey discoloration on fracture surfaces.

The results of the field strength tests, and other relevant data, are summarised below:

Parameter	Range	Comments
SPT Field 'N' Value	Typically, >50 below 3.0m bgl	Typically, high to very high strength soils

Laboratory testing revealed the following results:

Parameter	Range (MPa)	Comments
Point Load Index ($I_{s(50)}$)	0.13 to 0.79	None
Inferred Uniaxial Compressive Strength (UCS) based on correlated Point Load testing	3.12 to 18.96	Conversion factor (K) = 24 applied

N.B - Point Load testing undertaken on the 'rock-quality' core fragments recovered from RCBH01 and RCBH02

Potential Desiccation

Visible roots were observed to be present within the trial pit exposures down to depths of typically between 0.45m and 0.75m bgl at the exploratory hole locations. Particle Size Distribution (PSD) testing of the Made Ground soils across the site established that this material was characteristically a coarse-grained soil (silty sand and gravel with cobble content) and is not considered to typically exhibit volume change potential.

The underlying Glacial Till stratum encountered was found to comprise an interbedded and variable fine and coarse-grained soil which typically formed a clay-bound sand and gravel.

Assessment of the laboratory classification results indicates that the Glacial Till is likely to classify typically as a non-shrinkable to low-volume change soil (a clay of low plasticity where fine-grained dominated).

As such, it is considered that the soils beneath the proposed development footprint area are, as a whole, not likely to be actively desiccated or prone to shrinkage effects due to vegetative effects.

Groundwater

A shallow groundwater table was not encountered across the site. Due to the use of water flush during the drilling process, groundwater strikes could not be actively monitored. Following completion, standing groundwater was encountered within the boreholes as follows;

Exploratory Location	Strike Depth (m bgl)	Depth on Completion (m bgl)
RCBH01	9.00	Standing at 7.70m bgl (after 20 minutes)
RCBH02	8.40	Standing at 7.30m bgl (after 20 minutes)
TP01	N/A	Dry to 2.45m bgl (after 60 minutes)
TP02	N/A	Dry to 2.70m bgl (after 60 minutes)
TP03	N/A	Dry to 2.65m bgl (after 60 minutes)
TP04	N/A	Dry to 2.55m bgl (after 60 minutes)
TP05	N/A	
TP06	N/A	

Groundwater Monitoring

Groundwater monitoring has been carried out on six occasions to date in the instrumented borehole as a part of this investigation. The monitoring rounds were undertaken on the 19th August, the 24th August, the 31st August, the 3rd September, the 9th September, and the 15th September 2025. The results are as follows;

Exploratory Location	Depth (m bgl) 19th Aug 2025	Depth (m bgl) 24th Aug 2025	Depth (m bgl) 31st Aug 2025	Depth (m bgl) 3rd Sept 2025	Depth (m bgl) 9th Sept 2025	Depth (m bgl) 15th Sept 2025
TP01	Dry to 2.45m bgl	Dry to 2.45m bgl	Dry to 2.45m bgl	Dry to 2.45m bgl	Dry to 2.45m bgl	Dry to 2.45m bgl
TP02	Dry to 2.70m bgl	Dry to 2.70m bgl	Dry to 2.70m bgl	Dry to 2.70m bgl	Dry to 2.70m bgl	Dry to 2.70m bgl
TP03	Dry to 2.65m bgl	Dry to 2.65m bgl	Dry to 2.65m bgl	Dry to 2.65m bgl	Dry to 2.65m bgl	Dry to 2.65m bgl
TP04	Dry to 2.55m bgl	Dry to 2.55m bgl	Dry to 2.55m bgl	Dry to 2.55m bgl	Dry to 2.55m bgl	Dry to 2.55m bgl

Ground Gas

Ground gas monitoring has been carried out on six occasions to date in the instrumented boreholes using a calibrated Geotech GA 2000 gas analyser. The monitoring rounds were undertaken on the 19th August, the 24th August, the 31st August, the 3rd September, the 9th September and the 15th September 2025 across periods of both rising and falling atmospheric pressure conditions.

The results of the monitoring are summarised in the table below:

Parameter	Range	Comments
Oxygen (%v/v)	17.9 – 19.3	-
Carbon Dioxide (%v/v)	0.8 – 3.1	-
Methane (%v/v)	<0.1	-
Flow rate (l/h)	0.1 – 0.4	-

VOC monitoring was undertaken during the monitoring events within the standpipes using a MiniRae 3000 PID/VOC Monitor. Mobile concentrations of VOCs were found to be below the limit of detection (< 0 ppm).

Sulphate and pH Tests

Water-soluble sulphate and pH tests were carried out on twelve soil samples recovered from the exploratory holes across the site. The values recorded are summarised in the table below:

Stratum	Water-soluble Sulphate SO4 (mg/l)	pH (pH units)	Number tested
Made Ground	18 to 96	7.2 to 7.6	6
Glacial Till	80 to 130	7.9 to 8.4	3
Sherwood Sandstone Group	160 to 210	8.1 to 8.5	3

Ground Contamination Assessment

Soil Testing

Six samples of the superficial Made Ground soils from locations across the site were tested for a range of contaminants.

The test suite was decided upon following consultation of the Environment Agency's publication Land Contamination Risk Management (LCRM) and was performed on a representative range of targeted soil samples by specialist analytical soil laboratory i2 Analytical Ltd which holds both UKAS and MCERTS accreditation.

The test suite included a range of:

- Inorganic substances, including metals and metalloids
- Speciated Poly-cyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH)
- Asbestos screening
- BTEX / MTBE
- Phenols
- Semi-Volatile Organic Compounds (SVOC)

Unless explicitly stated on the laboratory report, the soil samples were tested to obtain 'Total' values within the soil. The results of the tests from this investigation are included in Appendix C.

Selected soil samples were screened on site using a hand-held photo-ionisation detector (PID) to measure any volatile organic hydrocarbons in the sample headspace. The results from the PID monitor indicated negligible levels of volatile compounds are present with values of less than the limit of detection (<0 ppm) recorded in the soil samples down to the full depth of the exploratory holes.

Risk Assessment Guidelines – Human Health

The human health risk assessment has been approached using the guidance and evaluation criteria provided in the Environment Agency's publication Land Contamination Risk Management (LCRM), published in October 2020 to undertake a Tier 2 Generic Quantitative Risk Assessment (GQRA) for the site based on the findings of the previously set-out Tier 1 Preliminary Risk Assessment and Conceptual Site Model (CSM).

Human health assessment criteria used are based upon the proposed final land use of the site. As the site is to be redeveloped to accommodate a split private residential and care home development, the Generic Assessment Criteria (GAC) for the standard land-use, *'residential without home-grown produce'* has been used for initial conservative screening for the risks to the identified end-users.

The results of the soil samples tested have been compared to the following published GACs:

Category 4 Screening Levels (C4SLs)

Published in March 2014 by DEFRA, a limited number of Category 4 Screening Levels (C4SLs) were produced to support the revised Statutory Guidance to support Part 2A of the Environmental Protection Act 1990, which was published in April 2012. This Guidance introduced a new four-category system for classifying land under Part 2A for cases of a Significant Possibility of Significant Harm to human health, where Category 1 includes land where the level of risk is clearly unacceptable, and Category 4 includes land where the level of risk posed is acceptably low.

Although not the primary purposes, the DEFRA letter dated 3rd September 2014 from Lord de Mauley established that the C4SLs also suitable for use in planning situations, as did the Department for Communities and Local Government (DCLG)'s 'Planning Portal' document from June 2014.

Suitable 4 Use Levels (S4ULs)

To supplement the limited number of C4SLs, a set of Suitable for Use Levels (S4ULs) were produced by Land Quality Management (LQM) and the Chartered Institute of Environmental Health (CIEH) in 2015 using the EA's Contaminated Land Exposure Assessment (CLEA) software, version 1.06 released in 2009, and the revised assumptions used in deriving the C4SLs. The S4ULs are more conservative than the C4SLs and are derived to represent the minimal levels of risk to human health as described in the Environment Agency's SR2 guidance, with the intention of being 'suitable for use' under planning.

Risk Assessment Guidelines – Groundwater

The procedures set out in Environment Agency's Remedial Targets Methodology (RTM) Hydrogeological risk assessment for contaminated land (2006), have been followed.

Results of Total Soil Tests

Asbestos

Screening for the presence of asbestos did not reveal any asbestos containing material (ACM) or fibres in the six representative samples of the superficial soils examined.

All other determinands

Results of the soil testing have been compared to relevant published GACs, as discussed above. For S4ULs, a range of values have been published for the organic contaminants based on the SOM (soil organic matter) content. As site-specific soil organic content was not determined, where S4ULs have been adopted for the organic contaminants, analytical results have been compared to the most conservative value, which is that for soils of 1% SOM as a preliminary screening tool.

None of the determinant concentration were higher than the relevant conservative GAC for human health (residential without home-grown produce) setting.

These findings and examination of trial pits and borehole arisings indicate that there is a low risk of a soil-contaminant-linkage developing for the aforementioned human health receptors and so we consider that no further assessment is necessary.

Human Health Risk Assessment

Following the field observations and assessment of laboratory results from this investigation, the initial conceptual site model can now be revised.

The following qualitative risk assessment has been carried out using the S-P-R (source-pathway-receptor) concept, which is predicated on the principle that a pathway must exist between a potential source and potential receptor for there to be a risk.

Potential sources of contamination have been assessed using the LRCM Guidelines.

From the initial CSM, the potential human receptors at risk are:

- Long-term risk group: end users of the site – future residents and visitors (children and adult)
- Short-term risk group: construction workers (adult)

The risks to these two groups of receptors and any necessary protective remedial measures resulting from development of the site are discussed below.

If the proposed site use or layout should alter significantly, then the human health risk assessment will require re-evaluation.

Long-Term Risk Group (Children and Adult Residents and visitors)

Visual examination of the Made Ground soils across the site as part of this phase of ground investigation revealed no visual or olfactory evidence of significant contamination on site (including risks from Asbestos). Testing of six soil samples from the Made Ground for a wide range of potential contaminants returned determinant concentrations below GAC for the proposed site use.

As, such, although the CSM identified possible heavy metals, metalloids, non-metals, asbestos as potential sources of contamination, there was no evidence of such in the soils on the site.

Consideration should be given to the localised elevated levels of selected PAHs and Lead (statistical outliers) identified within the Made Ground soils on the northern side of the site as part of the 2014 Preliminary Risk Assessment sampling exercise undertaken by Geotechnics Ltd. These elevated contaminants were attributed to the localised presence of slag / clinker and coal fragments within the Made Ground at the sampling locations which were not reflected in the soil sampling undertaken across the remainder of the site as part of this Phase 2 ground investigation by ECG Ltd.

Given the historical nature of the Made Ground soils and based on detailed review of historical redevelopment of the site over time, it is considered plausible and probable that the previously encountered slag / clinker and coal impacted soils (ref Geotechnics Ltd, 2014) form a localised zone on the northern side of the site, whilst the majority of the Made Ground soils on the site by volume derive from demolition rubble.

Furthermore, the previously sampled and affected Made Ground soils are to be removed from site as part of the land lowering groundworks and, as such, this potential contaminant pathway will be broken by source removal. However, the absence of soft landscaping as part of the redevelopment design will also serve to break the relevant source-pathway-receptor linkage between soil contaminants and site end users.

On this basis, it is considered that there is no further need for investigation or remedial measures at this site prior to the proposed redevelopment, as the soils at the site pose a low risk to this group of human receptors.

Given that the nature of ground investigations are not exhaustive in terms of site coverage, it is recommended that the developer adopts a Discovery Strategy during the groundworks phase of the development and that any areas of concern are referred back to Edlington Consulting Group at an early stage for further assessment.

Short-Term Risk Group (Construction and Maintenance Workers)

For construction workers and maintenance workers that are exposed to the ground, there is a short-term exposure risk (at each site they attend, which contributes to an overall lifetime exposure risk) and the pathway of primary concern is 'direct soil ingestion'. Protective measures that are different to those taken to protect the long-term exposure group (such as end-users of the site) are, therefore, required.

Remedial Measures

To reduce the risks to as low as reasonably practicable for this group of workers, it is recommended that appropriate health and safety measures be implemented along with the use of Personal Protective Equipment (PPE). All personnel coming into contact with the soil, groundworkers in particular, should be instructed to use gloves when on site to avoid dermal contact and to restrict inadvertent hand-to-mouth ingestion. Washing facilities should be provided, and should be used prior to activities such as eating, smoking or toilet visits.

Discovery Strategy

Should any suspicious soils be encountered that differ from our ground model, work should cease in that area and further assessment will be necessary by a suitably qualified geo-environmental engineer. This may require further intrusive investigation or soil sampling, along with supplementary contamination risk assessment and, potentially, remediation. Any further recommendations will require regulatory approval.

Regulatory Approval

The findings of this report and any subsequent Remediation and Verification Strategy will require approval by the Local Authority.

Ground Gas Risk Assessment

The preliminary ground gas risk assessment indicated that there are low risk potential sources of gas on, or in close proximity to, the site. As such, precautionary gas monitoring was recommended given the potential for carbon dioxide and methane gases.

The contamination testing of the soil samples carried out during the site investigation did not record any significant concentrations of hydrocarbons or significant visual or olfactory signs of contamination within the near surface soils. VOC vapour concentrations of all exploratory holes during the fieldworks as well as follow-on standpipe monitoring were measured to be below the limit of detection.

The results of the monitoring programme revealed that low levels of carbon dioxide, up to 3.1% v/v, are being produced in the ground. No Methane was recorded above the limit of detection at 0.1% v/v. Very low flow rates of between <0.1l/h and 0.4l/h was recorded that shows that significant volumes of gas are not being produced in the ground.

Ground Gas Screening Values

These results have been evaluated with reference to Code of practice for the characterization and remediation from ground gas in affected developments, BS8485, to confirm the conceptual site model.

Using the maximum recorded carbon dioxide reading of 3.1% with the highest recorded absolute flow rate of 0.4l/hr, the maximum gas screening value is 0.012l/hr. There were no carbon dioxide levels above 5% and no methane levels above 1%.

This classifies the site as Characteristic Situation CS1 (very low hazard potential) and NHBC green.

Ground Gas Protection Measures

Consequently, it is considered that no gas protection measures are necessary with regard to methane or carbon dioxide gas for this residential development subject to regulatory approval. Further ground gas monitoring may be required by the regulatory or local authority to confirm this requirement.

The BGS advises that basic radon gas protection measures may be necessary at this site. The final requirements for any radon protection measures will need to be agreed in writing with the Local Authority at an early design stage, prior to the redevelopment reconstruction.

Conclusions

The findings from our investigations to date indicate that no gas protection measures are necessary with regards, carbon dioxide or methane gases, subject to confirmatory approval by the local Regulator.

Depending upon the advice of the local Regulator, further supplementary ground gas monitoring of the borehole standpipes may be necessary to further assess the risk posed to end-users of the site. As such, early consultation with the local Regulator is advisable to avoid potential delays.

Basic radon protection measures may be required and this requirement should be confirmed in writing with the relevant Local Authority at an early stage as any protection measures would need to be incorporated into the structural design and appropriately verified during construction.

Controlled Waters Risk Assessment

Following the field observations and assessment of laboratory results from this investigation, the initial conceptual site model can now be revised.

The following qualitative risk assessment has been carried out in accordance with the procedures set out in the Environment Agency's Remedial Targets Methodology Hydrogeological risk assessment for contaminated land (2006) and uses the S-P-R (source-pathway-receptor) concept: which is predicated on the principle that a pathway must exist between a potential source and potential receptor for there to be a risk.

The potential environmental receptors, from the initial CSM, are:

- Controlled Waters - the superficial Glacial Till – classified as an Unproductive Strata.
- Controlled Waters - the bedrock Sherwood Sandstone Group – classified as a Principal Aquifer.
- Controlled Waters - nearest surface watercourse is recorded some 25m to the north of the site and comprises the Ashton Canal. The canal is elevated above general site level and, as such, it is considered unlikely to be hydraulic flow between the site and this watercourse.

The potential linkages, from the initial CSM, are:

Migration of heavy metals, metalloids, non-metals and various hydrocarbons into the aquifer beneath the site, depending on the degree of fracturing and permeability of the strata.

The CSM is revised, below, with consideration of the relevant field observations and laboratory test results.

Groundwater contamination

No obvious contamination was identified within the near surface / Made Ground soils in any part of the site based on the testing undertaken as part of this ground investigation. Within the soil samples tested as part of this phase of ground investigation, none of the determinant concentrations were elevated above normal background levels.

Furthermore, the exploratory works have demonstrated that the local groundwater table beneath the site is at depth >8.00m bgl and, as such, the potential for near surface leaching / migration of any unrecorded contaminants from the near surface soils into the underlying groundwater table is considered to be low.

Consideration should be given to the localised elevated levels of selected PAHs and Lead (statistical outliers) identified within the Made Ground soils on the northern side of the site as part of the 2014 Preliminary Risk Assessment sampling exercise undertaken by Geotechnics Ltd. These elevated contaminants were attributed to the localised presence of slag and coal fragments within the Made Ground and are not considered to be readily mobilised from this source by rainwater throughflow. Furthermore, the previously sampled and affected Made Ground soils are to be removed from site as part of the land lowering groundworks and, as such, this potential leachable contaminant pathway will be broken.

It is, therefore, considered that the above-recognised environmental receptors will not be at risk from potential groundwater pollution at the site, subject to the findings of the Discovery Strategy and regulatory approval.

Infrastructure Risk Assessment

Subsurface Concrete

The concrete design mix recommendations for subsurface concrete have been assessed in terms of BRE Special Digest 1.

In view of the known site history, the proposed development area can be considered as a brownfield location.

The groundwater beneath the site should be considered as mobile within the bedrock.

Chemical tests have recorded the following characteristic values for the given site situation:

Type of Site	Groundwater	Characteristic Soil Soluble Sulphate (mg/l)	Characteristic pH (pH units)
Brownfield	Mobile	110	8.0

These results provide a Design Sulphate Class of DS-1.

The above assessment provides an Aggressive Chemical Environment for Concrete (ACEC) class of AC-1.

Underground Services

Organic contaminants, such as petroleum or polycyclic aromatic hydrocarbons, may attack plastic pipes and remedial measures may be required should any evidence of contamination be encountered during the redevelopment. Should any suspected contamination be encountered, it is recommended that the advice of a specialist geoenvironmental consultancy such as Edlington Consulting Group should be obtained. The likely remedies for protecting services within any contaminated ground would likely comprise the removal of the pathway with the contaminated soils (such as by sleeving the pipe with another material) or by removing the contamination source itself.

It should be noted that the utility companies often have their own local guidelines and standards on levels of shallow soil contamination in the ground that may or may not be acceptable for the installation of below ground services. These standards may be different to those specified for assessing risks to human health and groundwater.

The local requirements should be obtained from the particular service supply company as soon as possible to avoid unexpected delays or additional development costs.

Guidance can be sought from the UK Water Industry Research (UKWIR), 'Guidance for the selection of water supply pipes to be used in brownfield sites', reference 10/WM/03/21, 2010. This document proposes that the assessment of the hazard to potable water supply pipes should be based on the following pathways: contact with migrating groundwater, permeation of vapour, and direct contact with soil.

Approval should be sought for the type of pipes proposed before they are installed.

Geotechnical Engineering Conclusions

We understand the redevelopment proposal comprises a reduced level dig to lower ground levels at the site by between 2m and 5m from existing levels, to an elevation broadly consistent with Store St and construction of a multi-storey residential apartment development across fourteen floors.

The footprint of the proposed development structure is understood to extend across the majority of the site area with a limited external paved communal area running down the western side of the site to give access to the rear of the structure.

The use of new retaining wall structures are understood to the required to support the neighbouring (higher elevation) ground to the south and southeast as a result of the reduced level dig.

Soils

The exploratory work from this investigation has proven the expected general strata sequence comprising a significant and variable thickness of Made Ground (historical fill) underlain by Glacial Till, further underlain by the Sherwood Sandstone Group bedrock.

Made Ground (Historical Fill)

The Made Ground was encountered at all exploratory locations from ground level and proved down to depths of between to depths of between 3.65m and 4.00m bgl within the boreholes (RCBH01 and RCBH02) on the lower terrace of the site.

The base of the stratum was tentatively encountered beneath the Made Ground at TP03 on the high-side of the site at a depth of 2.15m bgl, however the encountered clay soils beneath may also be reworked.

The stratum was represented by a highly variable material which was typically coarse-grained and comprised material which varied from brown to grey / dark grey silty slightly clayey sand and gravel with pockets of organic matter and roots with abundant crushed brick, stone, concrete, plastic and glass and cobbles of crushed brick and concrete (reinforced in places).

Localised fine-grained dominated content was encountered within the stratum which typically presented as an initial veneer of dark brown / grey very sandy clay with abundant organic matter and frequent roots and contained notable coarse-grained / brick cobble content.

Localised masonry obstructions (boulder-sized demolition rubble) should be expected within the stratum.

Glacial Till

The Glacial Till stratum was encountered at RCBH01 and RCBH02 beneath the Made Ground from depths of typically between 3.65m and 4.00m bgl and proved down to depths of between 8.40m and 8.50m bgl within RCBH01 and RCBH02.

Possible reworked Glacial Till was encountered at a depth of 2.15m bgl at TP03, however this material may be disturbed given the surrounding deep Made Ground at the remaining trial pit locations.

Represented by an initial upper portion comprising typically reddish orange mottled grey brown slightly gravelly clayey sand with clasts of sub-rounded to sub-angular siltstone and quartzite / sandstone inter-bedded with bands of silty sandy clay down to typically between 5.75m and 6.50m bgl.

Below these depths, the stratum was observed to typically grade to firm to stiff brown mottled grey silty very sandy gravelly clay with frequent tabular cobbles of sandstone and coarse angular gravel of extremely weak to weak sandstone with pockets / seams of silty sand.

Variably-weathered Sherwood Sandstone Group Bedrock

The variably-weathered Sherwood Sandstone Group bedrock was encountered at RCBH01 and RCBH02 beneath the Glacial Till from depths of typically between 8.40m and 8.50m and proved down to the base of the boreholes at a depth of 24.0m bgl within RCBH01 and RCBH02.

The stratum was typically represented by an initial highly-weathered upper portion comprising typically very dense to hard light brown to beige-grey fine to medium grained thickly bedded sandstone, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone down to a depths of 13.0m bgl.

Below this depth, detailed core logging established the stratum to progressively grade to a less-weathered state and comprised weak to moderately strong intact reddish brown/grey interbedded siltstone and sandstone, recovered as sandy angular coarse gravel of siltstone / sandstone.

Groundwater

Groundwater was not encountered during the shallow trial pitting across the site.

Due to the use of water flush within the boreholes during the drilling process, water strikes could not be accurately monitored during the deeper intrusive works; however, a medium groundwater inflow was noted at 9.00m bgl in RCBH01 and 8.40m bgl in RCBH02 during drilling.

Standing water was observed within RCBH01 and RCBH02 at depths of 7.70m bgl and 7.30m bgl respectively after 20 minutes.

Basement Excavation and Retaining Walls

At the time of writing, no specific details are known as to whether a basement level is intended to form part of the proposed re-development, however, given the split-level nature of the topography across and adjacent to the site and the proposed significant reduced level dig, the use of retaining structures is considered likely.

In order to inform and facilitate the design feasibility process, a preliminary geotechnical discussion on the formation and design of retaining walls has been presented.

Retaining Contiguous Piled Wall

Based on the testing undertaken as part of this investigation the following characteristic soil parameters for the strata at the site are considered appropriate.

Indicative parameters for the Made Ground

Parameter	Range	Comments
c_u' (Undrained Shear Strength)	45kPa	Based on empirical corelation from SPT 'N' values
γ'_s (effective unit weight)	18kN/m^3	-
Ø (Angle of internal friction)	25º	Based on empirical correlation with Plasticity Index (fine-grained portion) and conservative correlation with SPT 'N' values.
E' (Youngs Modulus)	27,000kPa	
Mv (Modulus of volume compressibility)	1.15 (m^2/MN)	Based on empirical (conservative) correlation with soil type

Indicative parameters for the Glacial Till

Parameter	Range	Comments
c_u' (Undrained Shear Strength)	75kPa	Based on empirical corelation from SPT 'N' values
γ'_s (effective unit weight)	19kN/m^3	-
Ø (Angle of internal friction)	28º	Based on empirical correlation with SPT 'N' values.
E' (Youngs Modulus)	33,000kPa	
Mv (Modulus of volume compressibility)	0.85 (m^2/MN)	Based on empirical (conservative) correlation with soil type

Indicative parameters for the bedrock Sherwood Sandstone Group

Parameter	Range	Comments
c_u' (Undrained Shear Strength)	>225kPa	Based on SPT and Point Load testing
γ'_s (effective unit weight)	22kN/m^3	-
Ø (Angle of internal friction)	32º	Based on empirical correlation values.
E' (Youngs Modulus)	58,000kPa	

It should be noted that the potential for induced movements of the supported structure will be significantly increased if the design and construction method adopted is not well designed and specified. A very high quality of workmanship will be required if the scheme is to be successful and a well-established specialist who has extensive experience with this type of construction must be used to undertake this work.

The wall designer should use these parameters to derive the active and passive earth pressure coefficients, Ka and Kp. The determination of appropriate earth pressure coefficients, together with factors such as the pattern of earth pressure distribution and the localised presence of deep tree-root desiccation, will depend upon the type/geometry of the wall and the overall design approach.

We recommend that a specialist contractor be consulted to confirm the most appropriate type of retaining structure and to provide the final wall design.

Site Excavation

Conventional hydraulic plant should be satisfactory for undertaking excavations (i.e., service trenches) within the soil; however, the location an extent of any permissible excavations will be determined by the nature and extent of the relevant root protection areas (RPAs) and the advice of a specialist should be sought to ensure that the relevant provisions of the RPAs in operation at the site as observed.

In line with HSE guidelines, all excavations requiring personnel access should be adequately supported to avoid the risk of collapse. Consideration should also be given to the stability of open trenches where personnel are working in close proximity.

It should be noted that long-term monitoring has not been undertaken and that the observed groundwater conditions beneath the site could vary further. Seasonal variation in groundwater levels beneath the site should be anticipated and further long-term monitoring would be required to determine the full seasonal regime.

Conventional pumping from sumps is likely to be sufficient to control any groundwater inflows down to a depth of approximately 4.00m bgl within the summer and autumn, however groundwater may rise higher than this level during the winter and spring depending on the prevailing weather conditions.

Foundation Options Appraisal

Spread Foundations

From a geotechnical perspective, the use of spread foundations at the site to support the proposed apartment structure is not considered feasible due to the variable nature and significant depth of Made Ground (historical fill) encountered across the site.

Although the proposed reduced level dig across the site to bring development elevations down to accord with Store St level will remove a significant thickness of the encountered Made Ground, it is likely that the remaining Made Ground beneath the post-level dig will likely be in excess of 1.50m to 2.00m bgl.

Whilst deep pad and strip footings could feasibly reach natural soils from the proposed post-level dig, the encountered formation level would comprise variable composition Glacial Till (typically a firm to stiff clay and medium dense sand). In light of the high structural loadings being applied to the ground, the observed strength of the Glacial Till is considered to be inadequate to support the proposed development structure.

An additional aspect which should be considered is the degree of stress-relief heave which is likely to take place in the Glacial Till as a result of the significant (but variable) removal of overburden generated by the reduced level dig. Initial calculations suggest this unloading could result in a reduction of effective stress within the Glacial Till of between 36kPa and 90kpa which would be expected to produce a heave yield effect in the Glacial Till over time.

Piled foundations

Piled foundations extending to a suitable depth of embedment through the full thickness of the Made Ground and underlying Glacial Till and *to a suitable depth of embedment* into the underlying Sherwood Sandstone Group bedrock would be capable, from a geotechnical perspective, of supporting the likely structural loads from the proposed development.

Driven pile systems are unlikely to be appropriate for use at the site given both the likelihood of boulder obstructions within the Made Ground and the strength of the Sherwood Sandstone Group bedrock. The use of driven techniques would likely result negative effects of ground vibration on nearby / adjacent structures.

Bored, cast-in-situ piles are considered potentially feasible although a specialist piling contractor should be consulted as to the efficiency and suitability of piles installed using their particular systems in these ground conditions. Piled foundations will require specialist design to determine the load-bearing capacities for a range of lengths / breadths of piles as well as the effects of overlapping ground stresses where pile groups are adopted and the variable depth of superficial weathering should be taken into account.

The effect of potential uplift / reduced effective stress effects on piles due to stress-relief heave within the Glacial Till stratum after unloading should be carefully considered at the design stage. Moderate groundwater strikes were encountered from a depth of typically around 8.50m bgl and should also be carefully considered to avoid the potential for 'necking' during pile casting.

Working Platforms for Tracked Plant

If construction on the site requires the use of heavy tracked plant, then reference will need to be made to the most recent guide for the design of 'Working Platforms for Tracked Plant', 2004, produced by the BRE.

Use of such plant will require construction of either a working platform or an adequate running surface if the subgrade is determined as being already adequate to support the anticipated plant loadings.

The following soil characteristics should be used for preliminary Working Platform design in accord with the most recent guidance given by the Building Research Establishment. The subgrade down to 2.0m depth should be considered as essentially a variable (interbedded) fine and coarse-grained soil.

Anticipated Subgrade Characteristics down to 2.00m depth	
Angle of shearing resistance of coarse-grained subgrade (φ's)	26º
Effective unit weight of subgrade material (ɣ's)	18kN/m^3

It should be noted that soft spots and zones of poor subgrade may exist on any site at shallow depth that will have a significant influence on the instability of tracked plant. The location of such features will not readily be determined by a general ground investigation for foundation design and more specific investigation at shallow depth may be required before the design of a working platform can be completed.

The advice of a specialist contractor should be sought to determine the most suitable size and thickness of platform required for their specific plant. This will take into account the size of the plant and anticipated loadings imposed on the working platform.

Disposal of Arisings

Site excavations, such as for foundations and services trenches are likely to produce arisings, some of which may be able to be re-used on-site and some of which will be surplus to requirements. The options for disposal of these arisings are discussed below:

Re-Use of Material on Site

Currently, if surplus arisings are 'fit for re-use' on the site and have not been treated, its re-use is allowed within the planning law. If it needs treating prior to re-use, exemptions can be sought from the EA to allow this activity.

A recent voluntary code of practice published by CL:AIRE, in conjunction with the EA, (the Definition of Waste: Development Industry Code of Practice, Version 2) endorses the re-use of arisings on and off the site of origin without the need for exemptions from the EA, dependent on whether it is "fit for purpose".

It also supports the use of "Hub and Cluster" sites (to enable surplus soil to be used on agreed sites in the local vicinity, dependent on the soil being 'fit for purpose').

The use of a Materials Management Plan (MMP) during the earthworks phase will help to avoid paying tax on soil movements that might otherwise attract tax, if they are construed by the HMRC as being waste without the relevant documentation to prove otherwise.

Based upon the preliminary chemical screening testing undertaken as part of this investigation, the soils on this site are considered to be suitable to be re-used on site for landscaping purposes, dependent on the agreement of the Local Authority. Depending upon the volume of soil being considered for re-sue, additional supplementary chemical testing may be required.

Waste Classification

Arisings that are surplus to requirements will, under current waste management legislation, be classified as Waste and need disposing off-site. Records must be kept of where the Waste is taken upon leaving site, and of its destination.

The classification of Waste soils is a two-fold process using the soil chemical test results and the European Waste Catalogue for off-site disposal; followed by testing under the Waste Acceptance Criteria (WAC) specifically for landfill disposal.

Waste Acceptance Criteria (WAC) – Landfill Disposal

If surplus arisings are to be disposed to a landfill facility, then the implementation of the Landfill Directive requires classification of the soils under the Waste Acceptance Criteria (WAC). This will determine whether it should be destined for an Inert, Non-hazardous, Stable Non-Reactive Hazardous, or Hazardous landfill, or whether is classed as 'Problematic Waste', for which an alternative disposal method must be sought.

Uncontaminated, naturally occurring, soils will remain Inert by default and eligible for the lower rate of landfill tax. Similarly, 'reworked soils' and demolition 'stone' comprising only materials listed in the Schedule of the Landfill Tax (Qualifying Material) Order 2011 (SI 2011/1017) will be eligible for the lower rate of landfill tax.

Testing of one sample of the Made Ground for Waste Acceptance Criteria (WAC) has been conducted and the results are presented in Appendix C. This indicates that the Made Ground soils tested passed the Inert waste criteria.

Summary Classification

The following tentative classifications can be summarised from the results of the EWC and WAC classifications:

Waste Stream	Initial EWC Classification for Removal from site	WAC for Landfill Disposal
Made Ground	Inert	Inert
Natural Soils	Inert	*(tentative pending confirmatory WAC testing)*

Any pieces of ACM encountered should be segregated and disposed of as hazardous waste unless gravimetric testing indicates that the concentration of asbestos fibres in the pieces is less than 0.1%.

Should any soils be encountered that differ from those encountered during this investigation, further testing and waste classification of those soils will be required.

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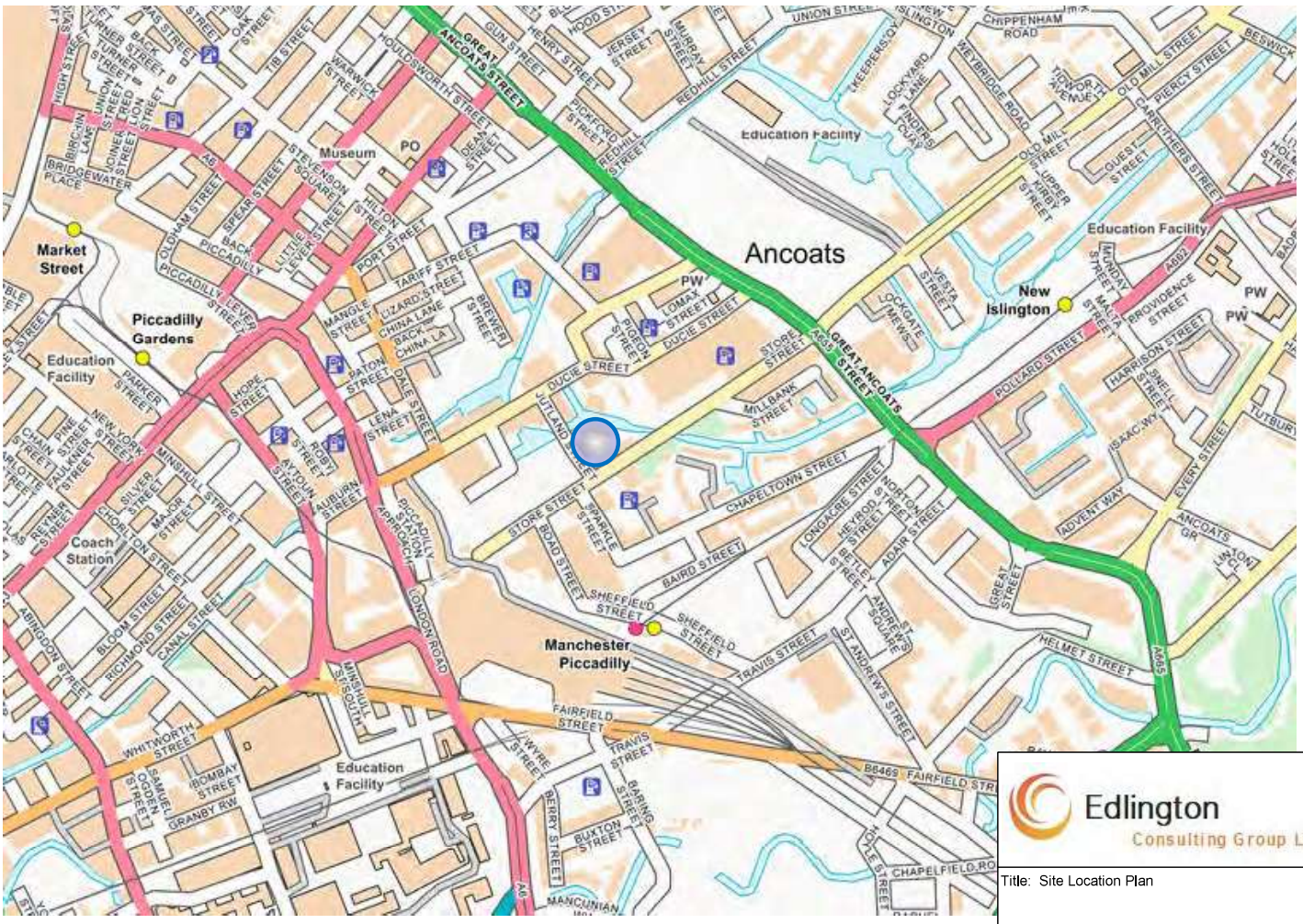
Transport and Road Research Laboratory (TRRL), The Structural Design of Bituminous Roads, Report 1132, 1984.

UK Water Industry Research (UKWIR), Guidance for the Selection of Water Supply Pipes to be Used in Brownfield Sites, 10/WM/03/21, 2010.

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APPENDIX A

SITE PLANS AND PHOTOGRAPHS



Key:

Approximate site location

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Title: Site Location Plan

Site: Land at 48 Store Street, Manchester, M1 2WA

Scale: NTS	Project Ref: E250321	Drawn By: DW



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Title: Exploratory Hole Location Plan – Existing Site Layout

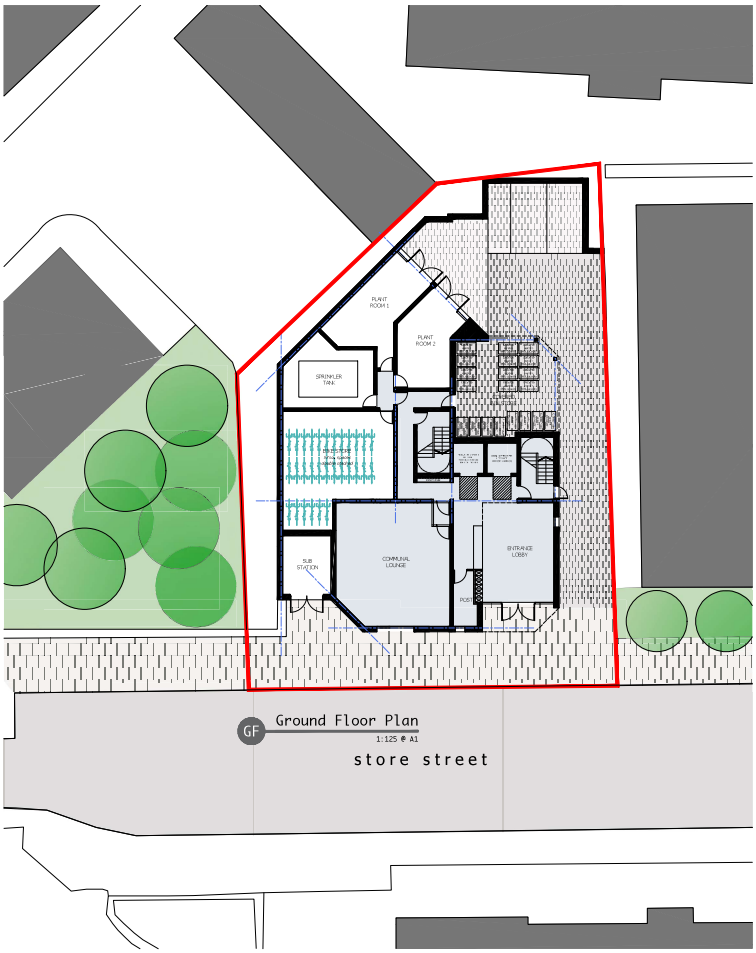
Site: Land at 48 Store Street, Manchester, M1 2WA

Scale: NTS	Project Ref: E250321	Drawn By: DW

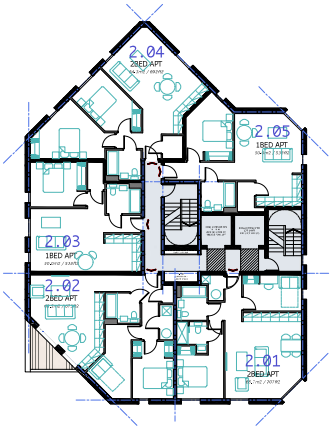
Key:

Rotary Cored Boreholes : ECG Limited, September 2025

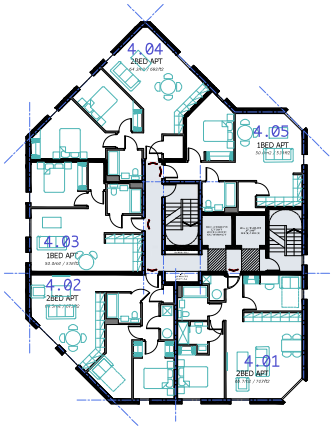
Machine Dug Trial Pits : ECG Limited, August 2025



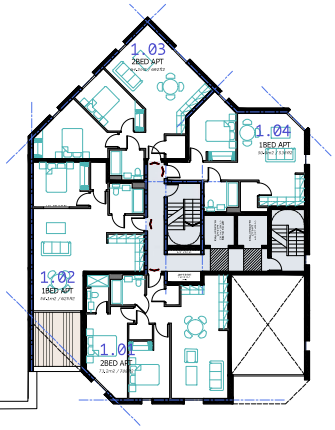
GF Ground Floor Plan
1:125 @ A1



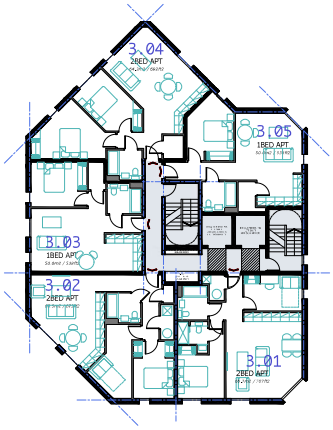
2F Second Floor Plan
1:125 @ A1



4F Fourth Floor Plan
1:125 @ A1



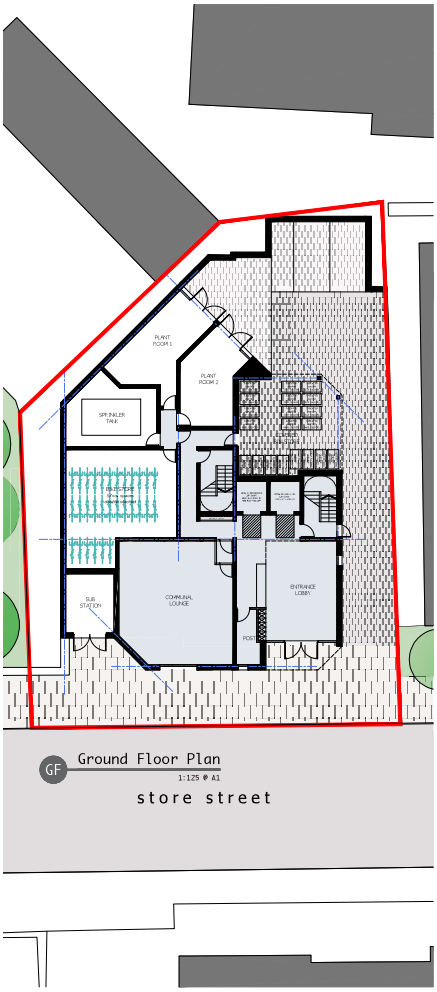
1F First Floor Plan
1:125 @ A1



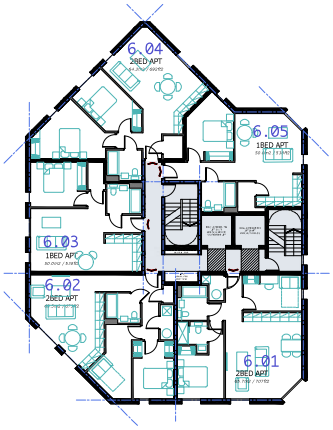
3F Third Floor Plan
1:125 @ A1

Area

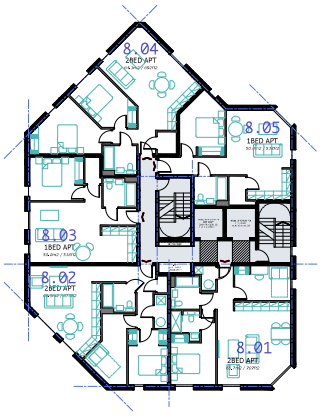
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Status: -
Location: Store Street | MANCHESTER
Scale: As Shown @ A1
Date: 14.04.2025
Drawing Title: Proposed Plans - GF - 4F
Job Number: 25-008
Drawing Number: SE01
Revision: -



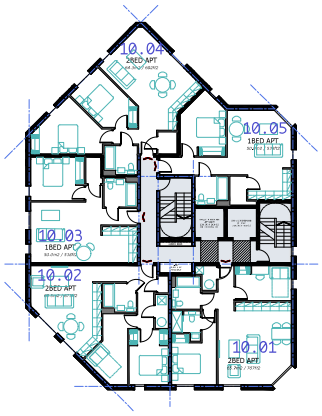
GF Ground Floor Plan
1:125 @ A1



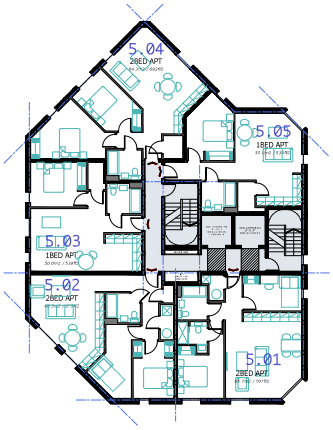
6F Sixth Floor Plan
1:125 @ A1



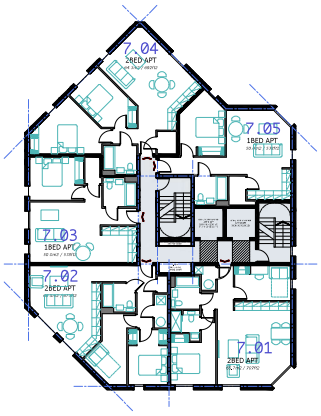
8F Eighth Floor Plan
1:125 @ A1



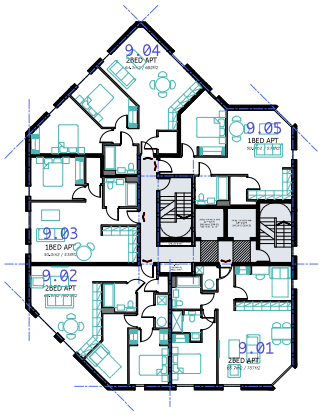
10F Tenth Floor Plan
1:125 @ A1



5F Fifth Floor Plan
1:125 @ A1



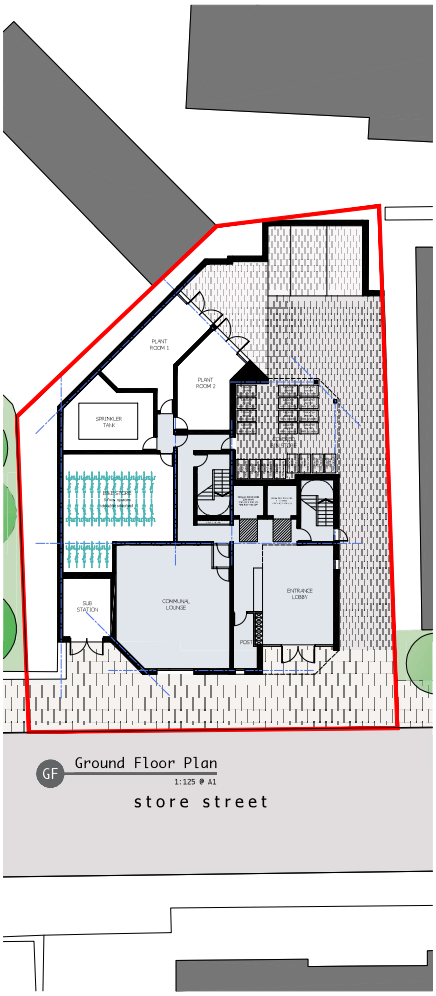
7F Seventh Floor Plan
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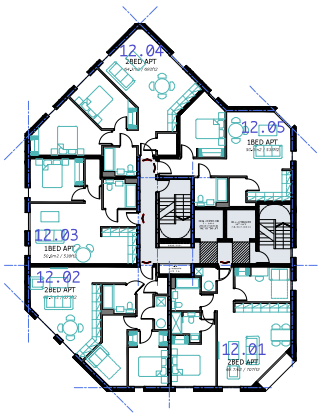
9F Ninth Floor Plan
1:125 @ A1

Area

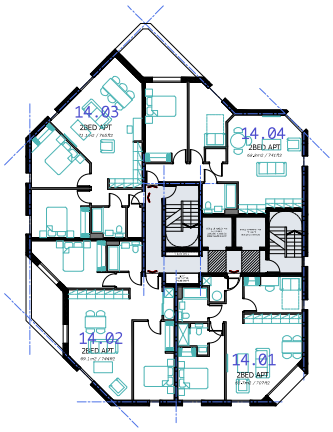
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Date: 14.04.2025
Drawing Title: Proposed Plans - 5F-10F
Job Number: 25-008
Drawing Number: S102
Revision: -



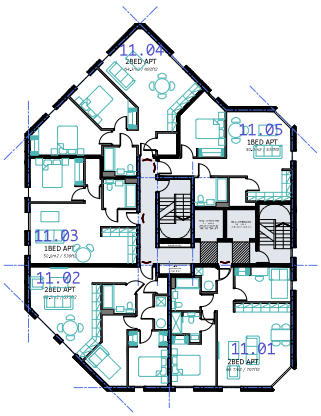
GF Ground Floor Plan
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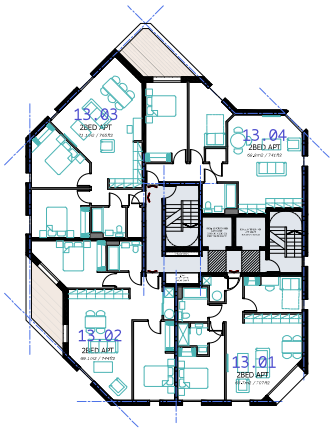
12F Twelfth Floor Plan
1:125 @ A1



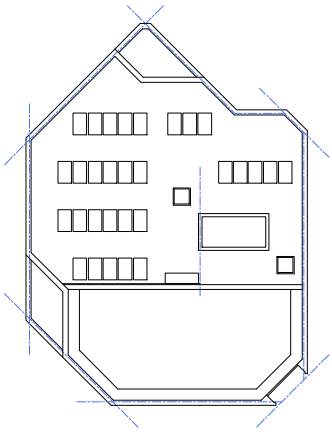
14F Fourteenth Floor Plan
1:125 @ A1



11F Eleventh Floor Plan
1:125 @ A1

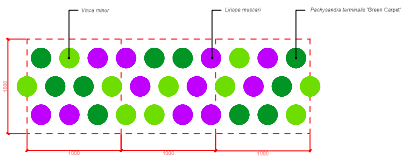


13F Thirteenth Floor Plan
1:125 @ A1



R Roof Plan
1:125 @ A1

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		Drawing Title: Proposed Plans - 11F - 14F		Job Number: 25-008	Drawing Number: S103	Revision: -



001 sheet L300 **TYPICAL PLANTING LAYOUT**

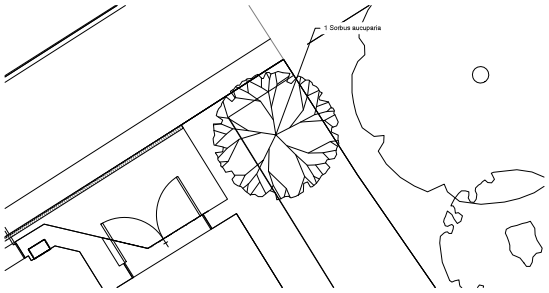
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TREES				
SPECIES	HEIGHT	ROOT TYPE	FORM	QUANTITY
Sorbus aucuparia	3.5-4.0m	Air Pot Containerised	Multi-stem	1

EVERGREEN GROUNDCOVER				
SPECIES	SIZE	ROOT TYPE	QUANTITY	NOTE
Liriope muscari	3	Air Pot Containerised	10 per SM²	Refer to detail/001 Sheet L300 for Layout
Pachysandra terminalis 'Green Carpet'	3	Air Pot Containerised	10 per SM²	Refer to detail/001 Sheet L300 for Layout
Vinca minor 'Alba'	3	Air Pot Containerised	10 per SM²	Refer to detail/001 Sheet L300 for Layout

003 sheet L300 **PLANTING SCHEDULE**

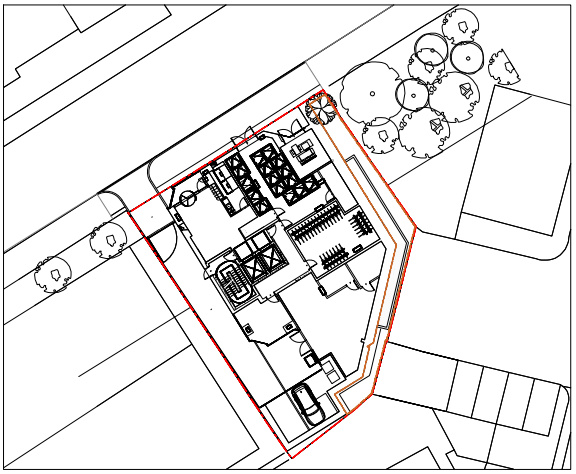
Scale: 1 : 20



002 sheet L300 **TREE PLAN**

Scale: 1 : 50

LOCATION PLAN 1:200



NOTES

1. This drawing is to be read in conjunction with all other drawings and specifications.
2. Do not scale off this drawing. Written dimensions to be taken only.
3. Any discrepancies found between this drawing and other drawings and specifications in the construction documents must be referred to the Landscape Architect prior to work commencing.
4. This drawing must not be copied in whole or in part without prior written consent of Optimised Environments Ltd.
5. Survey information is based upon aspect surveyors Topographical as Survey.

Issue	Revision	Initial	Date
B	Trees omitted from bollard. Tree added to car park area. Revised Planting Layout	AW	17/05/21
A	Revised Planting Layout	AW	30/04/21

optimised environments ltd

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MANCHESTER | 78 Store Street | Manchester | M1 2GJ | 0161 696 7993 | hello@optimisedenvironments.com

Client
LW Group

Project
M1 PICCADILLY

Store Street, Manchester

Drawing Title
PLANTING PLAN

Sheet 1 of 1

Scale Bar | North

Scale	VARIES	Date	20.04.21
By	CW	Status	PLANNING
Checked	AW	Approved	AW

Drawing Number: M1032_L300 | Rev: B

Computer File: P:\Projects\2021\M1032_Work\Tech\Cad\01\Cad\M1032-L300.dwg

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View southeast from Store St during rotary drilling rig access.



View south towards RCBH01 during initial set-up.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View southeast towards RCBH01 during drilling.



View east along northern site boundary of enabling works at RCBH02.



View of initial percussive core recovery through the Glacial Till at RCBH01.



Detailed view of core recovery from the Glacial Till at RCBH01.



View of initial weathered recovery from the Sherwood Sandstone Group at RCBH01.



View of core recovery from the less weathered Sherwood Sandstone Group at RCBH01.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View east along access ramp during the works.



View southeast from the northern site boundary.



View of initial core recovery from the Glacial Till at RCBH02.



Detailed view of initial core recovery from the Glacial Till at RCBH02.

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Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View of core recovery from the less-weathered Sherwood Sandstone Group at RCBH02.



Detailed view of broken / fractured core recovery from the Sherwood Sandstone Group at RCBH02.



View of broken / fractured core recovery from the Sherwood Sandstone Group at RCBH02.



Detailed view of broken / fractured core recovery from the Sherwood Sandstone Group at RCBH02.



View of initial core recovery from the weathered Sherwood Sandstone Group at RCBH02.



Detailed view of split core recovery from the Sherwood Sandstone Group at RCBH02.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View southeast towards RCBH02 during drilling.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View southeast across the high-side of the site towards TP02.



View southwest across the concrete plinth towards TP04.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View of trial pit excavation and standpipe installation at TP02.



View of exposed soils at TP03.

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Site Photographs

Client: Merebridge Construction Ltd	E250321 – Land at 48 Store St, Manchester, M1 2WA



View of exposed soils at TP04.



View of arisings at TP04.



View of exposed soils and relict reinforced concrete at TP02.



View of exposed soils and relict reinforced concrete at TP02.

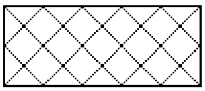
Edlington
Consulting Group Limited

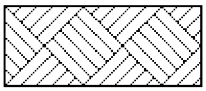
APPENDIX B

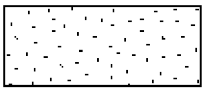
FIELDWORK AND FIELD TESTING RESULTS

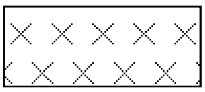
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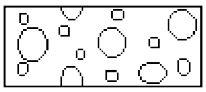
LEGEND - Soils

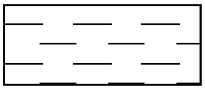

Made Ground

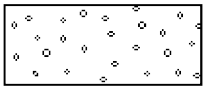

Topsoil

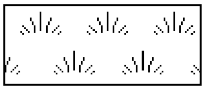

Sand


Silt

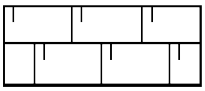

Boulders and Cobbles

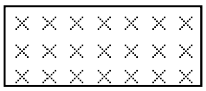

Clay

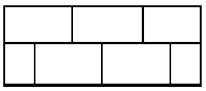

Gravel

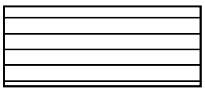

Peat

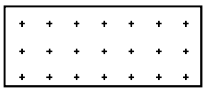
LEGEND - Rocks (Sedimentary)


Chalk

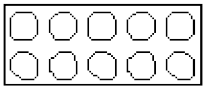

Siltstone

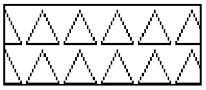

Limestone


Mudstone


Sandstone


Coal


Conglomerate


Breccia

LOG ABREVIATIONS

W	Water Sample	▽	Water Strike
B	Bulk Sample	▼	Water (Standing Level)
D	Disturbed Sample	PP	Pocket Penetrometer
J	Jar Sample	HV	Hand Vane
U	Undisturbed Sample	SPT	Standard Penetration Test
(No. of blows shown in brackets for U100 samples)		CPT	Cone Penetration Test
WAC	Waste Acceptance Criteria Sample	CBR	California Bearing Ratio
		*	Extrapolated Value

Pocket penetrometer testing provides values of unconfined compressive strength. The results have been converted to an approximate equivalent shear strength which should be used with due circumspection. As the pocket penetrometer tends to overestimate shear strength, we have used an appropriate reduction factor.

Edlington Consulting Group Limited

Rotary Cored Hole Borehole Log

Borehole No. RCBH 01

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 1-2/9/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	
							SPT N=14 (2,3/3,3,4,4)			MADE GROUND Brown to grey / dark grey silty slightly clayey SAND AND GRAVEL with pockets of organic matter and roots. Gravel and cobbles comprise crished brick, stone and concrete with occassional plastic and glass
		3.00		55	20	0	SPT N=50 (25/50)			... below 1.60m bgl becoming clayey silty SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments of black ash
							SPT N=20 (3,4/4,4,6,6)	4.00		GLACIAL TILL Medium dense reddish orange mottled grey brown slightly gravelly clayey SAND with clasts of sub-rounded to sub-angular siltstone and quartzite / sandstone inter-bedded with bands of silty sandy clay
		3.00 - 6.00		65	55	50	SPT N=24 (6,6/,6,6,6,6)			... below 6.50m bgl becoming firm to stiff brown mottled grey silty very sandy gravelly CLAY with frequent tabular cobbles of sandstone and coarse angular gravel of extremely weak to weak sandstone with pockets / seams of silty sand.
							SPT N=29 (5,6/,7,7,7,8)	8.50		WEATHERED SHERWOOD SANDSTONE Very dense to hard light brown to beige-grey fine to medium grained thickly bedded SANDSTONE, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone
		6.00 - 9.00		70	20	20	SPT N=50 (7,8/,8,9,12, 21)			

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 9.00m bgl, standing at 7.70m bgl after 20 minutes

Remarks: Boring advanced using water flush

Edlington Consulting Group Limited

Rotary Cored Hole Borehole Log

Borehole No. RCBH 01

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 1-2/9/2025

Project Number: E250321

Logged By: Dave Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	Stratum Description
							SPT N=50 (12,13/28,22)			WEATHERED SHERWOOD SANDSTONE Very dense to hard light brown to beige-grey fine to medium grained thickly bedded SANDSTONE, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone
		9.00 - 12.00		85	25	80	SPT N=50 (25/39,11)			
							SPT N=50 (25/45,5)	13.00		LESS-WEATHERED SHERWOOD SANDSTONE Weak to moderately strong intact reddish brown/ grey interbedded SILTSTONE / SANDSTONE, recovered as sandy angular coarse gravel of siltstone / sandstone
		12.00 - 15.00		90	30	90	SPT N=50 (25/50)			
							SPT N=50 (25/50)			
		15.00 - 18.00		85	30	100	SPT N=50 (25/50)			
							SPT N=50 (25/50)			

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 9.00m bgl, standing at 7.70m bgl after 20 minutes

Remarks: Boring advanced using water flush

Edlington Consulting Group Limited

Rotary Cored Hole Borehole Log

Borehole No. RCBH 01

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 1-2/9/2025

Project Number: E250321

Logged By: Dave Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	Stratum Description
		18.00 - 21.00		90	35	95	SPT N=50 (25/50)			LESS-WEATHERED SHERWOOD SANDSTONE Weak to moderately strong intact reddish brown/ grey interbedded SILTSTONE / SANDSTONE, recovered as sandy angular coarse gravel of siltstone / sandstone
		21.00 - 24.00		95	35	100	SPT N=50 (25/50)	24.00		

21 22 23 24 25 26 27 28 29 30

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 9.00m bgl, standing at 7.70m bgl after 20 minutes

Remarks: Boring advanced using water flush

Rotary Cored Hole Borehole Log

Edlington Consulting Group Limited

Borehole No. RCBH 02

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 2-3/9/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	
							SPT N=12 (2,3/3,3,3,3)			MADE GROUND Brown to grey / dark grey silty slightly clayey SAND AND GRAVEL with pockets of organic matter and roots. Gravel and cobbles comprise crushed brick, stone and concrete with occasional plastic sheeting, wire fragments and glass
										... below 1.75m bgl becoming clayey silty SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments of black ash
		3.00		65	20	10	SPT N=17 (3,4/3,4,5,5)	3.65		
							SPT N=19 (3,3/4,4,5,6)			GLACIAL TILL Medium dense reddish orange mottled grey brown slightly gravelly clayey SAND with clasts of sub-rounded to sub-angular siltstone and quartzite / sandstone inter-bedded with bands of silty sandy clay
		3.00 - 6.00		95	60	75	SPT N=22 (4,5/,5,5,6,6)			... below 5.75m bgl becoming firm to stiff brown mottled grey silty very sandy gravelly CLAY with frequent tabular cobbles of sandstone and coarse angular gravel of extremely weak to weak sandstone with pockets / seams of silty sand.
							SPT N=28 (5,6/,6,7,7,8)			
								8.40		WEATHERED SHERWOOD SANDSTONE Very dense to hard light brown to beige-grey fine to medium grained thickly bedded SANDSTONE, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone
		6.00 - 9.00		70	20	25	SPT N=50 (7,9/,9,9,14, 18)			

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 8.40m bgl, standing at 7.30m bgl after 20 minutes

Remarks: Boring advanced using water flush

Edlington Consulting Group Limited

Rotary Cored Hole Borehole Log

Borehole No. RCBH 02

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 2-3/9/2025

Project Number: E250321

Logged By: Dave Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	Stratum Description
							SPT N=50 (10,14/23,27)			WEATHERED SHERWOOD SANDSTONE Very dense to hard light brown to beige-grey fine to medium grained thickly bedded SANDSTONE, recovered as flaggy / tabular cobbles of silty sandstone and angular coarse gravel of sandstone
		9.00 - 12.00		85	25	75	SPT N=50 (25/36,14)			
								13.00		LESS-WEATHERED SHERWOOD SANDSTONE Weak to moderately strong intact reddish brown/ grey interbedded SILTSTONE / SANDSTONE, recovered as sandy angular coarse gravel of siltstone / sandstone
							SPT N=50 (25/41,9)			
		12.00 - 15.00		85	30	80	SPT N=50 (25/50)			
							SPT N=50 (25/50)			
		15.00 - 18.00		90	30	95	SPT N=50 (25/50)			
							SPT N=50 (25/50)			

11 12 13 14 15 16 17 18 19 20

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 8.40m bgl, standing at 7.30m bgl after 20 minutes

Remarks: Boring advanced using water flush

Edlington Consulting Group Limited

Rotary Cored Hole Borehole Log

Borehole No. RCBH 02

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 2-3/9/2025

Project Number: E250321

Logged By: Dave Webster to BS 5930:2015

Well	Water Strikes	Sampling Depth (m)	Casing Depth (m)	Total Core Recovery (%)	Solid Core Recovery (%)	Flush Recovery (%)	In-situ Testing Result	Depth (m)	Legend	Stratum Description
		18.00 - 21.00		90	30	100	SPT N=50 (25/50)			LESS-WEATHERED SHERWOOD SANDSTONE Weak to moderately strong intact reddish brown/ grey interbedded SILTSTONE / SANDSTONE, recovered as sandy angular coarse gravel of siltstone / sandstone
		21.00 - 24.00		95	35	100	SPT N=50 (25/50)	24.00		

21 22 23 24 25 26 27 28 29 30

Borehole Diameter: 90mm

Borehole Casing Depth: 9.00m

Instrumentation: None

Groundwater: Groundwater struck at 8.40m bgl, standing at 7.30m bgl after 20 minutes

Remarks: Boring advanced using water flush

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 01

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
		0.50	D		0.42			MADE GROUND Dark brown / grey very sandy CLAY with abundant organic matter and frequent roots (1mm to 6mm dia) to 0.22m bgl, underlain by brown to orange/beige slightly clayey silty SAND AND GRAVEL of stone with occasional burnt wood and ash.
		1.50	D					MADE GROUND Brown to grey brown clayey silty SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments ceramic
					2.45			End of Trial Pit at 2.45m

Pit Dimensions: 1.90m x 0.50m x 2.45m

Groundwater: None

Instrumentation: 33mm dia. standpipe installed to 2.45m bgl

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 02

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
		0.50	D					MADE GROUND Dark brown / orange grey sandy very gravelly CLAY with abundant organic matter and frequent roots (1mm to 4mm dia) to 0.45m bgl, underlain by brown to orange/beige slightly clayey silty SAND AND GRAVEL of stone with fragments of chain, decayed wood, glass, ceramic and plastic sheeting.
					0.80			
		1.00	D					MADE GROUND Reddish brown to grey silty gravelly SAND with abundant brick and masonry cobbles, fragments of metal and a boulder of reinforced crushed concrete with 8mm re-bar.
					2.70			End of Trial Pit at 2.70m

Pit Dimensions: 2.10m x 0.50m x 2.70m

Groundwater: None

Instrumentation: 33mm dia. standpipe installed to 2.70m bgl

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 03

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
		0.50	D		0.45			MADE GROUND Dark brown / grey very sandy CLAY with abundant organic matter and frequent roots (1mm to 6mm dia) to 0.22m bgl, underlain by brown to orange/beige slightly clayey silty SAND AND GRAVEL of stone with occasional glass
		1.75	D		2.15			MADE GROUND Brown to grey brown clayey silty SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments of black ash
					2.65			GLACIAL TILL (possibly reworked) Firm to stiff grey mottled brown to orange silty slightly sandy CLAY with fine to coarse sub-angular gravel clasts of sandstone
								End of Trial Pit at 2.65m

Pit Dimensions: 2.00m x 0.50m x 2.65m

Groundwater: None

Instrumentation: 33mm dia. standpipe installed to 2.65m bgl

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 04

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
		0.50	D		0.70			MADE GROUND Dark brown / grey very sandy CLAY with abundant organic matter and frequent roots (1mm to 4mm dia) to 0.30m bgl, underlain by brown to orange/beige slightly clayey silty SAND AND GRAVEL of stone with occasional glass
		1.50	D		2.55			MADE GROUND Red whole and half bricks and crushed masonry with fragments of glass and ocassional matal and ceramictiles in a matrix of reddish brown grey silty sabdy GRAVEL
								End of Trial Pit at 2.55m

Pit Dimensions: 1.90m x 0.50m x 2.55m

Groundwater: None

Instrumentation: 33mm dia. standpipe installed to 2.55m bgl

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 05

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
		0.50	D		0.40			MADE GROUND Dark brown / grey very sandy CLAY with abundant organic matter and frequent roots (1mm to 3mm dia) to 0.28m bgl, underlain by brown to orange/beige slightly clayey silty SAND AND GRAVEL of stone
		1.75	D		2.45			MADE GROUND Brown to grey brown silty gravelly SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments of glass, metal, ceramic and wood
								End of Trial Pit at 2.45m

Pit Dimensions: 2.20m x 0.50m x 2.45m

Groundwater: None

Instrumentation: None

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Trial Pit Log

Trial Pit No. TP 06

Project Location: Land at 48 Store Street, Manchester, M1 2WA

Co-ords:

Level:

Dates: 19/08/2025

Project Number: E250321

Logged By: David Webster to BS 5930:2015

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Result				
								MADE GROUND Dark brown / grey brown slightly clayey silty SAND AND GRAVEL of stone with abundant cobbles of brick
					0.34			
		0.50	D					MADE GROUND Brown to grey brown clayey silty SAND with abundant brick and masonry cobbles, fragments of metal and occasional fragments of ceramic tile
		1.70	D					
					2.30			End of Trial Pit at 2.30m

Pit Dimensions: 1.90m x 0.50m x 2.30m

Groundwater: None

Instrumentation: None

Remarks: Backfilled with arisings

Edlington Consulting Group Limited

Gas and Groundwater Monitoring Report

Date:	19/08/2025	**Ambient air temperature (°C):**	18
Time:	15:38	**Barometric pressure (mB):**	1012
Recorded by:	DW	**Barometric trend:**	Rising (4mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Low cloud, slight breeze

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	1.1	19.2	0.2	-0.01	<0.01	None
TP02	<0.1	0.8	19.3	0.1	0.07	<0.01	None
TP03	<0.1	1.6	18.8	0.1	0.04	<0.01	None
TP04	<0.1	1.4	19.0	0.2	0.05	<0.01	None

Edlington Consulting Group Limited

Gas and Groundwater Monitoring Report

Date:	24/08/2025	**Ambient air temperature (°C):**	16
Time:	10:17	**Barometric pressure (mB):**	1003
Recorded by:	CR	**Barometric trend:**	Falling (4mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Overcast, slight breeze

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	1.8	18.9	0.4	0.05	<0.01	None
TP02	<0.1	1.4	19.2	0.2	0.07	<0.01	None
TP03	<0.1	2.7	18.1	0.3	0.11	<0.01	None
TP04	<0.1	2.2	18.5	0.2	0.03	<0.01	None

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Gas and Groundwater Monitoring Report

Date:	31/08/2025	**Ambient air temperature (°C):**	15
Time:	08:46	**Barometric pressure (mB):**	997
Recorded by:	CR	**Barometric trend:**	Falling (3mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Misty rain, slight breeze

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	2.4	18.7	0.4	0.09	<0.01	None
TP02	<0.1	1.9	18.9	0.2	0.06	<0.01	None
TP03	<0.1	3.1	17.9	0.4	0.12	<0.01	None
TP04	<0.1	2.6	18.3	0.3	0.07	<0.01	None

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Gas and Groundwater Monitoring Report

Date:	03/09/2025	**Ambient air temperature (°C):**	18
Time:	12:29	**Barometric pressure (mB):**	1006
Recorded by:	NM	**Barometric trend:**	Rising (2mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Heavy rain

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	1.7	18.9	0.2	0.02	<0.01	None
TP02	<0.1	1.4	19.1	0.1	-0.04	<0.01	None
TP03	<0.1	2.3	18.6	0.2	0.05	<0.01	None
TP04	<0.1	1.9	19.0	0.2	0.03	<0.01	None

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Gas and Groundwater Monitoring Report

Date:	09/09/2025	**Ambient air temperature (°C):**	14
Time:	08:39	**Barometric pressure (mB):**	1005
Recorded by:	CR	**Barometric trend:**	Rising (3mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Clear, calm

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	2.0	18.8	0.1	-0.02	<0.01	None
TP02	<0.1	1.7	19.0	0.1	-0.01	<0.01	None
TP03	<0.1	2.6	18.3	0.2	0.03	<0.01	None
TP04	<0.1	2.2	18.4	0.2	0.01	<0.01	None

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Gas and Groundwater Monitoring Report

Date:	15/09/2025	**Ambient air temperature (°C):**	15
Time:	17:12	**Barometric pressure (mB):**	999
Recorded by:	CR	**Barometric trend:**	Falling (5mB) previous 24hr
Equipment:	Geotech GA2000 gas monitor and dip-meter	**Weather conditions:**	Overcast, moderate rain

Groundwater monitoring

Hole ID	Ground level (mAOD)	Water depth (m)	Water level (mAOD)	Depth of pipe base (m)	Remarks
TP01		Dry		2.45	None
TP02		Dry		2.70	None
TP03		Dry		2.65	None
TP04		Dry		2.55	None

Gas monitoring

Hole ID	Methane CH_4 (%v/v)	Carbon Dioxide CO_2 (%v/v)	Oxygen O_2 (%v/v)	Flow Rate (l/h)	Well Pressure (mBar)	PID* (ppm)	Remarks
Job/Hole	CH4	CO2	O2	INTERNAL FLOW	REL.PRESSURE		
	%	%	%	l/h	mb		
TP01	<0.1	2.7	18.7	0.3	0.07	<0.01	None
TP02	<0.1	2.1	19.1	0.2	0.05	<0.01	None
TP03	<0.1	2.9	18.0	0.4	0.11	<0.01	None
TP04	<0.1	2.4	18.4	0.2	0.08	<0.01	None

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Consulting Group Limited

APPENDIX C

LABORATORY TESTING RESULTS

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD
Telephone:- 07341 197178 Email: david@edlingtonconsulting.co.uk

PROJECT INFORMATION	SAMPLE INFORMATION
Site Location:- Store St	**Laboratory Tests Undertaken:-**
Client Reference:-	
Date Samples Received:- 4th September 2025	
Date Testing Completed:- 12th September 2025	

TEST TYPE	TEST METHOD	TESTED
Natural Moisture Contents (MC%)	(BS 1377:Part 2:1990 Clause 3.2)	✓
Liquid Limits (%)	(BS 1377:Part 2:1990 Clause 4.3)	✓
Plastic Limits (%)	(BS 1377:Part 2:1990 Clause 5.3)	✓
Plasticity Index (%)	(BS 1377:Part 2:1990 Clause 5.4)	✓
Saturated Moisture Content (%)	(BS1377 : Part 2 : 1990, clause 3.3)	
PSD - Wet Sieving	(BS 1377:Part 2:1990 Clause 9.2)	✓
Engineering Sample Descriptions	(BS 5930 : Section 6)	
Passing 425/63 (µm)	-	✓
Hydrometer	(BS 1377:Part 2:1990 Clause 9.5)	
Loss on Ignition (%)	-	
Soil Suctions (kPa)	BRE Digest IP 4/93, 1993	
Bulk Density (Mg/m^3)	(BS 1377:Part 2:1990 Clause 7.2)	
Strength Tests	(BS 1377:Part 7:1990 Clause 8 & 9)	
Soluble Sulphate Content (SO_4g/l)	(BS 1377:Part 3:1990 Clause 5.3)	✓
pH value	(BS 1377:Part 3:1990 Clause 9.4)	✓
California Bearing Ratios (CBR)	(BS 1377:Part 4:1990 Clause 7)	
Compaction Tests	(BS 1377:Part 4:1990 Clauses 3.0-3.6)	

The results relate only to the samples tested

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Laboratory testing in accord with BS EN ISO/IEC 17025-2000

Signed on behalf of Edlington Consulting Group Ltd :-_____ **Technical Signatory**

GEOTECHNICAL LABORATORY TEST RESULTS

Report No: E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD
Telephone :- 07341 197178 Email: david@edlingtonconsulting.co.uk

SAMPLES				CLASSIFICATION TESTS							CLASSIFICATION TESTS							STRENGTH TESTS					CHEMICAL TESTS	
Test Location	Sample Type	Sample Depth -m	Test Type	WC %	LL %	PL %	PI %	Passing 425 µm %	Modified PI %	Class	Passing 63 µm %	WC/ LL	PL+ 2%	Liquidity Index	Loss on Ignition %	Soil Suction kPa	Bulk Density Mg/m³	Test Type	Cell Pressure kN/m²	Deviator Stress kN/m²	Apparent Cohesion kN/m²	ϕ	pH Value	Soluble Sulphate Content SO4 g/l
TP 01	D	1.50	PSD																					
TP 02	D	1.00	PSD																					
TP 03	D	1.75	PSD																					
TP 04	D	1.50	PSD																					
TP 05	D	1.75	PSD																					
TP 06	D	1.70	PSD																					
BH 01	D	4.50	PI/63	25	38	22	16	85	14	CI	63	0.66	24	0.19									8.4	0.11
BH 01	D	6.50	PI/63	15	25	11	11	71	8	CL	42	0.60	16	0.09									8.4	0.13
BH 01	D	8.50	PI/63	12	29	14	14	72	10	CL	47	0.41	17	-0.21										
BH 01	D	11.50																					8.1	0.16
BH 01	D	17.50																						
BH 02	D	5.50	PI/63	12	29	15	14	77	11	CL	50	0.41	17	-0.21									7.9	0.08
BH 02	D	7.50	PI/63	16	28	14	14	71	10	CL	45	0.57	16	0.14										
BH 02	D	10.50																					8.3	0.21
BH 02	D	15.50																					8.5	0.18

Symbols:

U	Undisturbed Sample	R	Remoulded	PI	Plasticity Index	T	Triaxial Undrained	L	100mm specimen
D	Disturbed Sample	63	Passing 63µm	F	Filter Paper Suction Tests	M	Multistage Triaxial	S	38mm specimen
B	Bulk Sample	H	Hydrometer	CC	Continuous Core	HP	Hand Penetrometer		
W	Water Sample	PSD	Wet Sieving			V	Vane Test		

LABORATORY TEST RESULTS

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD

Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 01

Sample Depth: 1.50m

Hydrometer No.:

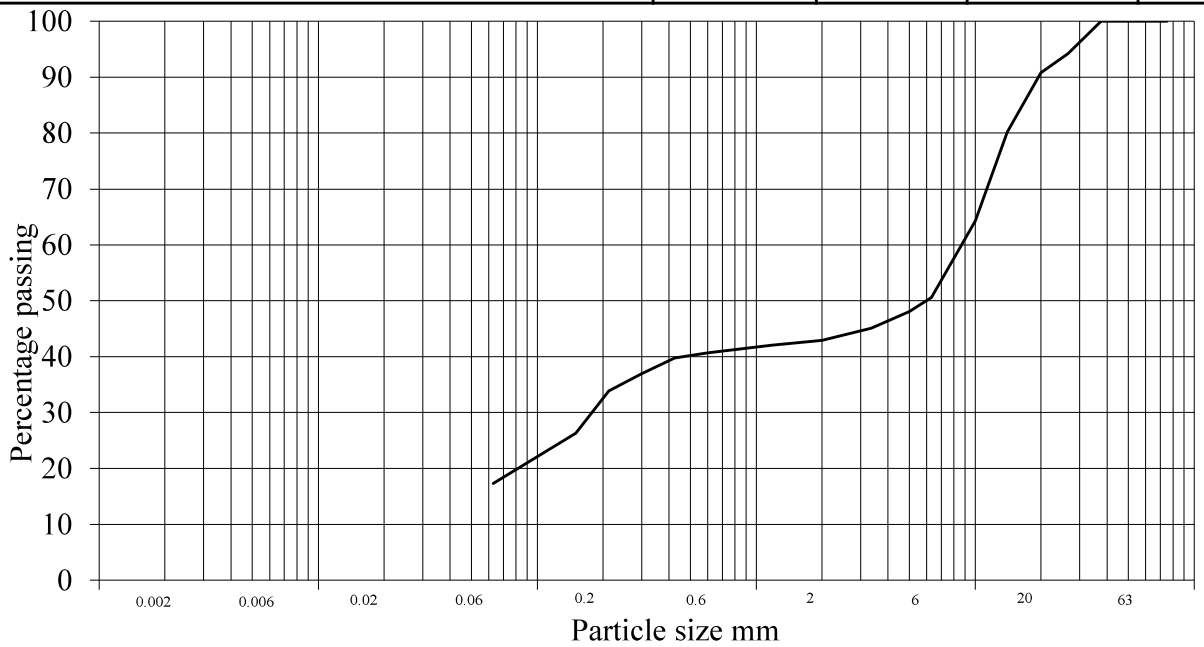
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	100.00		
26.5mm	94.20		
20mm	90.80		
14mm	80.20		
10mm	64.30		
6.3mm	50.60		
5mm	48.10		
3.5mm	45.10		
2mm	42.90		
1.18mm	42.10		
600µm	40.70		
425µm	39.80		
300µm	37.00		
212µm	33.90		
150µm	26.30		
63µm	17.30		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
17%				26%			57%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD

Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 02

Sample Depth: 1.00m

Hydrometer No.:

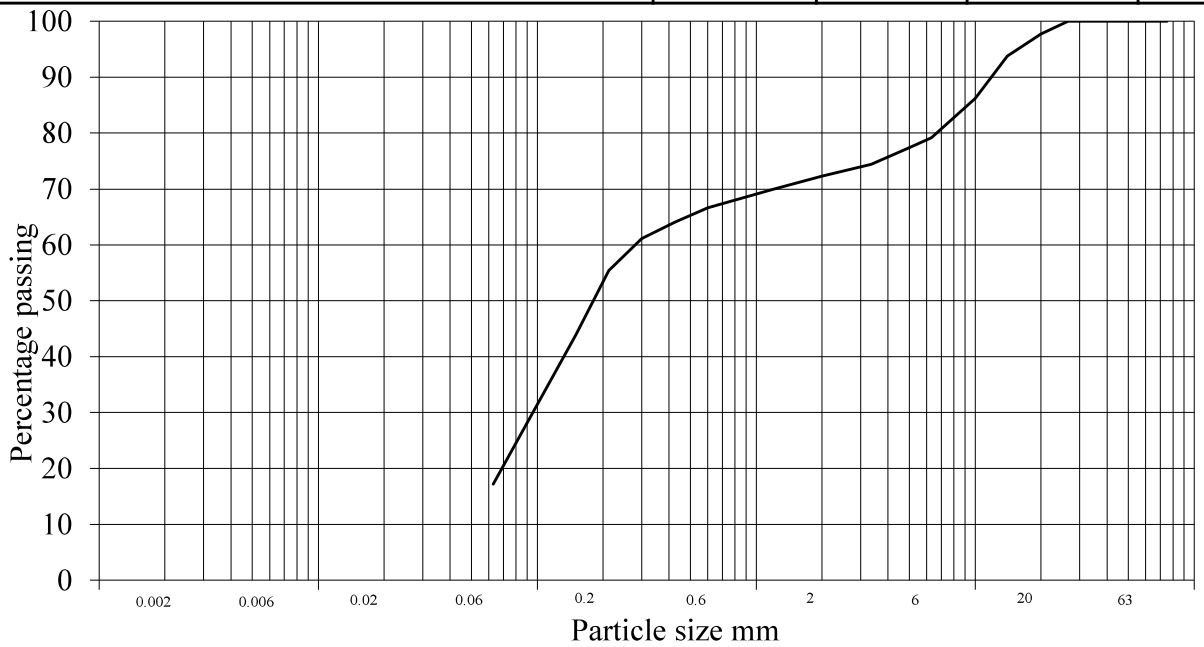
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	100.00		
26.5mm	100.00		
20mm	97.70		
14mm	93.80		
10mm	86.20		
6.3mm	79.20		
5mm	77.40		
3.5mm	74.40		
2mm	72.30		
1.18mm	69.90		
600µm	66.60		
425µm	64.00		
300µm	61.10		
212µm	55.40		
150µm	43.90		
63µm	17.20		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
17%				55%			28%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD

Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 03

Sample Depth: 1.75m

Hydrometer No.:

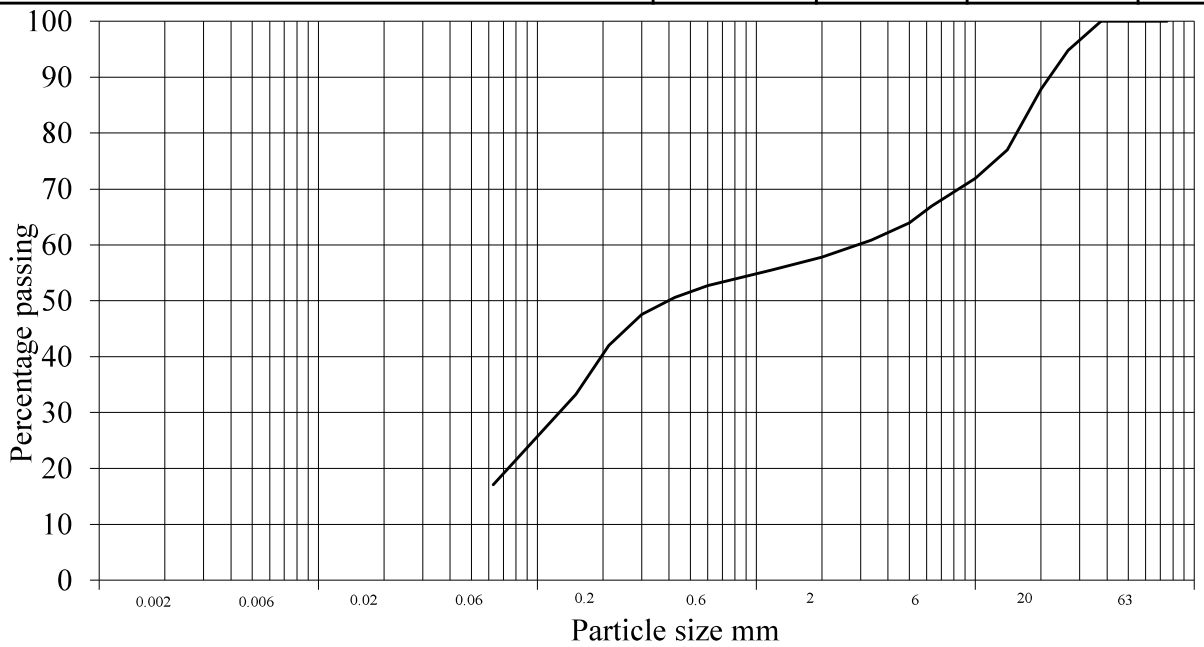
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	100.00		
26.5mm	94.80		
20mm	87.80		
14mm	77.00		
10mm	71.90		
6.3mm	66.90		
5mm	63.90		
3.5mm	60.80		
2mm	57.80		
1.18mm	55.50		
600µm	52.70		
425µm	50.60		
300µm	47.60		
212µm	42.00		
150µm	33.20		
63µm	17.10		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
17%				41%			42%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD

Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 04

Sample Depth: 1.50m

Hydrometer No.:

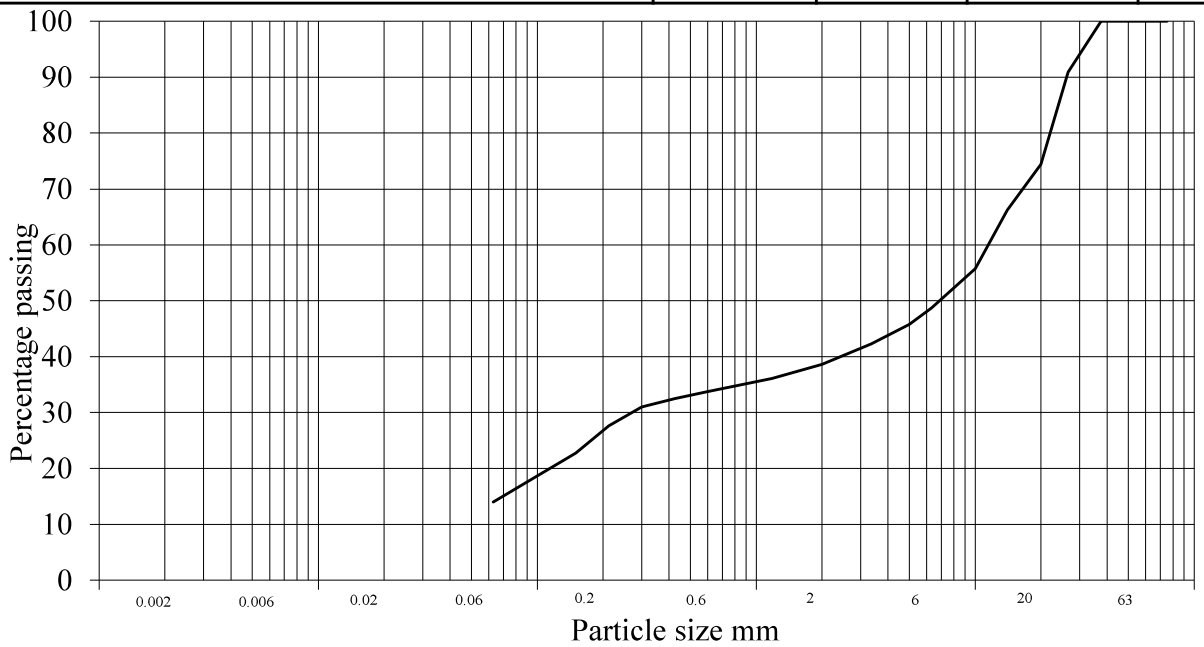
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	100.00		
26.5mm	90.90		
20mm	74.40		
14mm	66.20		
10mm	55.70		
6.3mm	48.70		
5mm	45.80		
3.5mm	42.30		
2mm	38.60		
1.18mm	36.10		
600µm	33.80		
425µm	32.50		
300µm	31.00		
212µm	27.60		
150µm	22.80		
63µm	14.00		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
14%				25%			61%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD
Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 05

Sample Depth: 1.75m

Hydrometer No.:

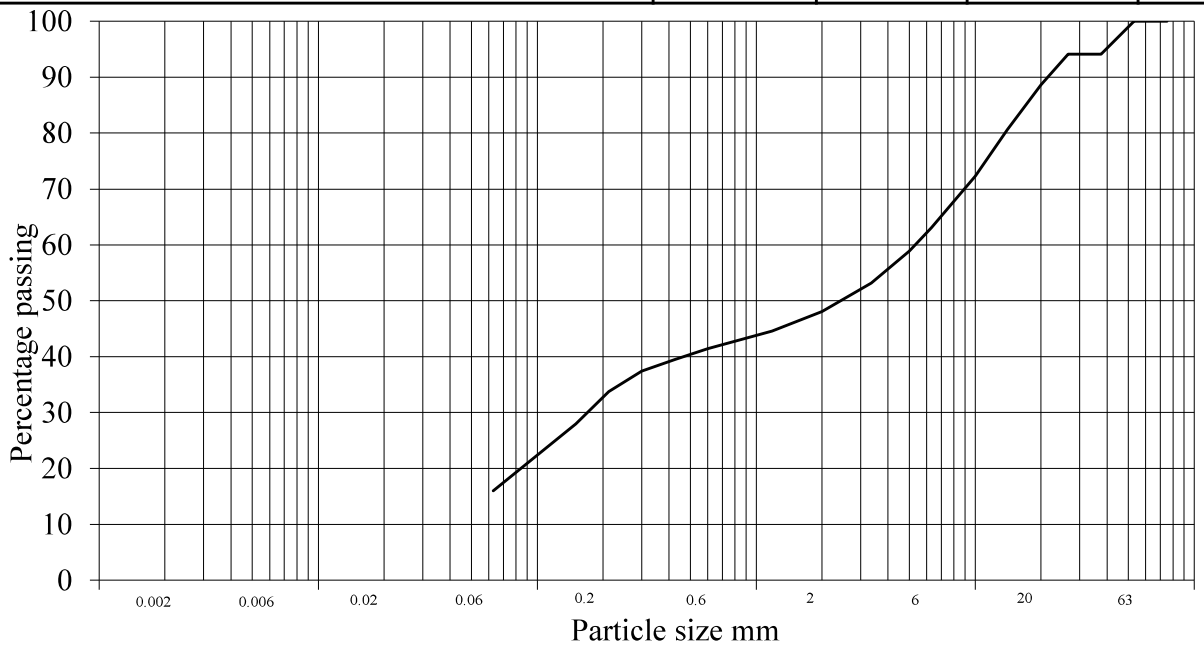
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	94.10		
26.5mm	94.10		
20mm	88.60		
14mm	80.60		
10mm	72.30		
6.3mm	63.10		
5mm	58.90		
3.5mm	53.20		
2mm	48.10		
1.18mm	44.60		
600µm	41.40		
425µm	39.50		
300µm	37.40		
212µm	33.80		
150µm	28.00		
63µm	16.00		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
16%				32%			52%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Edlington Consulting Group Ltd

Geotechnical Testing Facility

22 Glebe Meadow, Sharow, North Yorkshire, HG4 5BD

Telephone: 07341 197178 Email: david@edlingtonconsulting.co.uk

Site: Store St

Test Location: TP 06

Sample Depth: 1.70m

Hydrometer No.:

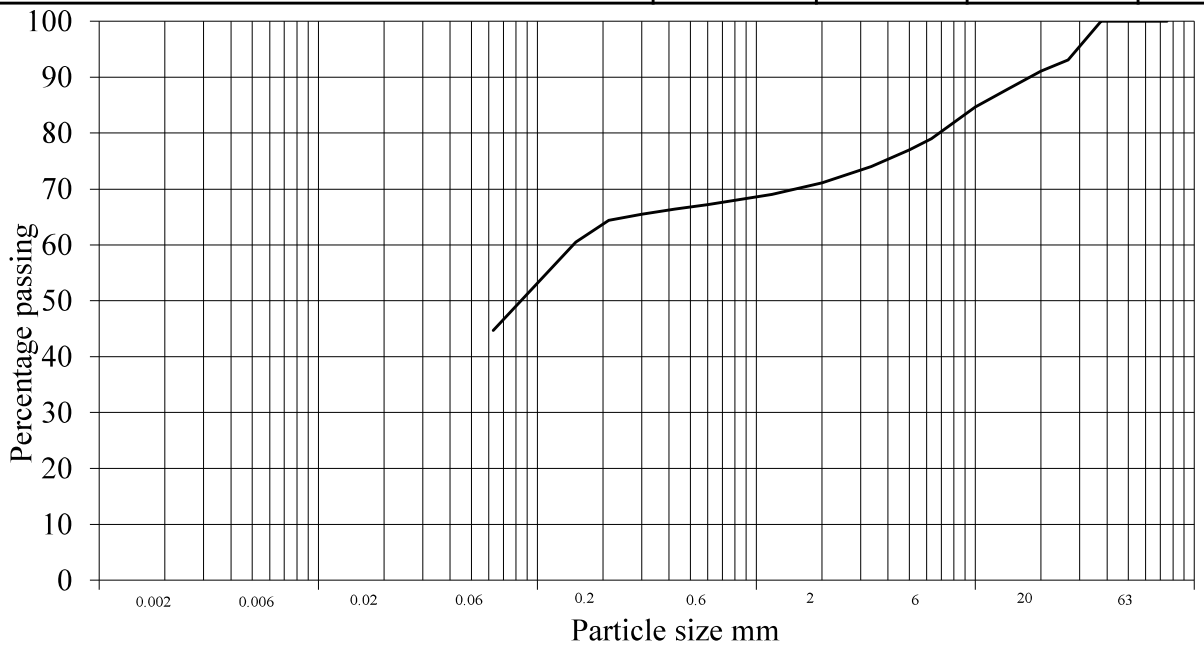
SG Gs:

Water Visc. (N):

Dry Mass of Soil after pretreatment (g):

Test Method: BS 1377 : Part 2 : 1990 : 9.2

BS test sieve	Cumulative Passing - %	Hydrometer Particle Diameter	Cumulative Passing - %
75mm	100.00		
63mm	100.00		
50mm	100.00		
37.5mm	100.00		
26.5mm	93.10		
20mm	91.10		
14mm	87.80		
10mm	84.70		
6.3mm	79.00		
5mm	77.00		
3.5mm	74.00		
2mm	71.10		
1.18mm	69.00		
600µm	67.20		
425µm	66.40		
300µm	65.50		
212µm	64.40		
150µm	60.50		
63µm	44.70		



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
45%				26%			29%			0%

PARTICLE SIZE DISTRIBUTION

Project Reference
E250321

Listers Geo
Slapton Hill Barn, Blakesley Road
Slapton
Towcester
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e: lab@listersgeotechnics.co.uk

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

t: 01923 225404
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e: reception@i2analytical.com

Analytical Report Number : 25-044506

Project / Site name:	StoreSt E250321	**Samples received on:**	20/08/2025
Your job number:	25 08 017	**Samples instructed on/ Analysis started on:**	20/08/2025
Your order number:	25 08 017 367	**Analysis completed by:**	27/08/2025
Report Issue Number:	1	**Report issued on:**	28/08/2025
Samples Analysed:	6 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654627	654628	654629	654630	654631
Sample Reference				TP01	TP02	TP03	TP04	TP05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.50	0.50	0.50	0.50	0.50
Date Sampled				19/08/2025	19/08/2025	19/08/2025	19/08/2025	19/08/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	3.1	18	12	9.3
Total mass of sample received	kg	0.1	NONE	0.1	0.2	2	0.3	0.1
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM	WEM	WEM	WEM	WEM
Analysis completed	N/A	N/A	N/A	26/08/2025	26/08/2025	26/08/2025	26/08/2025	26/08/2025
General Inorganics								
pH (L005B)	pH Units	N/A	MCERTS	7.6	7.4	7.4	7.3	7.2
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	84	30	190	80	36
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	41.9	15.2	96.3	40.2	18.2
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.26	0.06	< 0.05	0.1	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.44	0.25	< 0.05	0.29	0.19
Pyrene	mg/kg	0.05	MCERTS	0.36	0.24	< 0.05	0.24	0.23
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.2	0.13	< 0.05	0.16	0.07
Chrysene	mg/kg	0.05	MCERTS	0.25	0.13	< 0.05	0.19	0.09
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.34	0.17	< 0.05	0.21	0.15
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.1	0.05	< 0.05	0.07	0.06
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.21	< 0.05	< 0.05	0.19	0.11
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.11	0.05	< 0.05	0.09	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.11	0.08	< 0.05	0.09	< 0.05

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Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654627	654628	654629	654630	654631
Sample Reference				TP01	TP02	TP03	TP04	TP05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.50	0.50	0.50	0.50	0.50
Date Sampled				19/08/2025	19/08/2025	19/08/2025	19/08/2025	19/08/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	2.38	1.17	< 0.80	1.62	0.89
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.4	5.6	9.4	7	12
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.4	0.3	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	14	52	50	40
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	19	20	19	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.1	20	11	8.4	7.1
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	22	8.1	42	48	30
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	65	52	230	81	58
Petroleum Hydrocarbons								
TPH (EC10 - EC40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
VOCs								
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 5.0	-	< 8.0	< 8.0	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	-	< 5.0	< 5.0	< 5.0

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Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654627	654628	654629	654630	654631
Sample Reference				TP01	TP02	TP03	TP04	TP05
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Water Matrix				N/A	N/A	N/A	N/A	N/A
Depth (m)				0.50	0.50	0.50	0.50	0.50
Date Sampled				19/08/2025	19/08/2025	19/08/2025	19/08/2025	19/08/2025
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	NONE	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	ISO 17025	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	NONE	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Azobenzene	mg/kg	0.3	NONE	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.30	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	NONE	-	< 0.3	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	-	< 0.3	-	-	-

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

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Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654632
Sample Reference				TP06
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.50
Date Sampled				19/08/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	8.8
Total mass of sample received	kg	0.1	NONE	0.1
Asbestos				
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	WEM
Analysis completed	N/A	N/A	N/A	26/08/2025
General Inorganics				
pH (L005B)	pH Units	N/A	MCERTS	7.2
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	73
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	36.4
Total Phenols				
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05

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Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654632
Sample Reference				TP06
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.50
Date Sampled				19/08/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	< 0.80
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	42
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12
Lead (aqua regia extractable)	mg/kg	1	MCERTS	8.7
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	65
Petroleum Hydrocarbons				
TPH (EC10 - EC40) EH_CU_1D_TOTAL	mg/kg	10	MCERTS	< 10
VOCs				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 5.0
o-Xylene	µg/kg	5	MCERTS	< 5.0

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Analytical Report Number: 25-044506
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654632
Sample Reference				TP06
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.50
Date Sampled				19/08/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
SVOCs				
Aniline	mg/kg	0.1	NONE	-
Phenol	mg/kg	0.2	ISO 17025	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-
1,3-Dichlorobenzene	mg/kg	0.2	NONE	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-
2-Methylphenol	mg/kg	0.3	MCERTS	-
Hexachloroethane	mg/kg	0.05	ISO 17025	-
Nitrobenzene	mg/kg	0.3	MCERTS	-
4-Methylphenol	mg/kg	0.2	NONE	-
Isophorone	mg/kg	0.2	MCERTS	-
2-Nitrophenol	mg/kg	0.3	NONE	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-
4-Chloroaniline	mg/kg	0.1	NONE	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-
2,4,6-Trichlorophenol	mg/kg	0.1	NONE	-
2,4,5-Trichlorophenol	mg/kg	0.2	NONE	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-
2,6-Dinitrotoluene	mg/kg	0.1	NONE	-
2,4-Dinitrotoluene	mg/kg	0.2	NONE	-
Dibenzofuran	mg/kg	0.2	MCERTS	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	MCERTS	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-
4-Nitroaniline	mg/kg	0.2	NONE	-
Azobenzene	mg/kg	0.3	NONE	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-
Carbazole	mg/kg	0.3	MCERTS	-
Dibutyl phthalate	mg/kg	0.2	NONE	-
Anthraquinone	mg/kg	0.3	NONE	-
Butyl benzyl phthalate	mg/kg	0.3	NONE	-

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Analytical Report Number : 25-044506
Project / Site name: StoreSt E250321

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
654627	TP01	None Supplied	0,5	Brown clay and loam with gravel and cobbles
654628	TP02	None Supplied	0,5	Dark brown clay with gravel and cobbles
654629	TP03	None Supplied	0,5	Brown sand with gravel and cobbles
654630	TP04	None Supplied	0,5	Brown clay and sand with gravel
654631	TP05	None Supplied	0,5	Brown sand with gravel
654632	TP06	None Supplied	0,5	Brown clay and sand with gravel and cobbles

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Analytical Report Number : 25-044506
Project / Site name: StoreSt E250321

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

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Analytical Report Number : 25-044509

Project / Site name:	StoreSt E250321	**Samples received on:**	20/08/2025
Your job number:	25 08 017	**Samples instructed on/ Analysis started on:**	20/08/2025
Your order number:	25 08 017 367	**Analysis completed by:**	27/08/2025
Report Issue Number:	1	**Report issued on:**	28/08/2025
Samples Analysed:	1 10:1 WAC sample		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

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

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

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

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting
air	- once the analysis is complete

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Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

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Analytical Report Number: 25-044509
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654633
Sample Reference				TP03
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.50
Date Sampled				19/08/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	18
Total mass of sample received	kg	0.1	NONE	2
General Inorganics				
pH (L005B)	pH Units	N/A	MCERTS	7.1
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	0.4
Loss on Ignition @ 450°C	%	0.2	MCERTS	3
Acid Neutralisation Capacity	+/- mmol/kg	-9999	NONE	0.54
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05
Coronene	mg/kg	0.05	NONE	< 0.05
Total PAH				
Total WAC-17 PAHs	mg/kg	0.85	NONE	< 0.85
Petroleum Hydrocarbons				
Mineral Oil (EC10 - EC40) EH_CU_1D_AL	mg/kg	10	NONE	< 10
VOCs				
Benzene	µg/kg	5	MCERTS	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0
Total BTEX	µg/kg	10	MCERTS	< 10

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 25-044509
Project / Site name: StoreSt E250321
Your Order No: 25 08 017 367

Lab Sample Number				654633
Sample Reference				TP03
Sample Number				None Supplied
Water Matrix				N/A
Depth (m)				0.50
Date Sampled				19/08/2025
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Test Limit of detection**	**Test Accreditation Status**	
PCBs by GC-MS				
PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001
Total PCBs	mg/kg	0.007	MCERTS	< 0.007

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

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The results included within the report are representative of the samples submitted for analysis.

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

Telephone: 01923 225404
Fax: 01923 237404
email:reception@i2analytical.com

Waste Acceptance Criteria Analytical Results

Report No:	**25-044509**						
					Client:	**Listers Geo**	
Location	**StoreSt E250321**						
Lab Reference (Sample Number)	654633				**Landfill Waste Acceptance Criteria Limits**		
Sampling Date	19/08/2025				Inert Waste Landfill	Stable Non-reactive HAZARDOUS waste in non-hazardous Landfill	Hazardous Waste Landfill
Sample ID	TP03						
Depth (m)	0.50						
Solid Waste Analysis							
TOC (%)**	0.4				3%	5%	6%
Loss on Ignition (%) **	3				--	--	10%
BTEX (µg/kg) **	< 10				6000	--	--
Sum of PCBs (mg/kg) **	< 0.007				1	--	--
Mineral Oil (mg/kg) EH_1D_CU_AL	< 10				500	--	--
Total PAH (WAC-17) (mg/kg)	< 0.85				100	--	--
pH (units)**	7.1				--	>6	--
Acid Neutralisation Capacity (mmol / kg)	0.54				--	To be evaluated	To be evaluated
Eluate Analysis	10:1			10:1	Limit values for compliance leaching test		
(BS EN 12457 - 2 preparation utilising end over end leaching procedure)	mg/l			mg/kg	using BS EN 12457-2 at L/S 10 l/kg (mg/kg)		
Arsenic *	< 0.00100			< 0.0100	0.5	2	25
Barium *	0.00732			0.0732	20	100	300
Cadmium *	< 0.000100			< 0.00100	0.04	1	5
Chromium *	0.0014			0.014	0.5	10	70
Copper *	0.0054			0.054	2	50	100
Mercury *	< 0.000500			< 0.00500	0.01	0.2	2
Molybdenum *	0.00141			0.0141	0.5	10	30
Nickel *	0.0014			0.014	0.4	10	40
Lead *	< 0.0010			< 0.010	0.5	10	50
Antimony *	< 0.0017			< 0.017	0.06	0.7	5
Selenium *	< 0.0040			< 0.040	0.1	0.5	7
Zinc *	0.011			0.11	4	50	200
Chloride *	0.95			9.5	800	15000	25000
Fluoride*	0.83			8.3	10	150	500
Sulphate *	5.6			56	1000	20000	50000
TDS*	28			280	4000	60000	100000
Phenol Index (Monohydric Phenols) *	< 0.010			< 0.10	1	-	-
DOC	6.57			65.7	500	800	1000
Leach Test Information							
Stone Content (%)	< 0.1						
Sample Mass (kg)	2						
Dry Matter (%)	82						
Moisture (%)	18						

Results are expressed on a dry weight basis, after correction for moisture content where applicable.

*= UKAS accredited (liquid eluate analysis only)

Stated limits are for guidance only and i2 cannot be held responsible for any discrepancies with current legislation

** = MCERTS accredited

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes as defined by the Waste (England and Wales) Regulations 2011 (as amended) and EA Guidance WM3.
This analysis is only applicable for landfill acceptance criteria (The Environmental Permitting (England and Wales) Regulations) and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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Analytical Report Number : 25-044509
Project / Site name: StoreSt E250321

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
654633	TP03	None Supplied	0.5	Brown clay with gravel

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 25-044509
Project / Site name: StoreSt E250321

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20°C in soil	Determination of pH in soil by addition of water followed by electrometric measurement	In-house method	L005B	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
PCB's By GC-MS in soil	Determination of PCB by extraction with hexane followed by GC-MS	In-house method based on USEPA 8082	L027B	D	MCERTS
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by electrometric measurement	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031B	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination	L033B	W	ISO 17025
Dissolved organic carbon 10:1 WAC	Determination of dissolved organic carbon in leachate by TOC/DOC NDIR Analyser	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037B	W	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L039B	W	ISO 17025
One stage WAC 10:1 leachate preparation	One stage batch test at a liquid to solid ratio of 10 L/kg	BS EN 12457-2-2002	L043B	W	ISO 17025
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance	L046B	W	NONE
Loss on ignition of soil @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	In-house method	L047-PL	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons by GC-FID in soil	Determination of total petroleum hydrocarbons in soil by GC-FID	In-house method	L076B	D	NONE
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025

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Analytical Report Number : 25-044509
Project / Site name: StoreSt E250321

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)
Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser	In-house based on MEWAM Method ISBN 0117516260	L082B	W	ISO 17025
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Quality control parameter failure associated with individual result applies to calculated sum of individuals.
The result for sum should be interpreted with caution

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Edlington
Consulting Group Limited

APPENDIX D

DETAILED UXO RISK ASSESSMENT

Landmark Information

alpha ASSOCIATES



Store Street

Landmark Order No: 377774476_1

Client Reference: E250403

Detailed Unexploded Ordnance (UXO) Threat and Risk Assessment with Risk Mitigation Strategy

Meeting the requirements of the United Kingdom's
Construction Industry Research and Information Association's
Unexploded Ordnance Risk Management Framework:
"Unexploded Ordnance (UXO) – A Guide for the Construction Industry" (C681)
and in compliance with the Construction (Design and Management) Regulations 2015

6 Alpha Associates Ltd

Project No.: 11937

5th June 2025

V1.0

Achilles UVDB VERIFIED | BUILDER'S PROFILE | Constructionline Gold Member Verified Member | SafeContractor APPROVED | Institute of Explosives Engineers | REGISTERED ISOQAR UKAS MANAGEMENT SYSTEMS 0026 Certificate Number 25680 | ISO 9001, ISO 14001, ISO 45001

Using This Report

This Detailed UXO Threat and Risk Assessment with Risk Mitigation Strategy is designed to inform the reader whether military related Unexploded Ordnance (UXO) is likely to pose a hazard at the Study Site and if so, calculate the level of risk generated by proposed or likely ground intrusive operations at the Site. The assessment is intended to meet with the requirement of Stages 2 and 3 of the *Health and Safety Executive* endorsed *CIRIA C681 UXO Risk Management Framework* – for which *6 Alpha* were the lead technical author.

There are two prospective outcomes of this report; either the risk level requires a Risk Mitigation Strategy (Stage 3 of the *CIRIA C681* framework) aimed at reducing UXO risks As Low As Reasonably Practicable (ALARP) in accordance with the Project's minimum legal responsibility; or that no further action is required. In the former instance *6 Alpha* will provide a Risk Mitigation Strategy consisting of proactive and/or reactive risk mitigation measures aimed at reducing the identified risks to ALARP.

Document Control

Version	Author(s)	Reviewed By	Recipient
1.0	Dominic Barrett	Laurence Gregory	Client Reference: E250403

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Executive Summary

Document Scope

6 Alpha Associates Limited (6 Alpha) has been commissioned in partnership with the *Landmark Information Group* to provide a UXO Threat and Risk Assessment with Risk Mitigation Strategy, for the Site described as "Land at 48, Store Street, Manchester, M1 2WA". The Study Site is centred on *British National Grid Reference* 384986, 398076.

UXO Threat Assessment Summary

The output of *6 Alpha*'s UXO Threat Assessment is summarised at Table I:

UXO Threat Assessment Summary			
Threat Source		**Result**	**Comments**
	Was the Site or its vicinity considered a primary bombing target during WWII?	✔	*Luftwaffe* aerial photography and mapping identified six primary bombing targets within 1,000m of the Study Site boundary with the closest being *London Road Station* (60m to the south-west).
	Was the Site or its vicinity bombed during WWII?	✔	*ARP* records identified 25 bomb strikes within 1,000m of the Site; the closest was located 235m to the south-east.
	Was the Site or its vicinity damaged by bombing during WWII?	✔	Significant bomb damage was documented recorded potentially as close as 40m to the south of the Site.
	Has any *British* military activity been identified in the area?	✘	No evidence of military activity and/or munitions production or storage was identified on-site or within the immediate vicinity of the Study Site boundary.
	Has ordnance been manufactured and/or stored at the Site or its vicinity?	✘	
	Does UXO contamination pose a potential hazard at the Study Site?	✔	Given that WWII bombing and bomb damage were documented in the Site's immediate vicinity, it is possible that UXO might be encountered.

Table I: UXO Threat Assessment Summary

UXO Threat Items

Given the evidence presented at Table I, *6 Alpha* consider it reasonably foreseeable that a UXO encounter could occur at this Site. The most probable UXO threat items are *German* HE bombs and IBs. *British* AAA projectiles may also pose a residual threat.

Potential UXO Burial Depth

Given the likely ground conditions at the Study Site, the average WWII bomb penetration depth has been calculated as 5m below WWII ground level at this Study Site. Although larger UXBs could be present below this depth (potentially up to 10m), they were deployed infrequently during WWII and are highly unlikely to be encountered.

UXO Risk Pathways

The Study Site has undergone significant post-WWII development in certain areas, specifically concerning the clearance of almost all structures on-site by 1992. In addition, the ground conditions summary provided by the Client (at Section 5.1.1.), suggests that 3m-5m made ground has been deposited on top of the WWII ground level in areas of the Site in the post-war period. Whilst it is not clear whether the entire surface of the Site consists of made ground, or if it is limited to parts of the Site, it is generally considered likely that any UXO contamination within ground that has been disturbed since WWII would likely have been discovered and removed.

Nonetheless, a limited UXO risk pathway could be generated by intrusive works within any remaining area(s) of ground that has not been disturbed **since the time it might have been contaminated with UXO**.

UXO Risk Assessment

A Semi-Quantitative UXO Risk Assessment has been undertaken and the UXO risk rating is assessed to be:

MEDIUM

Such risks may pose harm to human health and damage any equipment involved in intrusive activities. Whilst the level of risk posed is relatively limited, the former risk to human health is intolerable. Therefore, such intolerable risks will require mitigating to ALARP, through the implementation of a risk mitigation strategy (see below, and Part III of the report).

Risk Mitigation Strategy

6 Alpha recommends that the UXO risk to the proposed intrusive works is reduced ALARP, through the implementation of both proactive and reactive UXO risk mitigation measures.

Recommended UXO Risk Mitigation Measures

There following risk mitigation measures summarised at Table II, are recommended as a minimum in order to reduce risks ALARP during intrusive works in **all previously undisturbed ground**.

UXO Risk Mitigation Measures Overview							
Proposed Intrusive Works		Emergency Response Plan	Safety and Awareness Briefings	On-Call EOD Engineer	UXO Watching Brief	Non-Intrusive UXO Survey	Intrusive UXO Survey
Open Works	Trial Pits	✔	✔	✔	✘	✘	✘
	Excavations	✔	✔	✔	✘	✘	✘
Blind Works	Boreholes	✔	✔	✔	✘	✘	✘
Residual UXO Risk Rating		**ALARP**					

Table II: UXO Risk Mitigation Measures Overview

Recommended Next Steps

We recommend that the Client's next steps are focused upon phase four of the UXO Risk Management Framework namely, the detailed designs of the recommended UXO risk mitigation measures as outlined above.

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Appendix 4 – WWII High Explosive Bomb Density

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Acronyms and Abbreviations

AAA	Anti-Aircraft Artillery	**NEQ**	Net Explosive Quantity
ALARP	As Low As Reasonably Practicable	**NGR**	National Grid Reference
ARP	Air Raid Precaution	**OS**	Ordnance Survey
AXO	Abandoned Explosive Ordnance	**PoW**	Prisoner of War
BDO	Bomb Disposal Officer	**RAF**	Royal Air Force
bgl	Below Ground Level	**RMS**	Risk Mitigation Strategy
BGS	British Geological Survey	**RN**	Royal Navy
BH	Borehole	**SAA**	Small Arms Ammunition
BPD	Bomb Penetration Depth	**SQRA**	Semi-Quantitative Risk Assessment
CIRIA	Construction Industry Research and Information Association	**TA**	Territorial Army
CS	County Series	**TARA**	Threat and Risk Assessment
EOD	Explosive Ordnance Disposal	**TNT**	Trinitrotoluene
HE	High Explosive	**UK**	United Kingdom
HSE	Health and Safety Executive	**UN**	United Nations
IB	Incendiary Bomb	**USAAF**	United States Army Air Force
kg	Kilogram	**UXB**	Unexploded Bomb
km	Kilometre	**UXO**	Unexploded Ordnance
LCC	London County Council	**V Weapons**	*Vergeltungswaffen* – Vengeance Weapons
LSA	Land Service Ammunition	**WWI**	World War One
m	Metre	**WWII**	World War Two

Part I: Introduction

1 Document Overview

1.1 Scope of Work

6 Alpha Associates Limited (6 Alpha) has been commissioned in partnership with the *Landmark Information Group* to provide an Unexploded Ordnance (UXO) Threat and Risk Assessment with Risk Mitigation Strategy, for the Site described as "Land at 48, Store Street, Manchester, M1 2WA".

1.2 Study Site Location

The Study Site is situated within the *City of Manchester* and totals an area of 0.07ha. The Study Site is centred on *British National Grid Reference* 384986, 398076 and whilst the ground cover is difficult to discern from the available satellite photography, the Site appears to consist of undeveloped ground (trees) and a perimeter brick wall.

The Site's Location and Site Boundary is depicted at Appendices 1 and 2, with aerial photography of the Study Site presented at Appendix 3.

1.3 Aims and Objectives

This document has the following aims and objectives:

1.3.1 Aims

The document aims to assess and evidence the nature and scope of the UXO risks to people, plant, equipment and/or the environment at this Study Site. In the event that an intolerable UXO risk is identified, a recommended UXO risk mitigation strategy will also be articulated.

1.3.2 Objectives

The document has the following objectives:

- To assess the nature and scope of potential UXO contamination at the Study Site;
- To assess whether any UXO contamination generated at the Site is likely to remain extant;
- To consider whether the proposed intrusive works will generate a viable UXO risk pathway;
- To identify those sensitive receptors likely to be impacted by an inadvertent UXO encounter during the proposed intrusive works;
- To assess the UXO risk to those sensitive risk receptors during intrusive works;
- To outline proportional risk mitigation measures that are consistent with a coherent overarching risk mitigation strategy, in order to effectively manage the UXO risk ALARP.

2 Introduction to UXO Risk Management

2.1 Definition of UXO

For the purposes of this risk assessment, *6 Alpha* have adopted the definition of UXO outlined in the undermentioned *CIRIA C681* guide, as follows:

"Explosive ordnance that has been primed, fuzed, armed, or otherwise prepared for use and used in an armed conflict. It may have been fired, dropped, launched or projected and should have exploded but failed to do so…UXO also refers to explosive ordnance that has not been used during an armed conflict, that has been left behind or dumped by a party to an armed conflict, and which is no longer under control of the party that left it behind or dumped it..."

2.2 Generic UXO Threats

There are multiple factors which may have contributed to the UXO contamination of a construction site in the *UK* but generally, UXO contamination is likely to result from the warfighting activity associated with WWI and WWII, the military occupation and use of land such as airfields, camps and training areas; and the manufacture of munitions to support the armed forces.

For example, *WWII Bomb Census* data from the *Ministry of Home Security* calculated that approximately 10% of bombs dropped on *Britain* during WWII failed to function as designed. If the bomb did not detonate when it was dropped, the force of impact enabled the Unexploded Bomb (UXB) to penetrate the ground. Whilst efforts were made to locate and render safe those UXBs that were observed entering the ground (or left behind clear evidence of having done so) during WWII, evidence of such UXBs was readily obscured by bomb damage debris, vegetation and a lack of footfall in some settings – thus, ensuring that an unquantifiable number of UXBs were left *in situ* below the surface of the ground.

Additionally, it has been estimated that at least 20% of the *UK's* land surface area has been used for military training activities or has otherwise been requisitioned for military use historically. Therefore, *British* Abandoned Explosive Ordnance (AXO), Land Service Ammunition (LSA), Small Arms Ammunition (SAA) and aerially delivered ordnance is also commonly encountered in areas that were formerly occupied by military forces (such as *Royal Air Force* (RAF) airfields, military camps and/or military training areas). Conventional and chemical munitions dumping was also prevalent in these periods with little consideration given to future safety implications. There was also widespread unrecorded dumping of LSA and SAA below the ground that was rarely recorded because the activity was often perceived to be inconsequential.

2.3 Generic UXO Risks

The explosive or chemical fill within UXO rarely becomes inert or loses its effectiveness with age, but the explosive fill may change or crystallise over time – increasing the high explosive's sensitivity to a physical shock or an impact. Trigger mechanisms and fuses, which may have failed, may corrode and deteriorate over time, becoming more sensitive to detonation. It is therefore possible that a significant impact on the UXO case, and the resultant effect upon the fuse, may cause its inadvertent detonation.

2.4 UXO Industry Best Practice

In the absence of specific legislation concerning the management of UXO risks during construction projects, the *UK*'s *Construction Industry Research and Information Association* (CIRIA) has published a best practice guide for the assessment and management of UXO risk in the construction industry (*CIRIA* document reference C681). The *CIRIA C681* guide has been judged and recognised by the *Health and Safety Executive* (HSE) as a minimum standard of good practice, that satisfies the law when applied in an appropriate manner.

6 Alpha were *CIRIA's* lead technical author for their *C681* publication and as such, are in a unique position to ensure that Client's manage UXO risk in a safe, cost-effective and time-efficient manner.

2.5 UXO Risk Management Strategic Framework

At Section 5 of *CIRIA's* C681 guide, a framework for the management of UXO risk is articulated and consists of four key stages. These correspond with the framework employed by *6 Alpha*, as presented at Table 1.

6 Alpha Risk Management Framework	UXO Risk Management Phase	CIRIA C681 Risk Management Framework	Delivered within Report? (✔/✘)
UXO Threat Assessment	**STAGE ONE**	Preliminary Risk Assessment	✔
UXO Risk Assessment	**STAGE TWO**	Detailed Risk Assessment	✔
Risk Mitigation Strategy	**STAGE THREE**	Risk Mitigation	✔
Implementation	**STAGE FOUR**	Implementation	✘

Table 1: 6 Alpha and CIRIA UXO Risk Management Frameworks

3 UXO Threat and Risk Assessment Methodology

3.1 Source – Pathway – Receptor Risk Model

The source-pathway-receptor model is a conceptual risk model employed by *6 Alpha* across all projects that informs how UXO risks are assessed. The model also helps to explain the link between the separate sections of this report and the UXO risk assessment at Section 7. The components of the model are as follows:

3.1.1 UXO Sources

The nature and scope of the UXO threat is summarised in the UXO threat assessment (at Section 4) and it forms the source element of the source-pathway-receptor model.

3.1.2 UXO Pathways

The UXO pathways are the routes by which the sources can reach the receptors. UXO pathways are likely to be either by contact and/or through soil energy transfer, through which the resulting shock wave (generated by a UXO source, or sources) may reach potential receptors. Nonetheless, surface events may also generate a through-air risk pathway in which blast and fragmentation from the UXO sources may also reach the receptors.

UXO risk pathways may be generated by a variety of operations that interact with the ground. Therefore, likely operations have been assessed and summarised (at Section 6), to demonstrate the potential risk pathway elements of the model.

3.1.3 UXO Receptors

Receptors are defined as anything which might be adversely affected by the consequences of an inadvertent detonation of any UXO source through an identified pathway. The proximity, robustness, and sensitivity of such receptors is essential in determining their capacity to withstand such high explosive effects and defining what degree of UXO risk might be tolerated (if any).

3.2 Semi-Quantitative Risk Assessment Methodology

The assessment of UXO risk is a semi-quantitative measure of the probability of UXO encounter and initiation and the consequence of an inadvertent UXO initiation; the former being a function of the identified hazard and proposed development methodology and the latter being a function of the type of hazard and the proximity of personnel (and/or other sensitive receptors) to the hazard.

UXO risk is calculated using the following formula:

Risk **(R)** = Probability **(P)** x Consequence **(C)**

3.3 Information Sources

Significant archive research associated with the Study Site has been undertaken to corroborate and to highlight, any and all potential sources of UXO contamination as well as to assess their likelihood of encounter. For the production of this report, *6 Alpha* have reviewed information from the following sources:

- Information gathered from the *National Archives* at *Kew*, including but not limited to:
  - *Ministry of National Security WWII Bomb Census* statistics;
  - *Air Raid Precaution* (ARP) written records and associated bomb strike mapping;
  - Official WWII bomb damage mapping;
- *Ministry of Defence* (MoD) *Abandoned Bomb Register*;
- *Former 33 Engineer Regiment* (Explosive Ordnance Disposal) records at *Carver Barracks, Wimbish*;
- Post-WWII *RAF* aerial photography;
- *County Series* (CS) and *Ordnance Survey* (OS) mapping.

3.3.1 Azimuth© UXO Threat Database

The above list is not exhaustive, and *6 Alpha's Azimuth*© database has also been heavily drawn upon to deliver the UXO threat assessment element of this report. The *Azimuth*© database contains digitised historic charts, aerial photographs and other extensive analogue records from an exhaustive range of additional national, regional and global archives and/or data sets that have been digitised.

3.4 Constraints

This UXO threat and risk assessment is constrained and limited by that information which is reasonably available to *6 Alpha* at the time of writing, as well as that UXO information that is reasonably accessible in a variety of archives, which *6 Alpha* have digitised and georeferenced or have otherwise summarised in written form.

This document may also require updates and changes, especially wherever and whenever the circumstances and factors associated with assessing UXO risk change. For example, if UXO threats are subsequently discovered and they are different from those that have been anticipated, and/or if proposed intrusive operations are significantly changed.

In such circumstances, risks may require re-evaluation, and any such changes are to be made by *6 Alpha*, to ensure the continued technical veracity and risk management efficacy of this document.

Part II: UXO Threat & Risk Assessment

4 UXO Threat Assessment

4.1 WWII Aerial Bombing

Manchester's importance to the *British* war economy as an inland port, industrial centre, and aircraft manufacturer, meant the city and surrounding area represented a significant bombing target for the *Luftwaffe*. The first air raids occurred during August 1940 and continued until 1942.

The *Luftwaffe* bombing campaign of *Manchester* peaked between the 22nd and the 24th December 1940 (the *Manchester,* or *Christmas, Blitz* as it was known). *Manchester* continued to be bombed throughout the war and on the 24th December 1944 *V1* rockets were launched towards the city. The rockets generally failed to meet their intended targets, with one stray rocket impacting *Oldham*, killing 27 civilians.

4.1.1 WWII HE Bomb Density

The Study Site was located within *Manchester County Borough,* as presented at Appendix 4. This region recorded six HE bomb strikes per 100 hectares, a "very low" level of bombing. However, further site-specific data has been considered regarding the potential bombing of the Site during WWII.

4.1.2 WWII Luftwaffe Bombing Targets

Luftwaffe aerial reconnaissance photography and mapping did not identify the Study Site as a primary bombing target. Nonetheless, *London Road Station with Branch Station, Goods Station and Goods Shed* (60m to the south-west of the Site), *Goods Station with Goods Shed* (310m to the south-east), *Vulcan Works* (340m to the east), a *Textile Factory* (560m to the south-east), *Oldham Road Goods Station and Goods Shed* (870m to the north-north-west) and *Manchester Works with Mills* (930m to the north-east) were all documented as primary bombing targets in the Site's vicinity.

The locations of *Luftwaffe* bombing targets, in relation to the Study Site, are presented at Appendix 5.

4.1.3 WWII HE Bomb Strikes

During WWII, *ARP* wardens and other local officials compiled detailed logs of bomb strikes across their respective districts that were then often consolidated and mapped at the end of WWII. These records did not note any HE bomb strikes within the Study Site. Nonetheless, at least 25 HE bomb strikes were recorded within 1,000m of the Study Site boundary, with the closest recorded 235m to the south-south-east on *Sheffield Street* and 380m and 390m to the south-south-east adjacent to the railway lines at *Manchester Piccadilly*. A parachute mine detonation was also recorded 370m to the south-south-east of the Site, in close proximity to the aforementioned railway lines.

Furthermore, whilst IBs may have fallen within the Study Site, they were dropped in large clusters and accurate record keeping was often either non-existent or perfunctory. Nonetheless, 98 IB strikes were noted in the wider area. The closest cluster of IB strikes were documented 275m to the north-east, 320m to the north-east and 340m to the north-west of the Site.

In addition to IBs and HE bomb strikes, during the latter stage of WWII, when more conventional aerial bombardment of the *UK* had significantly declined, the main threat came from *V* type weapons. *V1* and *V2* rockets were thin-skinned, unmanned and inaccurate weapons and generally exploded upon impact and thus, are less likely to pose a UXO threat. There is also no evidence to suggest that the Study Site (or its immediate vicinity) was subjected to rockets strikes during WWII.

The locations of WWII-era bomb strikes, in relation to the Study Site, are presented at Appendix 6.

4.1.4 WWII Bomb Damage

An analysis of *Manchester Corporation* bomb damage mapping associated with the Study Site does not show any bomb damage within it. Nonetheless, *"Damaged Buildings"* were documented 330m to the south and 340m to the south, with *"Demolished Buildings"* mapped 340m to the south-south-east of the Site. Moreover, an analysis of post-war mapping and 1944 aerial photography identified extensive clearance areas as close as 40m to the south of the Site – which is likely to be indicative of bomb damage given the extensive concentration of WWII bombing documented in the general area. Further research of historical records also noted that the *London Road Goods Station* (140m to the south-west), *London Road Station* (now *Manchester Piccadilly Station* and located 200m to the south-west of the Site), and *Ancoats Goods Station* (330m to the south-east) were all heavily damaged by bomb strikes during WWII.

4.1.5 UXB Entry Holes

The CS mapping prior to WWII (1932) and aerial photography (1944) shows that the Study Site was located within a densely developed urban area during WWII, with the Study Site itself consisting of part of a residential structure and part of *Packing Case Manufactory*. Therefore, it is likely that the Study Site would have been accessed frequently during WWII and as such, any clearly visible UXB entry holes within the Site are likely to have been observed and reported at the time.

4.2 *British* Military Activity

There is no evidence to suggest that the Study Site or its immediate vicinity has previously been occupied by military personnel. Therefore, it is considered unlikely that munitions were previously stored, located and/or fired from this Study Site.

4.3 Previous UXO Encounters

An analysis of historic records did not identify any UXO encounters within the vicinity of the Study Site, as follows:

4.3.1 Abandoned Bombs

The Abandoned Bomb register was compiled from wartime records and was published in the form of a written answer to the *House of Commons* in 1996. The list initially only covered abandoned bombs in *London* but has since been released for the rest of the UK.

An examination of the *MoD*'s official abandoned bomb records has not identified any abandoned bombs on-site or within 1,000m of the Study Site boundary.

4.3.2 WWII UXO Disposal Tasks

An examination of pertinent historical records associated with the Study Site has not identified any WWII-era UXO disposal tasks within 1,000m of the Study Site.

4.3.3 Post-WWII UXO Encounters

An examination of pertinent historical records associated with the Study Site has not identified any post-WWII era UXO disposal tasks within 1,000m of the Study Site.

4.4 UXO Threat Summary

Given the evidence presented above, *6 Alpha* consider it reasonably foreseeable that a UXO encounter could occur at this Site. The most probable UXO threat items are *German* HE bombs and IBs. *British* AAA projectiles may also pose a residual threat as they were likely fired in defence of the local area during WWII bombing raids.

5 UXO Burial Depths

5.1 Overview

It is important to establish the likely burial depth for threat spectrum UXO at the Study Site. The potential penetration depth of an UXB was dependent on a number of factors including but not restricted to those prior to striking the ground (e.g. velocity and orientation of the UXB), which in turn will be influenced on factors such as the release altitude from the aircraft and encounters with infrastructure during its fall; those encountered at the point of impact (i.e. was the impact on concrete, grass, water etc.) and finally, the below ground level conditions (e.g. infrastructure/services, basements, foundations, and geology).

Accordingly, the ground conditions at the Study Site must be understood in order to determine the average and maximum *German* UXB penetration depths, as well as the potential for other types of munitions to be buried. The provenance of made ground must also be considered in order to accurately determine the ground levels at the time when UXO contamination may have occurred (so as to accurately determine the average/maximum bomb penetration depths) and subsequently to inform any further recommendations.

5.1.1 Ground Conditions

The Client has described the ground conditions as follows:

- "*Ground Conditions: Phase 1 desk study indicates local geology to comprise Glacial Till over Chester Formation sandstone. Historical mapping indicates infilling at the site and ground levels appear to have been built up across the site with deposited Made Ground and spoil from nearby construction projects over the years with 3-5m of Made / Reworked post-war ground anticipated*."

5.2 UXB Burial Depths

Based on the ground conditions described above, the average BPD for a 250kg *German* HE bomb is assessed to be approximately 5m bgl, with the maximum BPD considered to be approximately 10m bgl.

Although it is possible that the *Luftwaffe* deployed larger bombs in the area, an analysis of WWII bomb census data clearly evidences that their deployment was infrequent. Therefore, to use such larger bombs for BPD calculations **are not justifiable under the ALARP principle and thus, CIRIA C681 guidance**.

WWII *German* bombs have a greater penetration depth when compared to IBs and AAA projectiles, which are unlikely to be encountered at depths greater than 1m bgl.

5.2.1 The J-Curve Effect

As a UXB penetrated the ground, it's velocity naturally slowed where it either came to an abrupt stop (e.g., against foundations) or would continue along a route of least resistance – which often resulted in a curving of the trajectory back towards the surface. This is known as the "J Curve" effect and often resulted in a considerable horizontal off-set from the point of entry. This explains why UXBs have been discovered against or under the foundations of buildings which were present during WWII, or many meters from their entry holes. A diagrammatical representation of the "J Curve" effect is presented at Figure 1.

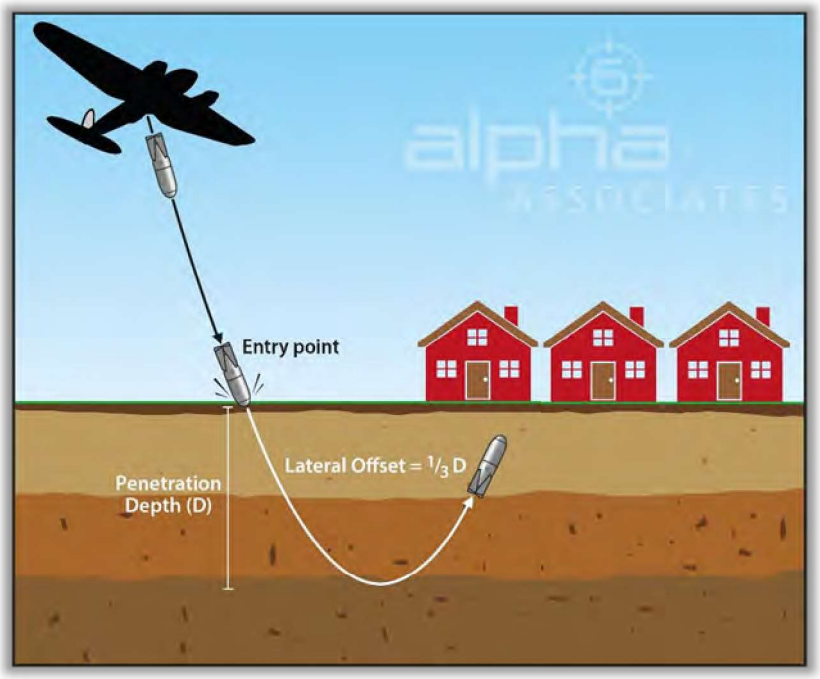


Figure 1: The "J Curve" Effect

6 UXO Risk Pathways

6.1 Overview

In order to assess whether a viable UXO risk pathway might exist at the Study Site, potential UXO contamination sources must be assessed (and have been at Section 4 of the report) and the likely depth of UXO contamination ought to be established (as per Section 5 of the report). Additionally, the Site's construction history ought to be considered to assess whether any previous intrusive works will have encountered and removed any UXO contamination present at the Site.

6.2 Study Site Construction History

From an analysis of CS and OS mapping, together with aerial photography, the following site history can be deduced:

Year	Development History
1932 CS Map	The Study Site was situated in a densely developed urban area and comprised several structures.
1944 Aerial Photography	Changes were not recorded at the Study Site.
1954 OS Map	New structures were built across the Study Site, and a *Travelling Crane* was temporarily installed in the eastern sector.
1971 OS Map	Changes were not recorded at the Study Site.
1985 OS Map	Changes were not recorded at the Study Site.
1992 OS Map	All structures on-site had been demolished, other than small wall in the western sector.
2003 Aerial Photography	Changes were not recorded at the Study Site.
2016 OS Map	Changes were not recorded at the Study Site.
2024 OS Map	Changes were not recorded at the Study Site.

Table 2: Study Site Development History

As per Table 2, it is apparent that the Study Site has undergone significant post-WWII development in certain areas, specifically concerning the clearance of almost all structures on-site by 1992. In addition, the ground conditions summary provided by the Client (at Section 5.1.1.), suggests that 3m-5m made ground has been deposited on top of the WWII ground level in areas of the Site in the post-war period. Whilst it is not clear whether the entire surface of the Site consists of made ground, or if it is limited to parts of the Site, it is generally considered likely that any UXO contamination within ground that has been disturbed since WWII would likely have been discovered and removed. Nonetheless, it is apparent that the previous intrusive works are unlikely to have disturbed the ground in all areas of the Study Site down to the likely average UXO burial depth of 5m bgl.

6.3 Proposed Works

An outline of the proposed intrusive works is also presented in order to evidence the potential UXO risk pathways that may be generated, should such work encounter those threat spectrum UXO that have been identified in Section 4.

A general overview of the scope of works for the project has been communicated to *6 Alpha* and consists of:

- "*Ground Investigations: Medium Trial Pit between 1m and 5m below ground level, Shallow Bulk Excavation up to 2m below ground level;*
- *Borehole Depth: Rotary boreholes (2no.) planned to extend to 20m depth with bedrock anticipated at between 6-9m bgl;*
- *Intrusive Work: In addition to trial pitting and ground level reduction; 2no. rotary boreholes will likely be required for pile design purposes;*
- *Excavation Depth: Trial pits to 3-4m depth with a preparatory ground level reduction of typically 1.5m bgl to facilitate access and development levels.*"

Consequently, it is apparent that the proposed works might generate a UXO risk pathway in ground that has not been previously disturbed (including any ground below post-WWII intrusive work) to a depth of 5m bgl.

If the planned methods are changed, then the risk assessment is to be reviewed and updated if necessary.

7 UXO Risk Assessment

7.1 Threat Items

The most probable sources of UXO risk at this Study Site are *German* HE bombs, whilst IBs and *British* AAA projectiles pose a residual threat. The consequences of initiating *German* HE bombs are generally more severe than initiating IBs or AAA projectiles, and thus they pose the greatest prospective risk to intrusive works.

7.2 Risk Pathways

Given the nature and scope of the prospective UXO hazard at the Study Site, all types of aggressive intrusive activities (i.e., investigative groundworks and construction methodologies) into previously undisturbed ground (including ground below any post-WWII redevelopment) to a depth of 5m bgl may generate a viable risk pathway.

7.3 Risk Receptors

The likely risk receptors include:

- Site personnel;
- Plant and equipment;
- Third-party infrastructure (utilities/services) and buildings;
- The natural environment.

Consequences of UXO initiation include:

- Injuries and/or fatalities to personnel;
- Damage to plant and equipment, nearby buildings and infrastructure;
- Rupture and damage underground utilities/services and the natural environment.

Consequences of an unexpected and unplanned UXO discovery include:

- Incurring delays and additional costs through the expenditure of additional risk mitigation resources and EOD clearance;
- Disruption to local community;
- Negative publicity.

7.4 Semi-Quantitative Risk Assessment

A semi-quantitative risk assessment has been undertaken, and the results are presented at Table 3.

Activity	UXO Threat Item	Probability (SH+EM=P)	Consequence (D+PSR=C)	Risk (PxC=R)
Trial Pits	Aerial Bombs	1+2=3	3+3=6	**3x6=18**
	AXO/LSA/SAA	0+2=2	3+2=5	**2x5=10**
	AAA Projectiles	1+2=3	3+1=4	**3x4=12**
Boreholes	Aerial Bombs	1+3=4	3+2=5	**4x5=20**
	AXO/LSA/SAA	0+3=3	3+2=5	**3x5=15**
	AAA Projectiles	1+3=4	3+1=4	**4x4=16**
Excavations	Aerial Bombs	1+2=3	3+3=6	**3x6=18**
	AXO/LSA/SAA	0+2=2	3+2=5	**2x5=10**
	AAA Projectiles	1+2=3	3+1=4	**3x4=12**

Table 3: UXO SQRA Results

7.4.1 SQRA Conclusions

The SRQA has determined that the proposed intrusive works may generate, as a reasonable worst-case scenario, a ***MEDIUM*** level of risk at the Study Site. Such risks may pose harm to human health and damage any equipment involved in intrusive activities. Whilst the level of risk to site personnel is relatively limited, it is intolerable and will require mitigating in accordance with the ALARP risk reduction principle, as per Part III of this report.

Part III: UXO Risk Mitigation Strategy

8 UXO Risk Mitigation Strategy

8.1 Strategic Overview

As per *CIRIA* C681 guidance, *6 Alpha* recommended that the identified UXO risks are reduced ALARP. Crucially, the ALARP principle states that if the cost of reducing a risk significantly outweighs the benefit, then the risk may be considered tolerable. This does not mean that there is never a requirement for UXO risk mitigation, but that any mitigation must demonstrate that it is beneficial. Any additional mitigation that delivers diminishing benefits and that consumes disproportionate time, money and effort are considered *de minimis* and thus unnecessary. Because of this principle, UXO risks will rarely be reduced to zero (nor need they be).

Consequently, a limited suite of reactive UXO risk mitigation measures ought to be implemented ahead of proposed intrusive operations at the Study Site in order to reduce the identified UXO risks to ALARP.

8.2 Proactive UXO Risk Mitigation Measures

The level of risk to the proposed works at this Study Site does not warrant the implementation of proactive UXO risk mitigation measures in the form of a geophysical UXO survey or UXO Watching Brief. The implementation of such measures at this Site would be beyond what is required under the ALARP risk reduction principle.

8.3 Reactive UXO Risk Mitigation Measures

The following reactive risk mitigation measures should be undertaken for all activities in all areas:

8.3.1 Operational UXO Emergency Response Plan

Appropriate site management documentation should be held on-site to guide and plan for the actions which should be undertaken in the event of a suspected or real UXO discovery (this plan can be supplied by *6 Alpha*).

8.3.2 UXO Safety and Awareness Briefings

The briefings are essential when there is a possibility of an explosive ordnance encounter and are a vital part of the general safety requirement. All personnel working on the Site should receive a briefing on the following:

- The identification of threat spectrum UXO;
- What actions they should take to keep people and equipment away from such a hazard and to alert site management.

Information concerning the nature of the UXO threat should also be held in the site office and displayed for general information on noticeboards - both for reference and as a reminder for ground workers.

The safety awareness briefing is an essential part of the *Health & Safety Plan* for the site and helps to evidence conformity with the appropriate health and safety standards and legislation.

8.3.3 On-Call EOD Engineer

An on-call EOD Engineer will be able to identify and/or advise on the appropriate course of action in the event of any suspicious and/or real UXO finds and should be implemented at this Site to mitigate the residual UXO risk associated with the proposed works. *6 Alpha* offer three tiers of immediate telephone and/or email response.

8.4 ALARP Safety Sign Off Certification

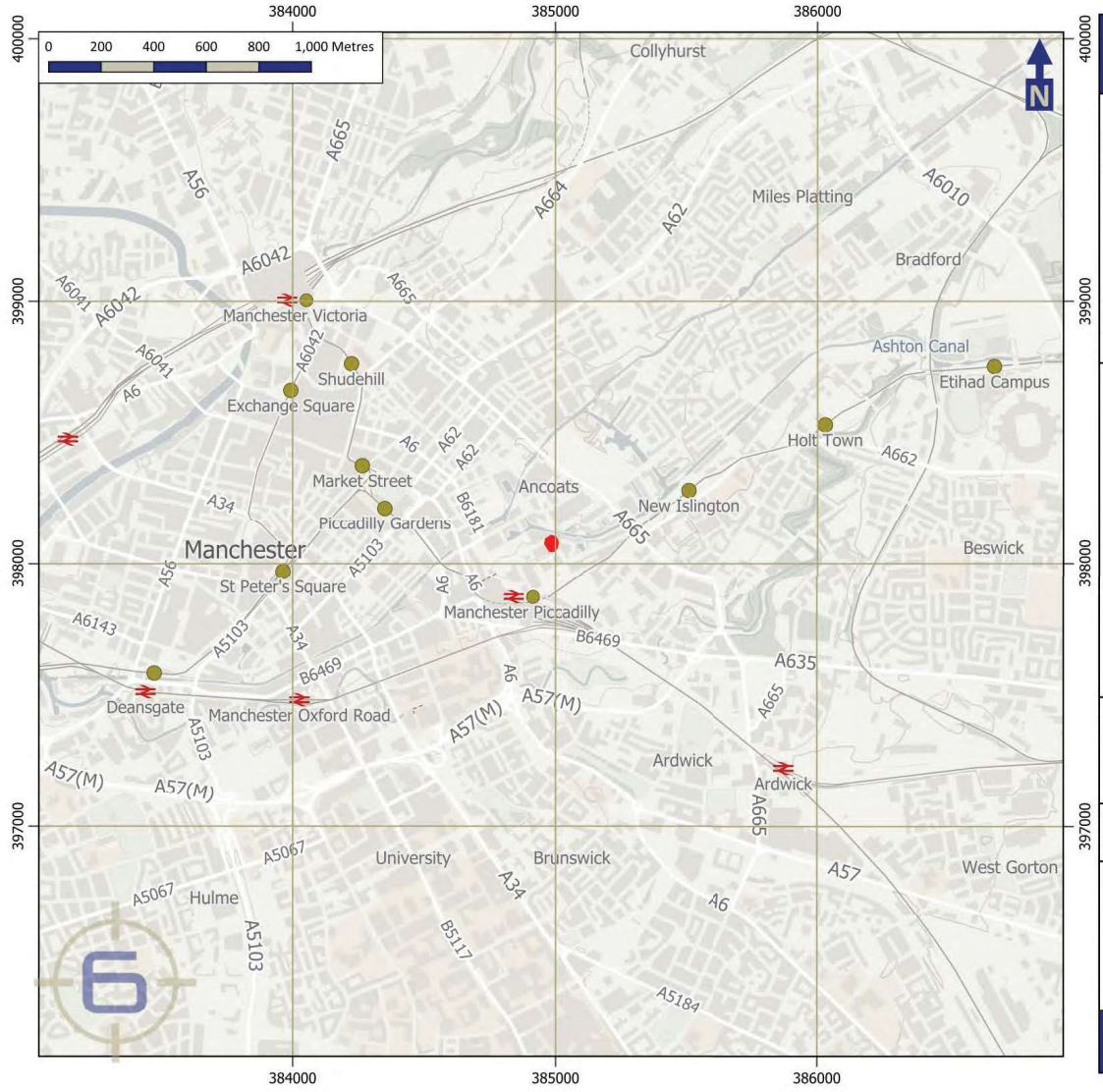
ALARP safety sign-off certification provides an independent source of evidence that a Client has followed industry best practice and has successfully managed and reduced UXO risks to ALARP. Following the execution of *6 Alpha's* UXO risk mitigation measures, we can deliver ALARP safety sign-off certification, in advance of the proposed operations.

In such circumstances the project will be able to certify for the benefit of all of its stakeholders, that all reasonably practicable measures have been taken to protect contractors from UXO hazards and that the commissioning Client will have acted in compliance with industry best practice as well as the national safety legislation.

In accordance with best practice therefore, *6 Alpha* ALARP safety sign-off certification does not imply that any site is free from UXO, rather, that the necessary and appropriate UXO risk mitigation measures have been appropriately applied to evidence that UXO risks have been reduced ALARP.

8.5 Recommended Next Steps

We recommend that the Client's next steps are focused upon phase four of the UXO Risk Management Framework namely, the detailed designs of the recommended UXO risk mitigation measures as outlined above.



Site Location

BOMB SEARCH

LEGEND

Site Boundary



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
11937	1	DB	LG	29/05/2025

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special risks consultancy

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Site Boundary

BOMB SEARCH

LEGEND

Site Boundary



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

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Modern Aerial Photography

BOMB SEARCH

LEGEND

Site Boundary



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
11937	3	DB	LG	29/05/2025

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Map data: Google, Airbus

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WWII High Explosive Bomb Density

BOMB SEARCH

LEGEND

Site Boundary

High Explosive Bomb Density

- Less than 15 bombs per 100 hectares
- 16-25 bombs per 100 hectares
- 26-35 bombs per 100 hectares
- 36-45 bombs per 100 hectares
- Over 46 bombs per 100 hectares



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

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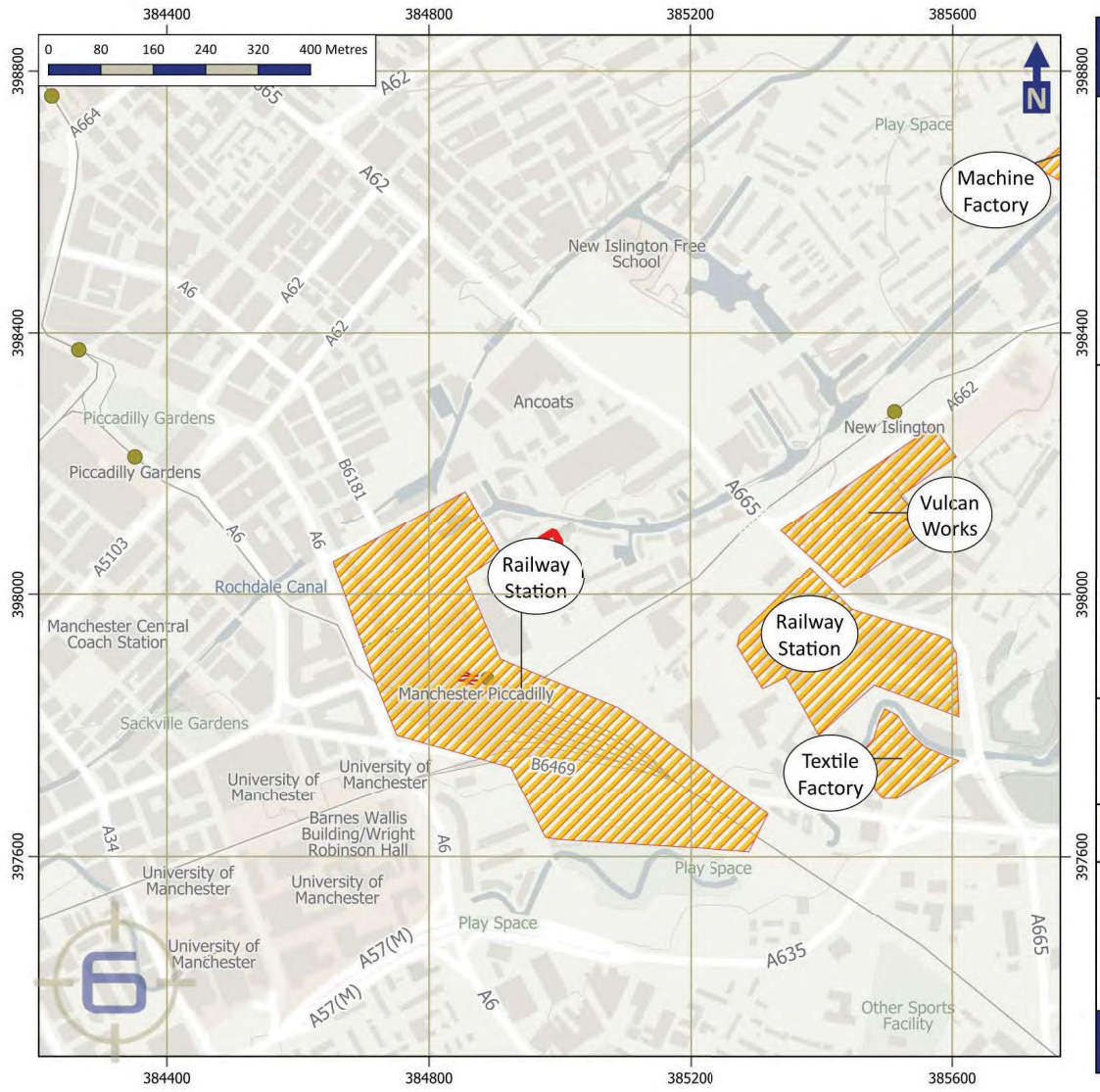
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Appendix 5 – WWII *Luftwaffe* Bombing Targets



WWII Luftwaffe Bombing Targets

BOMB SEARCH

LEGEND

- Site Boundary
- Luftwaffe Target



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

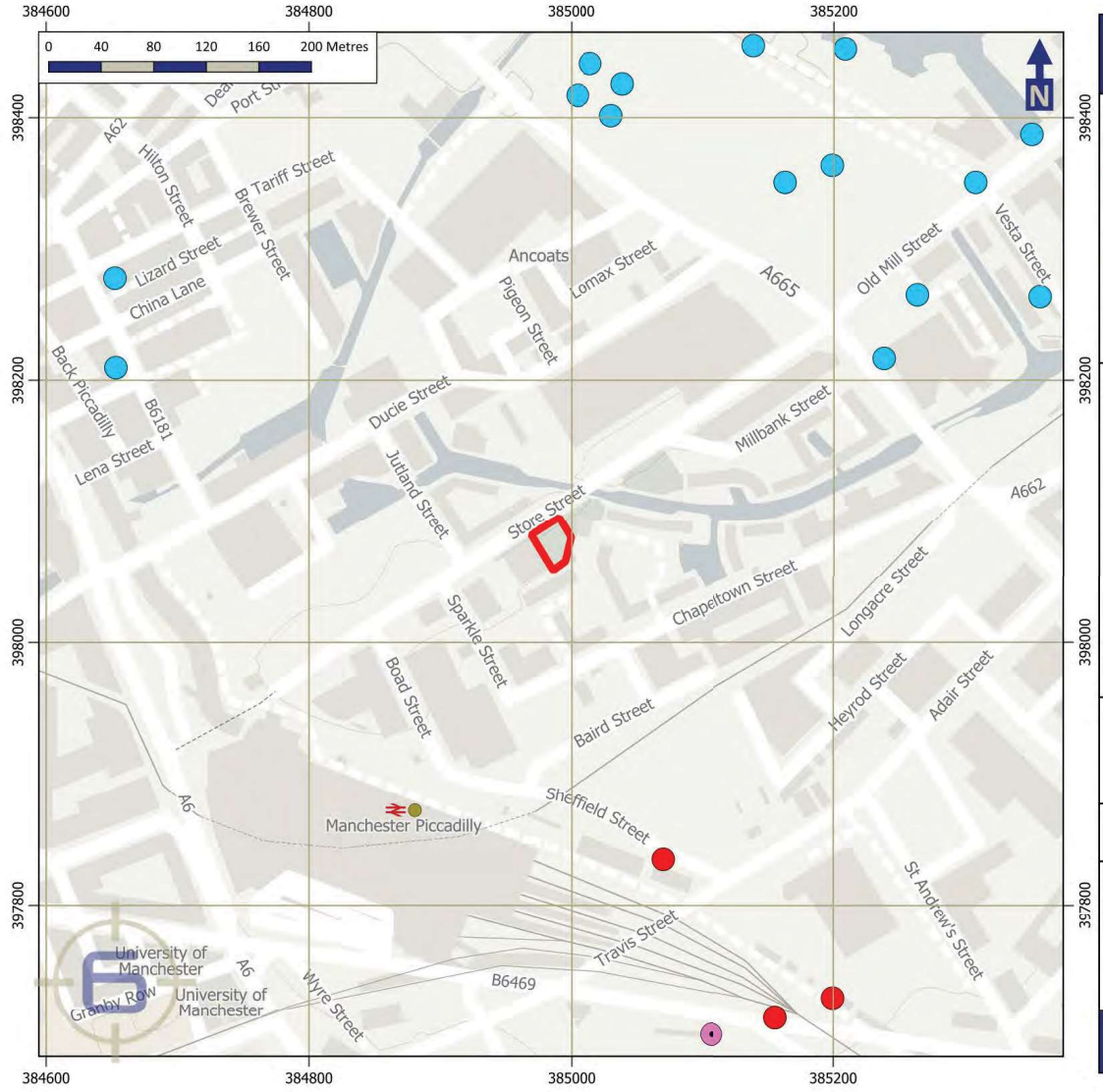
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WWII Bomb Strikes

BOMB SEARCH

LEGEND

Site Boundary

Consolidated Bomb Strikes

- High Explosive Bomb
- Incendiary Bomb
- Parachute Mine



British National Grid

Address

Land at 48, Store Street, Manchester, M1 2WA

PROJECT NO.	FIGURE	DRAWN	CHECKED	DATE
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